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REVIEW REPORT ON UMPQUA RIVER AND TRIBUTARIES, OREGON. SOUTH UM--ETC(U)
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REVIEW REPORT

ON

UMPQUA RIVER AND TRIBUTARIES, OREGON

INTERIM REPORT

SOUTH UMPQUA RIVER

VOLUME IV

REPORTS OF COOPERATING AGENCIES

APPENDIX E - FISH AND WILDLIFE SERVICE

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U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS

DECEMBER 1971

(6)

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON,
~~INTERIM REPORT~~ SOUTH UMPQUA RIVER,

Volume IV.

(11) Dec 71

(12) 260 p.

APPENDIX E.

~~REPORT OF THE~~ FISH AND WILDLIFE SERVICE

Appendix F. Environmental Protection Agency.

Appendix G. Bureau of Reclamation.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

730 N. E. PACIFIC STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

Reference: RBS

December 20, 1971

District Engineer
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Sir:

This is our detailed report on the effects proposed Days Creek dam and reservoir project, South Umpqua River, Douglas County, Oregon, would have on fish and wildlife resources. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). It is based on project information and engineering data provided by your office prior to October 1971, and is intended to accompany your feasibility report authorized by the River and Harbor Acts of 1938 and 1958. Our analysis is based on a 100-year project life. Monetary values assigned to recreational-type fish and wildlife benefits are based upon criteria contained in Supplement No. 1 to Senate Document No. 97.

This report has been reviewed by the Fish Commission of Oregon and Oregon State Game Commission. It has been endorsed by these agencies as indicated in the appended copies of letters from Acting Director Thomas E. Kruse, dated November 22, 1971, and Director John W. McKean, dated November 22, 1971. Biological data were obtained in cooperation with these agencies.

The Fish Commission of Oregon indicated that the following points needed amplification:

1. Adequate data are not available on the life cycle of shad in the South Umpqua River to predict project effects on this species.

2. The recommended fishery evaluation study would probably cost $175,000 rather than $150,000 as shown in the report.

3. A problem could develop with juvenile coho salmon in the reservoir preying on spring chinook salmon juveniles thus

reducing production of the latter species. If this occurs it may be necessary to limit the number of coho that spawn upstream from the project and use other means of compensating for these fish, such as hatchery production.

4. To be effective and economical, periodic treatment of the reservoir to control nongame fish would require that the reservoir be drawn down to near stream bottom.

5. The stocking rates involving 500,000 fall chinook and 250,000 spring chinook salmon and 150,000 summer steelhead are annual rates.

The Oregon State Game Commission suggested that trend data shown in table 2 and on page 7 be changed to show zero benefit from year 1 to 4 rather than year 5 since there would be some benefit by year 5.

We are in agreement with the suggestions made by these agencies and where possible have modified the report to clarify these points.

National Marine Fisheries Service has reviewed and commented on the report.

PROJECT DESCRIPTION

Days Creek dam and reservoir would be a multipurpose project serving the functions of flood control, fish and wildlife, recreation, municipal and industrial water supply, irrigation, and water quality. The proposed dam, to be located on the South Umpqua River 1 mile upstream from the town of Days Creek would be about 254 feet high. The reservoir would be about 16 miles long, have 52 miles of shoreline, a storage capacity of 480,000 acre-feet, and a surface area of 4,270 acres at full conservation pool level, elevation 1,022.[1/] Reservoir filling would occur between February 1 and May 1. Summer water releases would result in a drawdown of 35 feet by Labor Day. The reservoir would be operated to provide maximum flood control during the period December 1 to February 1. At this pool level, elevation 948, reservoir drawdown would be 74 feet below conservation pool level, storage capacity 205,000 acre-feet, surface area 2,840 acres, and shoreline 34 miles. This operational procedure would prevail except during low water years when water from holdover storage would be needed for conservation purposes. Maximum drawdown anticipated would be 128 feet. Up to 17,000 linear feet of channel stabilization would be provided to prevent erosion that might result from project operation.

[1/] All elevations are in feet and refer to mean sea level datum.

Studies conducted in relation to Tiller dam site, an alternate to Days Creek site, indicated a high potential for degrading water quality due to excessive turbidity and siltation resulting from deposits of montmorillonite clay in and above the reservoir site. Since Days Creek dam site is downstream from Tiller, the same problem could apply to this project location. Impoundment and subsequent release of turbid water from this project could have an adverse effect on the existing fishery of the Umpqua River and would greatly reduce fishery benefits. Plan formulation includes recommendation of studies adequate to show if turbidity would preclude significant fishery benefits. These studies would precede project construction. Our analysis was made on the assumption that a turbidity problem would not exist.

Project plans include a number of measures for the conservation and development of fish and wildlife resources and reflect close coordination among the Corps of Engineers, State fish and wildlife agencies, and our Bureau. These measures are outlined below and are included in the with-the-project analysis.

Days Creek dam and reservoir would be designed to regulate downstream flow and water quality in the South Umpqua River. A multilevel intake tower would permit selective withdrawal of water from the reservoir permitting temperature control of released water to enhance fish habitat in 60 miles of the river downstream from the dam. Selection of water at the desired temperature would be facilitated by provision of 12 intake ports. Data indicate releases to the river would have maximum temperatures of about 54° F. and 56° F. in average and low-water years, respectively. Dependable releases of 750 cfs to 950 cfs would be provided for the period June through September. Flows during the remainder of the year would generally exceed 700 cfs except for years of water shortage. Potential downstream flows and water temperatures at the damsite are shown in the following table.

Table 1. Potential Reservoir Operation Schedule [1/]

Month	Reservoir Discharge	
	Flow (cfs)	Temperature (°F)
January	677	35
February	1,164	39
March	1,544	41
April	935	46
May	1,498	49
June	793	53
July	1,024	54
August	1,013	54
September	1,031	54
October	833	52
November	733	52
December	704	50

1/ Based on average water year (1949).

Fish passage facilities would be included in the dam to maintain salmon runs now spawning upstream from the reservoir site. Salmon spawning within the reservoir site and runs of steelhead and searun cutthroat trout which spawn upstream from the dam would be maintained by construction of hatchery facilities. Hatchery facilities would also be constructed to produce spring chinook salmon fry for rearing in the project pool and rainbow trout for reservoir stocking to provide a trout fishery. Project funds would be provided for a 10-year period to produce juvenile salmon and steelhead trout at an existing hatchery. These fish would be used to establish and increase anadromous fish runs downstream from the dam.

Prior to impoundment, the South Umpqua River and its tributaries upstream from the damsite would be chemically treated to control nongame fish. Retreatment would be provided at approximately 10-year intervals.

Approximately 1,200 acres of land upstream from the reservoir site would be acquired for wildlife mitigation. Funds would also be provided to perform periodic habitat control measures on these lands.

FISH

Without the Project

South Umpqua River system provides good habitat for several species of anadromous fish including spring and fall chinook and coho salmon, winter steelhead and searun cutthroat trout, and shad. Resident game fish found in the system are rainbow and cutthroat trout and brown bullhead. Nongame fish common to the drainage include sucker, squawfish, redside shiner, dace, and cottids.

The upper reaches of the river system provide suitable habitat for spring chinook and coho salmon and winter steelhead and searun cutthroat trout. Downstream from Tiller, summer flows are extremely low, and water temperatures are high. River temperatures of 80° F. have been recorded near Tiller and 94° F. at Winston. The river system downstream from Tiller supports runs of anadromous fish whose migration and spawning patterns coincide with periods of favorable flows and water temperatures. Species using this area are coho and fall chinook salmon, winter steelhead and searun cutthroat trout, and shad.

Anadromous fish spawning runs using the South Umpqua River are estimated at 1,000 spring chinook, 650 fall chinook, and 5,750 coho salmon; 2,500 winter steelhead and 2,000 searun cutthroat trout; and 3,000 shad. Their progeny will provide 151,000 pounds of salmon and 3,400 pounds of shad annually to the commercial fishery in the Pacific Ocean and Umpqua River and an average annual sport fishery of 78,200 angler-days in the Umpqua River and Pacific Ocean over the period of analysis.

Cutthroat trout are the most abundant of the resident game fish found in the river system. This species generally inhabits the headwater areas which are not used by anadromous fish. Rainbow trout are sparsely distributed throughout the system. Natural trout production is supplemented by annual stocking of about 25,000 legal size rainbow trout by the Oregon State Game Commission. It is estimated that an average of 3,500 angler-days for resident trout will occur annually within the river system over the analysis period. Of this total, 500 angler-days will occur within the pool area and the remaining 3,000 days upstream from the reservoir.

With the Project

Days Creek dam without fish passage would block anadromous fish spawning runs of 1,000 spring chinook and 2,750 coho salmon, and 2,500 winter steelhead and 2,000 searun cutthroat trout. Progeny from these runs would provide 67,900 pounds of salmon annually to the commercial fishery in the Pacific Ocean and an average annual sport fishery of 38,000 angler-days in the Umpqua River and Pacific Ocean.

Measures have been included in project plans to permit continued salmon use of spawning areas available upstream from the proposed reservoir. Provision of upstream and downstream fish passage facilities would help assure perpetuation of this resource over the project life.

Attempts to pass steelhead and searun cutthroat trout at high dams have met with limited success, posing questions as to whether passage is an adequate means of maintaining runs of these fish. Therefore, project plans include construction funds for hatchery facilities to maintain present runs of steelhead and searun cutthroat trout ascending upstream from the dam. Additional hatchery facilities would also be provided to sustain current runs of 100 spring chinook and 1,250 coho salmon which spawn within the reservoir area.

Days Creek reservoir would create habitat favorable for nongame fish. Populations of these fish would increase under these conditions causing a decrease in anadromous and resident fish resources using the upstream river area. Project plans include funds for chemical treatment to control nongame fish populations.

With provision of the foregoing measures, upstream and downstream fish passage, hatchery facilities, and nongame fish control, anadromous fish runs utilizing the South Umpqua River upstream from the damsite would be maintained at without-the-project levels.

Improved streamflows and reduced water temperatures provided by the project would greatly improve fish habitat downstream from the dam allowing establishment of increased anadromous salmon and trout spawning runs. These increases are estimated at 5,300 spring chinook, 6,900

fall chinook, and 660 coho salmon, 1,300 winter steelhead, and 3,100 summer steelhead trout. Once established, progeny from these runs would provide an average annual benefit to the commercial fishery of 392,000 pounds of salmon valued at $218,000 and an average annual sport fishery of 117,700 angler-days valued at $6 per day. Projected increases in commercial harvest and fishermen use are shown in table 2.

Table 2 Anticipated Development Trends for Anadromous Fish Benefits in South Umpqua River Downstream from Days Creek Dam

Type of Harvest	Years After Project Completion			
	1 to 4	10	50	100
Commercial (pounds)[1/]				
Spring chinook	0	65,750	--	65,750
Fall chinook	0	347,750	--	347,750
Coho	0	11,150	--	11,150
Sport (angler-days)[2/]				
Spring chinook	0	6,500	13,000	13,000
Fall chinook	0	34,500	69,000	69,000
Coho	0	3,000	6,000	6,000
Winter steelhead	0	3,300	6,600	6,600
Summer steelhead	0	7,750	15,500	15,500

1/ Value per pound, spring and fall chinook $.56, coho $.39.
2/ Value per angler-day $6, all species.

Development of these runs would be dependent upon stocking of hatchery produced juvenile fish of the affected species for the first 10 years of project operation. Funding of this operation has been included in project plans.

Shad spawn in the lower 25 miles of the South Umpqua River during May, June, and July. This species prefers water temperatures above 55° F. for migration, spawning, and development. Peak spawning occurs at temperatures of about 64° F. Water released from Days Creek reservoir at 54° F. would reduce temperatures in the lower river during late June and July. However, water temperatures are expected to be near 64° F. at the upstream end of the shad spawning area. Project flows downstream

from the dam during June and July would be several times greater than present flows. Increased flow could result in physical damage to shad spawn and cause it to drift further downstream, thereby reducing the available rearing area. The project is not expected to significantly affect shad production, however, additional study is needed to confirm project effects on this resource.

With fish passage facilities and nongame fish control, Days Creek reservoir could be used for rearing spring chinook salmon. This use would result in an estimated average annual project benefit of 192,000 pounds of salmon to the commercial fishery valued at $107,500 and 33,500 angler-days valued at $6 per day. An increased escapement of 10,300 adult spring chinook salmon annually would be expected to develop as the result of this program. Anticipated development trends for anadromous fish reservoir rearing benefits would be as follows: Commercial benefits, year 0 to 4, 0 pounds; year 10, 207,600 pounds remaining constant thereafter. Sport fishery benefits, year 0 to 4, 0 angler-days; year 10, 20,600 angler-days; year 50, 41,200 angler-days, remaining constant thereafter. Benefits would be valued at $.56 per pound and $6 per angler-day. Funds are included in the project for natchery facilities needed to produce the required salmon fry for this project function.

With control of nongame fish and annual stocking, the reservoir would support an average annual sport fishery for resident trout of 77,800 angler-days valued at $2 per day over the project life. Initial use would be 31,100 angler-days increasing to 93,400 days by the 50th year of project operation. Angler use would remain constant thereafter. Hatchery facilities needed to produce rainbow trout for stocking the reservoir to obtain this fishery benefit are included in the project.

Proposed downstream channel stabilization could reduce the above noted anadromous fish benefits through loss of spawning area and excessive siltation.

Resident trout populations and angler effort in the river upstream from the reservoir would remain at levels shown under without-the-project conditions. The reservoir would cause a loss of 500 angler-days of stream fishing annually. However, it is anticipated that improved flow conditions downstream from the dam will provide stream angling to offset the loss.

WILDLIFE

Without the Project

Days Creek reservoir site provides good wildlife habitat. Important vegetative species in the area include Douglas fir, western red cedar, oak, madrone, alder, vine maple, willow, cottonwood, several species of

Ceanothus, oceanspray, snowberry, wild blackberry, wild rose, and miscellaneous grasses and forbs. About 1,000 acres of croplands are within the reservoir site. Forage crops are the main commodity produced.

Cultivated bottomlands and adjacent brushy slopes in the project area are particularly attractive to black-tailed deer, the principal big game animal occupying the reservoir site. White-tailed deer are occasionally seen in the project vicinity. About 480 deer utilize the area on a year-round basis. These animals contribute an estimated 2,200 hunter-days annually. Hunter effort is not expected to change significantly over the period of analysis. Black bears inhabit the area, but numbers are low and they are seldom hunted.

Upland game species using the area are ring-necked pheasant, California and mountain quails, silver grey squirrels, ruffed grouse, mourning doves, band-tailed pigeons, and brush rabbits. California and mountain quails are the most abundant species. Without the project, annual hunting effort for upland game is estimated at 600 man-days. Hunter use is expected to continue with little change.

Waterfowl use of the area is light. About 40 pairs of wood ducks and mallards use the river within the reservoir site for nesting. Hunting effort for waterfowl is estimated at 150 man-days annually. This effort is not expected to change significantly over the period of analysis.

Fur animals common to the area include beavers, minks, muskrats, river otters, ringtails, skunks, bobcats, coyotes, foxes, raccoons, and weasels. Fur harvest in the project area has an estimated average annual pelt value of $500. Harvest of furs is expected to remain relatively constant over the period of analysis.

Hunting of nongame animals and birds such as bobcats, coyotes, raccoons, ground squirrels, and crows has shown considerable increase in popularity. Hunting for these species within the reservoir site is minor at this time. However, the area has a high potential for this use. Average annual hunter effort for nongame species over the period of analysis is estimated at 150 man-days.

Habitat within the project area supports a variety of small mammals, song birds, hawks, and owls, which add considerably to the enjoyment of recreationists using the area. The northern bald eagle, golden eagle, and American osprey are among the protected species which use the reservoir site. No known rare or endangered plant or animal species appearing on the Federal register utilize the reservoir site. However,

the American osprey is being considered for possible addition to the Federal list of rare and endangered birds, and the American osprey and northern bald eagle are listed among the State of Oregon's endangered birds.

With the Project

Days Creek reservoir would inundate about 4,400 acres of important wildlife habitat. About 30 miles of riparian habitat would be inundated, and up to 3 miles could be destroyed if bank revetment is needed for the proposed channel stabilization.

Habitat reductions would cause a loss of animals dependent on the area for forage and cover and a resultant decrease in hunter-days supported by these animals. Estimated average annual hunter-day losses are: big game--2,200, upland game--600, and nongame--150.

Waterfowl nesting use of the river in the reservoir site would be eliminated. The reservoir would provide a resting area for waterfowl. However, it is not located along a major flyway and is not expected to attract appreciable numbers of ducks. Hunter use of the area would show little change over without-the-project conditions.

The annual fur harvest occurring in the project area would also be lost. The project would not significantly affect any rare and endangered plants or animals.

Project plans include funds for acquisition of 1,200 acres of land upstream from the proposed reservoir area. Funds are also included for management of this area for mitigation of project-caused wildlife losses.

DISCUSSION

Days Creek dam and reservoir project would have significant effects on fish and wildlife resources. Therefore, project authorization should include fish and wildlife conservation and development as a project purpose. Many of the measures included for fish and wildlife are interrelated, and deletion of any part could have a significant impact on assigned benefits.

Prior to project construction, additional studies should be undertaken to determine the extent to which water quality would be affected by deposits of montmorillonite or other colloidally fine clay. If such studies indicate turbid conditions would prevail in the reservoir and downstream river areas to the extent that significant fishery benefits could not be anticipated, the project should not be constructed. This study should be

conducted by the Corps of Engineers in cooperation with interested State and Federal agencies.

With a multilevel intake tower, dependable summer streamflows of from 750 cfs to 950 cfs having a maximum temperature of 56°F. could be provided for enhancement of fish resources. The value of the stream releases would depend upon assurance that water designated for fishery purposes would not be diverted for other uses but remain in the stream channel to the river mouth. Capital cost of the outlets is estimated at $2,650,000 and annual operation, maintenance, and replacement costs at $2,000. During years of water shortage, reservoir operation should be coordinated with the Oregon State Game Commission, Fish Commission of Oregon, National Marine Fisheries Service, and Bureau of Sport Fisheries and Wildlife to establish reservoir releases.

Upstream fish passage provided by the project would consist of adult trapping, holding, and hauling facilities. The trapping structure should include measures for separation of nongame fish to prevent their being transported upstream from the dam. The downstream migrant passage facility should be constructed in accordance with modern passage designs available at the time of project construction. Present minimum criteria are: (1) The facility should be constructed at a location assuring maximum attraction of migrants (present knowledge indicates that location would be on the upstream face of the dam); (2) Have the capacity to attract fish within 5 feet of the pool surface at all anticipated pool levels; (3) Be operable from November through June; (4) Provide sufficient flow for attraction of migrants (200 cfs is presently considered a minimum attraction flow); (5) Fish mortality within the system should be negligible. Capital costs of fish passage facilities are estimated at $2,100,000 with an estimated annual operation, maintenance, and replacement cost of $27,500. These costs are for loss prevention measures and would be project costs.

Hatchery facilities would be needed to maintain present runs of 100 spring chinook and 1,250 coho salmon which spawn within the reservoir area plus the 2,500 winter steelhead and 2,000 searun cutthroat trout which spawn upstream from the dam. Such facilities would also be needed to provide spring chinook salmon fry for rearing in the project reservoir, and provide trout for the reservoir trout fishery. The trapping and hauling facilities could be used to obtain adult fish for hatchery operation. These facilities could be provided through expansion of the Cole M. Rivers Hatchery now being constructed as part of the Corps of Engineers Lost Creek project on the Rogue River, or by construction of a new hatchery within the Umpqua River system. Hatchery location and the operating agency should be determined when the project design memorandum is prepared.

Estimated capital cost of hatchery facilities needed to compensate for project-caused losses of salmon and steelhead and searun cutthroat trout would be $1,684,000. Estimated operation, maintenance, and replacement

costs would be $101,000 annually. These costs would be project costs. Facilities should be constructed and operational concurrent with the start of any project construction which would affect natural production of salmon and steelhead.

Hatchery facilities needed for production of spring chinook salmon fry for rearing in the reservoir would require an estimated capital expenditure of $173,000 and estimated annual operation, maintenance, and replacement costs of $12,000. These costs should be allocated to anadromous fish enhancement.

Capital cost needed to produce rainbow trout in the hatchery for the reservoir fishery is estimated to be $405,000; operation and maintenance costs are estimated at $24,000 annually. These costs would be subject to cost-sharing provisions of the Federal Water Project Recreation Act (P.L. 89-72).

The drainage area upstream from the damsite would be chemically treated to remove nongame fish. Periodic retreatment would be required at about 10-year intervals. To be effective and economical, retreatment would require that the reservoir be drawn down to near streambed elevations. This measure would prevent degradation of fish habitat upstream from the dam and help maintain anadromous fish populations at preproject levels. Rehabilitation would be accomplished by using methods and materials acceptable to the Secretary of the Interior, Oregon State Game Commission, Fish Commission of Oregon, and the project sponsor. Initial treatment costs are estimated at $4,000 and estimated periodic retreatment costs would be about $20,000 every 10 years. These costs would be project costs.

To accelerate the buildup of fall chinook salmon and establish runs of spring chinook salmon and summer steelhead trout downstream from the dam, project plans include funding of hatchery operations over a 10-year period. Annual stocking of 500,000 fall chinook and 250,000 spring chinook salmon and 150,000 summer steelhead trout would be carried out over the first 10 years of project operation. It is anticipated that these fish can be produced at existing hatcheries. If rearing space is not available at existing facilities, temporary rearing ponds would have to be provided. Annual operation and maintenance costs for this project feature are estimated at $120,000.

An evaluation study of the above described measures for protection and enhancement of anadromous fish resources of the South Umpqua River should be done to determine if modification of project design or operation is needed to accomplish fish and wildlife conservation and development goals. This study should include an evaluation of project effects on shad downstream from the dam and of juvenile coho salmon in the reservoir preying on spring chinook salmon juveniles. This study would be conducted during the first 5 years following project completion and is estimated to cost $175,000. Oregon State Game Commission and Fish Commission of Oregon would conduct the study, which should be coordinated with the Corps of Engineers, National Marine Fisheries Service, U. S. Forest Service, and Bureau of Sport Fisheries and Wildlife.

Tagging studies show a wide ocean distribution of anadromous fish originating from the Umpqua River. Large catches are reported along the coast of California, Oregon, Washington, and British Columbia. Beneficiaries of project anadromous fish enhancement would be widely scattered among the sport fishermen in the Umpqua River and the sport and commercial fisheries of the Pacific Ocean. Identification of these beneficiaries for purposes of assigning repayment obligations would be impossible. Therefore, we conclude that all costs assigned to enhancement of anadromous fish resources should be considered nonreimbursable Federal costs.

Project planning includes funds for acquisition of 1,200 acres of land to mitigate project-caused wildlife losses. Also included are funds for habitat management. Acquisition areas should be located along the river upstream from the reservoir area and include about 200 acres of irrigated croplands. Estimated cost of acquiring these lands is $400,000. The 200 acres of irrigated lands would be used to produce legumes while the remaining 1,000 acres would be managed to maintain maximum deer browse production. Initial development costs are estimated at $65,000. Estimated operation and maintenance costs would be $15,000 every 5 years for the 200-acre area and $50,000 every 10 years for the remaining area. Specific lands to be acquired should be determined when the project design memorandum is prepared.

Project lands outside the reservoir area are generally steep and have shallow soils so offer little opportunity for mitigation of wildlife losses. Development of project recreation sites should be coordinated with the Oregon State Game Commission and the Bureau of Sport Fisheries and Wildlife and include planting of forage species. This would reduce the impact of such developments on wildlife. Project lands not assigned to recreation, reserved for project operation and public safety, or retained by the Bureau of Land Management, should be made available to the Oregon State Game Commission for management under a General Plan and subsequent Cooperative Agreement.

Zoning of the project reservoir and lands would be required to insure that certain sections of the reservoir or periods of time would be available for fishing, hunting, and other fish and wildlife uses without undue interference from other recreational activities. A zoning plan should be cooperatively developed by the Corps of Engineers, Oregon State Game Commission, Fish Commission of Oregon, Bureau of Land Management, and the Bureau of Sport Fisheries and Wildlife.

To conserve fish and wildlife resources associated with the South Umpqua River channel, stabilization work should be minimized. Plans for this project feature should be coordinated with the Oregon State Game Commission, Fish Commission of Oregon, National Marine Fisheries Services, and the Bureau of Sport Fisheries and Wildlife.

RECOMMENDATIONS

We recommend:

1. That the report of the District Engineer, Corps of Engineers, include the conservation, improvement and development of fish and wildlife resources among the purposes for which the project is to be authorized.

2. That detailed studies be undertaken prior to any project construction to determine the affect of deposits of clay found in the drainage area on water quality as it pertains to water to be impounded in the reservoir and subsequently released to the South Umpqua River. If these studies indicate turbid conditions would prevail in the reservoir and downstream areas, to the extent that significant fishery benefits could not be anticipated, the project should not be constructed. This study should be conducted by the Corps of Engineers in cooperation with interested State and Federal agencies.

3. That multiple-level water outlets be constructed at Days Creek dam to provide water quality control in the South Umpqua River. Capital costs are estimated at $2,650,000 and annual operation, maintenance, and replacement costs at $2,000. Costs would be assigned to enhancement of anadromous fish.

4. That reservoir releases be maintained at not less than the flows shown in the following table, except for years of water shortage.

Period	Flow (cfs)
October thru May	650
June	750
July-August	950
September	800

During years of water shortage, reservoir operation should be coordinated with the Oregon State Game Commission, Fish Commission of Oregon, National Marine Fisheries Service, and Bureau of Sport Fisheries and Wildlife to establish reservoir releases.

5. That upstream and downstream fish passage be provided. Upstream passage would consist of a trapping, holding, and hauling facility. The trapping stucture should include measures for separation of nongame fish. Downstream passage facilities should be constructed to meet the following criteria: (1) They should be constructed at a location which will assure maximum attraction of migrants (present knowledge indicates that location would be on the upstream face of the dam); (2) Have the

capacity to attract fish within five feet of the pool surface at all anticipated pool levels; (3) Be operable from November through June; (4) Provide sufficient flow for attraction of migrants (200 cfs is presently considered a minimum attraction flow); (5) Fish mortality within the system should be negligible. The design and plan would be developed cooperatively by the Fish Commission of Oregon, Oregon State Game Commission, Corps of Engineers, National Marine Fisheries Service, and Bureau of Sport Fisheries and Wildlife. Capital costs of fish passage structures are estimated at $2,100,000 with annual operation, maintenance, and replacement costs $27,500. These costs should be assigned to anadromous fish loss mitigation.

6. That project funds be provided for construction of hatchery facilities to maintain runs of salmon which spawn within the reservoir site, runs of steelhead and searun cutthroat trout that spawn upstream from the proposed damsite, spring chinook salmon fry for rearing in the project reservoir, and to produce rainbow trout for the reservoir trout fishery. Estimated capital cost of hatchery facilities needed to mitigate project-caused salmon and steelhead and searun cutthroat trout losses would be $1,684,000 and annual operation, maintenance, and replacement costs $101,000. These costs should be assigned to anadromous fish loss mitigation.

Hatchery facilities needed for production of salmon fry for rearing in the reservoir would require an estimated capital expenditure of $173,000 and annual operation, maintenance, and replacement costs of $12,000. These costs should be assigned to anadromous fish enhancement.

Capital costs of hatchery facilities needed to produce rainbow trout for the reservoir fishery are estimated at $405,000 and annual operation, maintenance, and replacement costs, $24,000. Funds equal to one-half the initial construction costs should be provided in accordance with the Federal Water Project Recreation Act (P.L. 89-72).

Location of hatchery facilities and designation of an operating agency should be determined cooperatively by the Oregon State Game Commission, Fish Commission of Oregon, National Marine Fisheries Service, Corps of Engineers, and the Bureau of Sport Fisheries and Wildlife.

7. That the project fund initial and periodic chemical control of nongame fish in the South Umpqua River upstream from the proposed damsite. This program would be cooperatively conducted by the Oregon State Game Commission, Fish Commission of Oregon, Bureau of Sport Fisheries and Wildlife, and Corps of Engineers with materials and methods acceptable to the Secretary of the Interior and the aforementioned agencies. Initial treatment costs are estimated at $4,000 with a periodic retreatment cost of $20,000 approximately every 10 years. These costs should be assigned to mitigation of anadromous and resident fish losses.

8. That hatchery operation be funded for a 10-year period to accelerate the buildup of fall chinook salmon runs and establish runs of spring chinook salmon and summer steelhead trout downstream from the dam. Annual operation and maintenance costs are estimated at $120,000 and would be for anadromous fish enhancement.

9. That project funds of $175,000 be provided during the first 5 years following project completion to evaluate post-project conditions and effects of the project on anadromous fish resources. This study should commence with the start of project operation. It should be designed to determine the effectiveness of project measures to prevent and offset losses to existing fish runs and to establish any modifications in project structures or operation needed to obtain intended objectives. This study would be conducted by the Oregon State Game Commission, and Fish Commission of Oregon in cooperation with National Marine Fisheries Service, U. S. Forest Service, Bureau of Sport Fisheries and Wildlife, and Corps of Engineers. Costs should be assigned to mitigation of anadromous fish losses.

10. That all capital, operation, maintenance, and replacement costs associated with anadromous fish mitigation measures be treated in the same manner as other project joint costs and allocated among the beneficial purposes of the project.

11. That all separable costs associated with anadromous fish enhancement be considered nonreimbursable Federal costs.

12. That 1,200 acres of land, including 200 irrigated acres, be acquired to mitigate project-caused wildlife habitat loss. These lands should be located along the river upstream from the reservoir area. This area and project lands not assigned to recreation, reserved for project operation and public safety, or retained by the Bureau of Land Management should be made available to the Oregon State Game Commission for management under a General Plan and subsequent Cooperative Agreement. Acquisition costs are estimated at $400,000. Initial development costs would be an estimated $65,000. Operation and maintenance costs on the 200 acres of irrigated lands are estimated at $15,000 every 5 years and on the remaining 1,000 acres $50,000 every 10 years. Specific lands to be acquired should be determined when the project design memorandum is prepared. These costs should be assigned to mitigation of wildlife losses.

13. That channel stabilization work be coordinated with the Fish Commission of Oregon, Oregon State Game Commission, National Marine Fisheries Service, and Bureau of Sport Fisheries and Wildlife.

14. That the report of the District Engineer, Corps of Engineers, provide for development of a reservoir zoning plan in connection with overall planning for the reservoir to insure that certain areas of the reservoir

or periods of time would be available for fishing, hunting, and other wildlife purposes without conflicting uses for general recreation. Such a plan would be developed cooperatively by the Corps of Engineers, Oregon State Game Commission, Fish Commission of Oregon, Bureau of Land Management, Bureau of Outdoor Recreation, and Bureau of Sport Fisheries and Wildlife for recommendation to the appropriate regulatory agency.

15. That the following language be incorporated in the recommendations of the report of the District Engineer, Corps of Engineers:

a. That Federal lands and project waters in the project area be open to public use for fishing and hunting, except for sections reserved for safety, efficient operation, or protection of public property, and certain areas where closures may be necessary to conserve or develop fish and wildlife resources.

b. That leases of Federal land in the project area reserve the right of public use of such land for hunting and fishing.

Please advise us of your proposed action concerning our recommendations. We would appreciate notification of any changes in project plans so we may revise our report if necessary.

Sincerely yours,

John D. Findlay

JOHN D. FINDLAY
Regional Director

Attachments

GAME COMMISSION

OFFICE OF THE DIRECTOR

P.O. BOX 3503 • 1634 S.W. ALDER ST. • PORTLAND, OREGON • 97208 • Ph. 229-5551

TOM McCALL
GOVERNOR

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DAN CALLAGHAN, Member
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J. PAT METTE, Member
FRANK A. MOORE, Member
JOHN W. McKEAN
State Game Director

November 22, 1971

Mr. John D. Findlay
Regional Director
Bureau of Sport Fisheries and Wildlife
P. O. Box 3737
Portland, Oregon 97208

Dear Mr. Findlay:

We have reviewed a draft report of the effects the proposed Days Creek project would have on the fish and wildlife resources. Generally, we concur with the report with one minor exception.

Table 2 on page 8 lists anticipated benefits for anadromous fish as being zero for years one to five. Since there would be some benefits by year five, we suggest this be changed to read from years one through four. This same change should be made on line 2, page 9.

We have appreciated the opportunity to make this review and provide comments.

Sincerely yours,

John W. McKean

John W. McKean
Director

cc River Basin Studies, Portland Area Office, BSF&W
Fish Commission of Oregon
National Marine Fisheries Service

FISH COMMISSION

OFFICE OF THE DIRECTOR

307 STATE OFFICE BLDG. • 1400 S.W. 5th AVE. • PORTLAND, OREGON • 97201

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GOVERNOR

COMMISSIONERS
JOSEPH I. EOFF
Chairman
EDW. G. HUFFSCHMIDT
Vice Chairman
McKEE A. SMITH
Member

November22, 1971

Mr. John D. Findlay, Director
Bureau of Sport Fisheries and Wildlife
Post Office Box 3737
Portland, Oregon 97208

Dear Mr. Findlay:

In your letter of October 19, 1971 from Mr. Charles F. Simmons our agency was requested to review the draft report on the effects of the proposed Days Creek Dam and Reservoir project, South Umpqua River, Oregon on the fish and wildlife resources. We have completed our review of the report and concur with its contents. However, we feel a few points need amplification.

Page 15 of the report discusses an evaluation study of measures for protection and enhancement of anadromous fish resources of the South Umpqua River. It should be made clear that this includes the effects of the project on the shad resource. Shad are important in the basin to both the sport and commercial fisheries. We do not have adequate information on the life cycle of the shad in the South Umpqua River to predict the effect of the project on this species. Therefore we are making special mention of the shad here so that if the fishery evaluation study for the project finds this species to be adversely affected, corrective actions can be taken.

The report states the cost of the evaluation study would be $150,000 for a five-year period. We believe this cost was arrived at two or more years ago and therefore with the inflation should be above that figure now. A cost of $175,000 is probably a more realistic figure at this time and the cost will rise above that before the dam is constructed and the study starts.

Page 6 discusses fish passage at the project. We believe fish passage will be successful and agree with this procedure. However, at some projects where we have conducted evaluation studies, a problem has developed with juvenile coho in the reservoir preying on spring chinook juveniles which reduces production of the latter species. If a serious problem of this kind should be disclosed by the evaluation study, we may need to limit the numbers of coho that spawn above the project and use other means of compensating for these fish, such as by hatchery production.

On page 4 the report mentioned that the stream and tributaries upstream from the damsite would be chemically treated to control nongame fish populations and that treatment would probably be needed at ten year intervals. We are in complete agreement with this statement but point out that effective and economic treatment will require that the reservoir first be drawn down to near stream bed elevation.

On page 14 the report says that stocking of 500,000 fall chinook, 250,000 spring chinook and 150,000 summer steelhead trout would be carried out over the first ten years of the project to accelerate the build-up in established runs. It should be made clear that these stocking rates are annual rates.

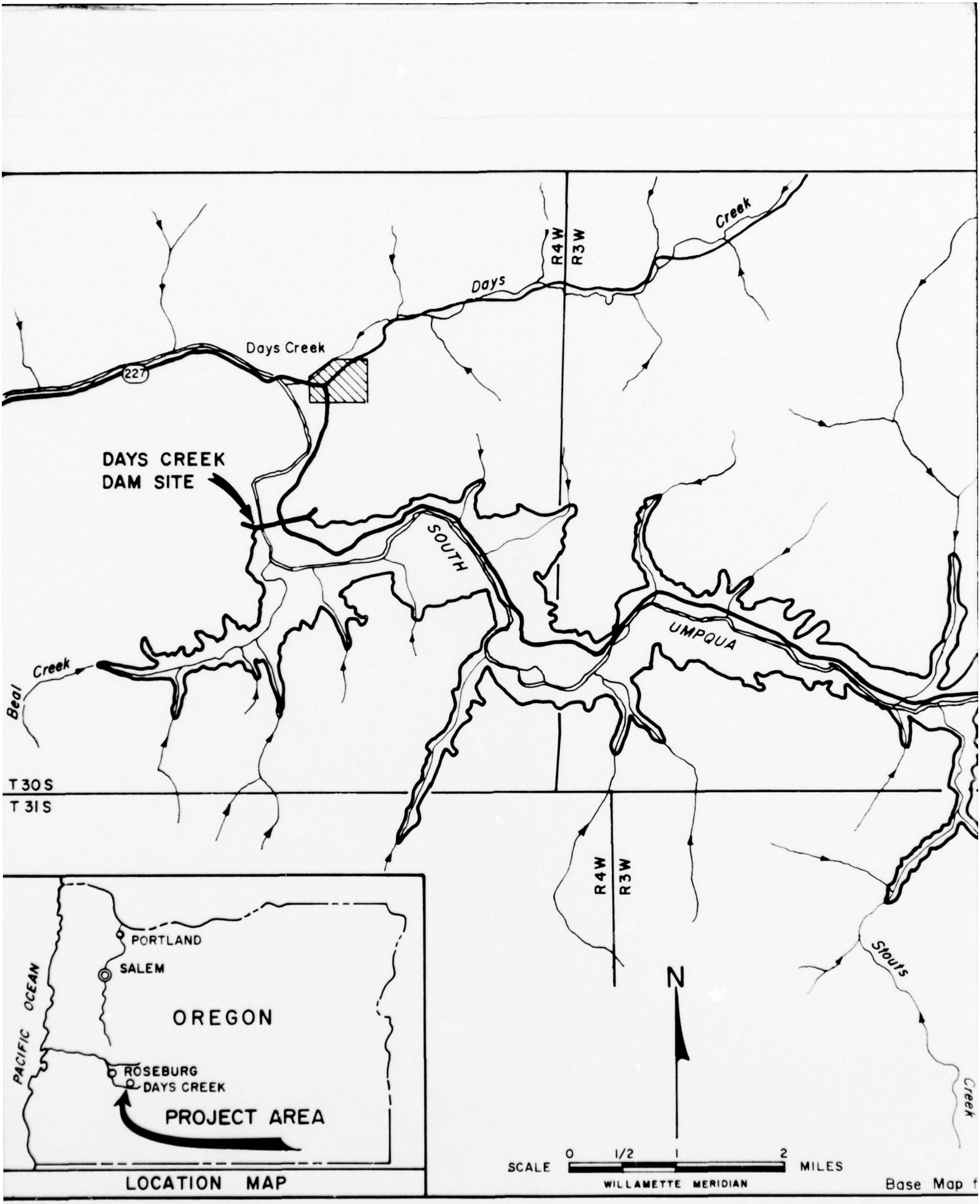
We appreciate the opportunity to comment on this report.

Sincerely,

Thomas E. Kruse

THOMAS E. KRUSE, ACTING
STATE FISHERIES DIRECTOR

cc Bureau of Sport Fisheries and Wildlife, River Basins Section
Corps of Engineers, Portland District
National Marine Fisheries Service
Oregon State Game Commission


Days Creek
227
DAYS CREEK
DAM SITE
Days
Creek
R4W
R3W
SOUTH
UMPQUA
Beal
Creek
T30S
T31S
R4W
R3W
Stouts
Creek
N
PORTLAND
SALEM
OREGON
PACIFIC OCEAN
ROSEBURG
DAYS CREEK
PROJECT AREA
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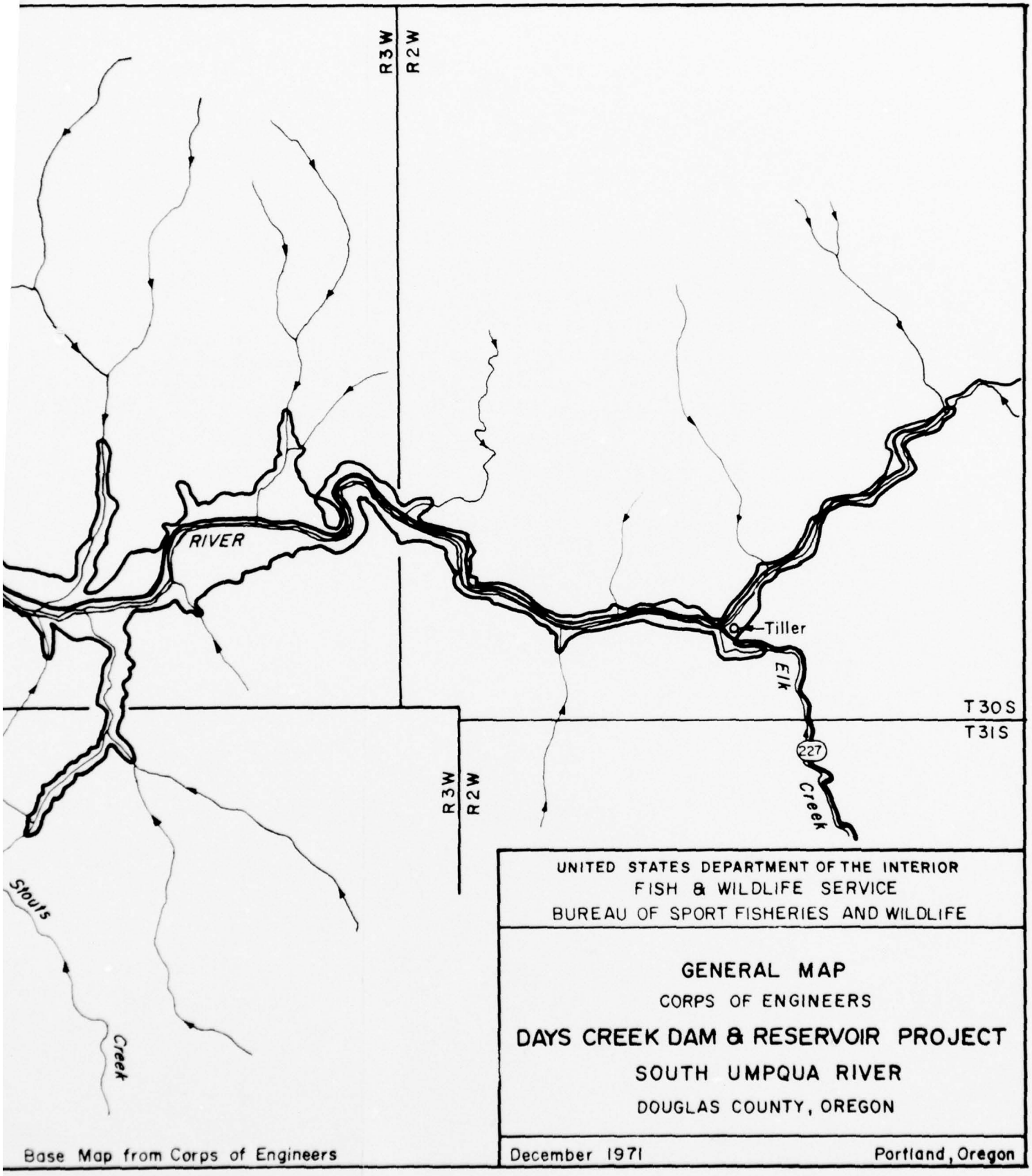
WILLAMETTE MERIDIAN
Base Map f



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH & WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

GENERAL MAP

CORPS OF ENGINEERS

DAYS CREEK DAM & RESERVOIR PROJECT

SOUTH UMPQUA RIVER

DOUGLAS COUNTY, OREGON

Base Map from Corps of Engineers

December 1971 Portland, Oregon

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON
INTERIM REPORT, SOUTH UMPQUA RIVER

APPENDIX F

REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

August 31, 1971

Colonel Paul J. Triem
District Engineer
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Colonel Triem:

As requested in your letter of May 18, 1971, we have reviewed the updated project data on your proposed Days Creek Project, Umpqua River Basin. The review was made to determine whether, in light of the new data, our original water quality evaluation of the project, dated November, 1970, would need to be revised. The following comments are the results of this review.

Our original report set forth the needs for minimum flows necessary for water quality control, alternative means of satisfying water quality needs, and the estimated physical impact of the project on water quality in the Umpqua River Basin. These needs and impact assessments are not changed by the revised project data.

It is our understanding that the size of the optimum project has been reduced from a 550,000 acre-foot reservoir to one with a capacity of 480,000 acre-feet. There has also been a corresponding reduction in the amount of project-related irrigation diversions and a change in the schedule of flow releases. Any shortages of flow in low flow years are to be shared equally by irrigation and fishery functions.

The revised water temperature predictions included in the new project data indicate that the river temperatures would be close to the optimum range for fish of 50° - 60°F in April through June, cited in our earlier report. However, the April temperature would still be below the optimum and, therefore, multi-level reservoir outlet facilities are still recommended for temperature and general water quality control purposes.

Our earlier report indicated that under project conditions, minimum year flows in October would be some 250 cfs below requirements

for water quality control. Rough calculations using the new project data indicate the deficit would now be only about 20 cfs. This essentially satisfies needs for minimum flows.

This agency is still very concerned about possible turbidity and sedimentation problems related to the proposed project. Since excessive turbidity related to project operations would constitute a violation of Oregon State Water Quality Standards, the benefits assigned to the project for water quality control cited in our previous report ($80,000 annually) must be contingent upon the satisfactory resolution of the turbidity problem prior to construction of the Days Creek Reservoir.

Except for the comments stated above, the findings and recommendations contained in our November, 1970 Water Quality Control Study of the Days Creek Project represent the current views on projected related water quality aspects.

Robert W. Zeller

Dr. Robert W. Zeller, Ph.D.

cc: Kenneth Spies, Director, Oregon Environmental Quality Control Commission, Portland, Oregon
Fred J. Overly, Regional Director, Bureau of Outdoor Recreation, Seattle, Washington
H. T. Nelson, Regional Director, U. S. Bureau of Reclamation, Boise, Idaho
John Findlay, Regional Director, Bureau of Sport Fisheries and Wildlife, Portland, Oregon
John McKean, Director, Oregon State Game Commission, Portland, Oregon
Director, Oregon State Fish Commission, Portland, Oregon
F. D. Gustafson, Director, Oregon State Water Resources Board, Salem, Oregon
George M. Kaydas, Chief, Water Resource Investigations, National Marine Fisheries Service, Portland, Oregon
Joseph A. Krivak, Acting Chief, Basin Planning Branch, Environmental Protection Agency, Washington, D. C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHWEST REGION

IN REPLYING ADDRESS
REGIONAL OFFICE
ROOM 501 PITTOCK BLOCK
PORTLAND, OREGON 97205

November 25, 1970

Colonel Paul D. Triem
District Engineer
Portland District, Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Colonel Triem:

Enclosed is a revised final draft of our water quality evaluation of Days Creek Reservoir, Umpqua River Basin Project, Oregon. This draft supersedes the October 1970 report transmitted to you on October 27, 1970.

The revisions were made following comments from fishery interests that reservoir releases from a single low-level outlet in Days Creek Dam would be too cold for anadromous fishery purposes during spring months. Also, the Oregon Department of Environmental Quality expressed concern that reservoir waters would be more turbid at lower levels, and that releases from a low-level outlet would therefore be less desirable from a turbidity standpoint.

We have subsequently reevaluated our October studies and concluded that multiple-level outlets in Days Creek Dam would be needed to meet optimum fishery temperature requirements in the South Umpqua River. We do not believe that the turbidity problem, as presently predicted, could be satisfactorily controlled through use of multi-level outlets alone, but these outlets could be utilized in conjunction with other control measures necessary to maintain turbidities of downstream releases within acceptable limits.

The Conclusions, Recommendations, and Temperature sections of our report dated October 1970 have been revised to reflect the results of our reevaluation. Please discard your copy of our report transmitted in October.

Sincerely yours,

Robert W. Zeller, Ph.D.
Director
River Basin Planning Programs

Enclosure:
Draft of report

cc: Harold T. Nelson, George M. Kaydas, Kenneth H. Spies, F. D. Gustafson
John F. Mangan, John D. Findlay, E. J. Weathersbee, A. J. Erickson (2)
Fred J. Overly, Robert Schoning, L. L. Baton

DAYS CREEK RESERVOIR--UMPQUA RIVER BASIN PROJECT
WATER QUALITY CONTROL STUDY

United States Department of the Interior
Federal Water Quality Administration
Northwest Region, Portland, Oregon

November 1970

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

An investigation of water quality and water supply needs for the Umpqua River Basin was conducted by the Federal Water Quality Administration with respect to the possible impact of the Tiller and Galesville Projects, proposed by the U. S. Army Corps of Engineers, on the Umpqua River. A report was prepared and submitted in September of 1966 presenting the results of that investigation. In a letter dated October 3, 1969, the U. S. Army Corps of Engineers requested a review of the 1966 FWQA report relative to a change in reservoir site from Tiller to Days Creek. The objectives of the resulting study by FWQA were to review the Umpqua River Basin report prepared by this office with respect to:

1. A change from the Tiller Reservoir site to the Days Creek site.

2. Any major changes in the economic and demographic projections used in the 1966 report.

3. Current water quality standards criteria.

4. Policy changes in evaluating project-associated benefits.

A temperature analysis for the Days Creek Reservoir and the South Umpqua River, with emphasis on fishery requirements, was a significant part of the current study. The soil conditions in the Umpqua River Basin are conducive to erosion; therefore, potential turbidity problems were investigated. A dissolved oxygen analysis was conducted considering agricultural as well as municipal and industrial sources of wastes. The study was carried out in light of the water quality standards for the Umpqua River Basin which have been established since the 1966 report. The municipal and industrial water supply portion of the earlier report was considered adequate and was not updated for this report.

CONCLUSIONS

1. Multi-level outlets will be necessary to provide adequate temperature control in the South Umpqua River for anadromous fishery purposes.

2. The Days Creek Reservoir would be filled with highly turbid water, and the reservoir would likely remain turbid throughout most of the year. The turbid condition of the water released to the South Umpqua River would have an adverse effect on the ecology of the stream, on fishery production, and on the utility of the South Umpqua River for some recreational purposes.

3. Under the proposed project operation schedule, dissolved oxygen standards criteria for a 1-in-10 low-flow year would be met in the South Umpqua River during all months except October.

4. Under the projected 2020 conditions without the project, water pollution control facilities in addition to those prescribed in the Water Quality Standards Implementation Plan would be needed to comply with standards criteria for the South Umpqua River.

5. Benefits would accrue to the project for water quality control equal to the least expensive alternatives for maintaining water quality standards in the absence of the project. The amount of these benefits is estimated at $80,000 annually. Accrual of these benefits is dependent upon a change in the proposed operation schedule to meet minimum flow requirements for the month of October.

RECOMMENDATIONS

It is recommended that:

1. Additional studies of turbidity problems be conducted and acceptable control measures be devised prior to construction of the project;

2. Multi-level reservoir outlets be provided in Days Creek Dam;

3. The proposed reservoir operation schedule be revised to meet October water quality control flow requirements for the South Umpqua River;

4. Water quality monitoring facilities be provided during construction and operation of the project.

PROJECT DESCRIPTION

The Days Creek Reservoir site has been proposed as an alternative to the previously studied Tiller site. Tiller has been dropped by the Corps of Engineers as a possible site for development.

The Days Creek site is located on the South Umpqua River, approximately one mile south of Days Creek, Oregon. The site is about 15 miles downstream from the Tiller site and has a 40 percent larger drainage area. The project reservoir will provide approximately 550,000 acre-feet of storage capacity for flood control, recreation, fishery enhancement, irrigation, and water quality control.

ECONOMY

Recent population projections developed for the Columbia-North Pacific Framework Study do not vary significantly from those used in the 1966 report. For the most part, the economic projections for the Umpqua River Basin have also remained constant. One exception concerns potential food processing in the basin. The 1966 report suggested that a large food-processing plant would probably locate near Roseburg. More recent studies indicate that most of the additional food produced will likely be shipped out of the basin for processing. Except for food processing, the 1966 economic projections were used.

WATER QUALITY STANDARDS

The State of Oregon has adopted special water quality and waste treatment standards for the Umpqua River Basin since the 1966 report. Table 1 shows the special water quality standards for the Umpqua River Basin. Table 2 lists the present and potential beneficial water uses in the Umpqua River Basin to be protected by the special standards. The provisions of the special standards are in addition to, and not in lieu of, the standards approved by the Secretary of the Interior and contained in "Standards of Quality for Public Waters of Oregon and Disposal Therein of Sewage and Industrial Wastes" (Oregon Administrative Rules, Chapter 334, Division 1, Subdivision 1).

TABLE 1

* SPECIAL WATER QUALITY STANDARDS FOR THE UMPQUA RIVER BASIN

No wastes shall be discharged and no activities shall be conducted which either alone or in conjunction with other wastes or activities shall cause in waters of the Umpqua River Basin:

Organisms of the Coliform Group Where Associated with Fecal Sources (MPN or Equivalent MF Using a Representative Number of Samples)	Dissolved Oxygen (D.O.)	pH	Turbidity (Jackson Turbidity Units, JTU)	Temperature	Dissolved Chemical Substances (mg/l)	
1. Mainstem Umpqua River from tidewater to South Umpqua River confluence, South Umpqua River from mouth to near Canyonville (R.M. 53), and Cow Creek from mouth to Glendale (R.M. 42), Average concentrations of coliform bacteria to exceed 1,000 per 100 milliliters, except during periods of high surface runoff.	D.O. concentrations to be less than 90 per cent of saturation at the seasonal low, or less than 95 per cent saturation in spawning areas during spawning, hatching, and fry stages of salmonid fishes.	pH values to fall outside the range of 7.0 to 8.5.	Any measurable increases in natural stream turbidities when natural turbidities are less than 30 JTU, or more than a 10 per cent cumulative increase in natural stream turbidities when stream turbidities are more than 30 JTU, except for certain short-term activities which may be specifically authorized by the Department of Environmental Quality under such conditions as it may prescribe and which are necessary to accommodate essential dredging or construction where turbidities in excess of this standard are unavoidable.	Any measurable increases when stream temperatures are 58° F. or above, or more than 2° F. increases when stream temperatures are 56° F. or less.	Arsenic (AS)	0.01
					Barium (Ba)	1.0
					Boron (Bo)	0.5
					Cadmium (Cd)	0.01
					Chloride (Cl)	25.00
					Chromium (Cr)	0.05
					Copper (Cu)	0.005
					Cyanide (CN)	0.01
					Fluoride (F)	1.0
					Iron (Fe)	0.1
					Lead (Pb)	0.05
					Manganese (Mn)	0.05
					Phenols (Totals)	0.001
					Total Dissolved Solids	100.00
					Zinc (Zn)	0.1
2. North Umpqua River and all other unspecified stream sections and tributaries in the basin, average concentrations of coliform bacteria to exceed 240 per 100 milliliters, except during periods of high surface runoff.						

* Water Quality and Waste Treatment Standards for the Umpqua River Basin, Oregon Administrative Rules, Chapter 334.

TABLE 2

* BENEFICIAL USES TO BE PROTECTED
UMPQUA RIVER BASIN

Beneficial Use	Present	Future
Domestic		
Private	X	X
Municipal	X	X
Industrial		
Process	X	X
Boiler Feed	X	X
Cooling	X	X
Agricultural		
Irrigation	X	X
Livestock Watering	X	X
Natural Resources		
Fish	X	X
Aquatic Life	X	X
Wildlife	X	X
Recreation		
Fishing	X	X
Hunting	X	X
Water Contact Sports	X	X
Navigation		
Commercial Shipping	0	0
Hydro Power	X	X

* Water Quality and Waste Treatment Standards for the Umpqua River Basin, Oregon Administrative Rules, Chapter 334.

The standards also establish minimum levels for treatment and control of sewage and industrial wastes. Important treatment provisions included in the Water Quality and Waste Treatment Standards for the Umpqua River Basin, Oregon Administrative Rules, Chapter 334, are:

A. Sewage Wastes

1. During the period of low streamflows (approximately June 1 to October 31 of each year), secondary treatment resulting in monthly average effluent concentrations not to exceed 20 mg/l of 5-day 20^{o} (C) biochemical oxygen demand (BOD) and 20 mg/l of suspended solids or equivalent control.

2. During the period of high streamflows (approximately November 1 to May 31 of each year), a minimum of secondary treatment or equivalent shall be provided, and all waste treatment and control facilities shall be operated at maximum efficiency so as to minimize waste discharges to public waters.

3. All sewage wastes shall be disinfected, after treatment equivalent to thorough mixing with sufficient chlorine to provide a residual of at least one part per million after 60 minutes of contact time.

4. More stringent waste treatment requirements may be imposed, especially in headwaters and tributary streams, where waste loads may be large relative to streamflows.

B. Industrial Wastes

1. Industrial waste treatment requirements shall be determined on an individual basis in accordance with appropriate standards provisions. Wastes shall receive a minimum of secondary treatment or equivalent (equal to at least 85 percent removal of 5-day biochemical oxygen demand and suspended solids).

2. Where industrial effluents contain significant quantities of potentially toxic elements, treatment requirements shall be determined utilizing appropriate bioassays.

The State of Oregon "non-degradation policy" is also applicable to the Umpqua River and its tributaries. Minimum standards of quality which presently apply to all waters of the State are set forth in Section 11-010 of Oregon Administrative Rules, Chapter 334, as follows:

> 11-010 HIGHEST AND BEST PRACTICABLE TREATMENT AND CONTROL REQUIRED. Notwithstanding the general and special water quality standards contained in this subdivision, the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and over-all water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.

WATER QUALITY CONTROL

Temperature

Temperature evaluations for the proposed Days Creek Reservoir on the South Umpqua River were based upon the 1-in-10 low-flow year of 1941, the average hydrologic year of 1949, and average monthly weather at the Roseburg airport. Simulated reservoir operation schedules, including outflow for the years of investigation, were provided by the Corps of Engineers. The 550,000 acre-feet (Plan II) reservoir plan is discussed in this report. Plan I (420,000 acre-feet) and Plan III (640,000 acre-feet) reservoir isotherms and downstream temperatures do not differ appreciably from Plan II; therefore, they are not included. A single low-level outlet (elevation 785.0) was assumed operating throughout the evaluation period. Diversions below the dam for irrigation, and the resulting return flows, were not considered in the temperature analysis. Expected reservoir releases for hydrologic years 1941 and 1949 are shown on Figure 1. Reservoir temperature patterns were calculated using a temperature prediction mathematical model; the resulting isotherm patterns are shown on Figures 2 and 3.

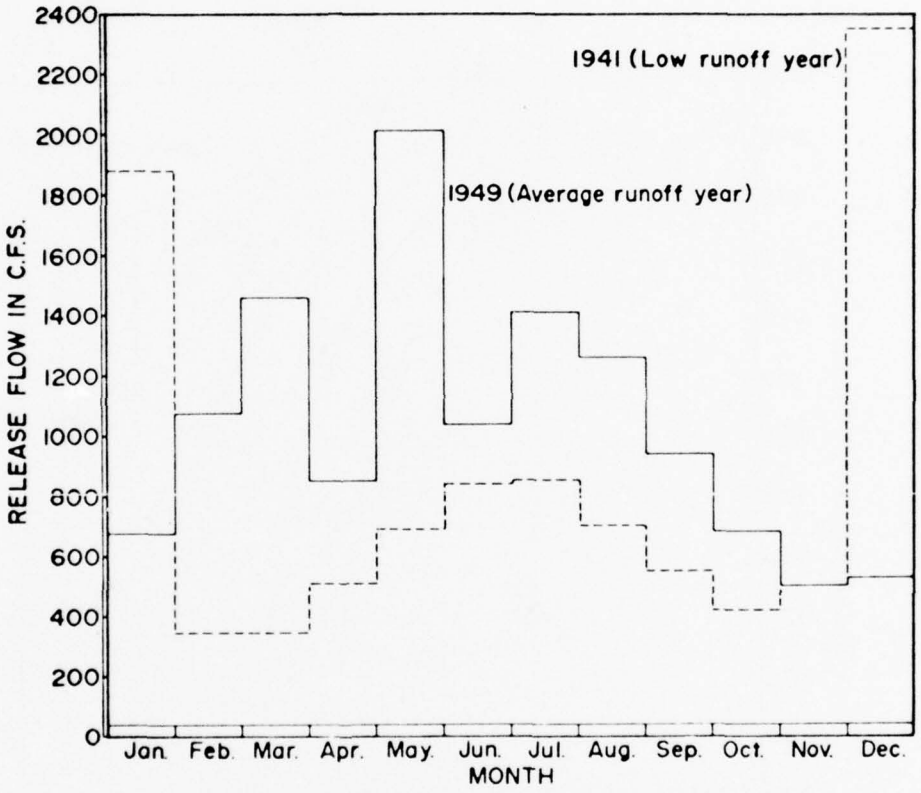


Figure 1 - Days Creek Reservoir - Regulated Release Flows

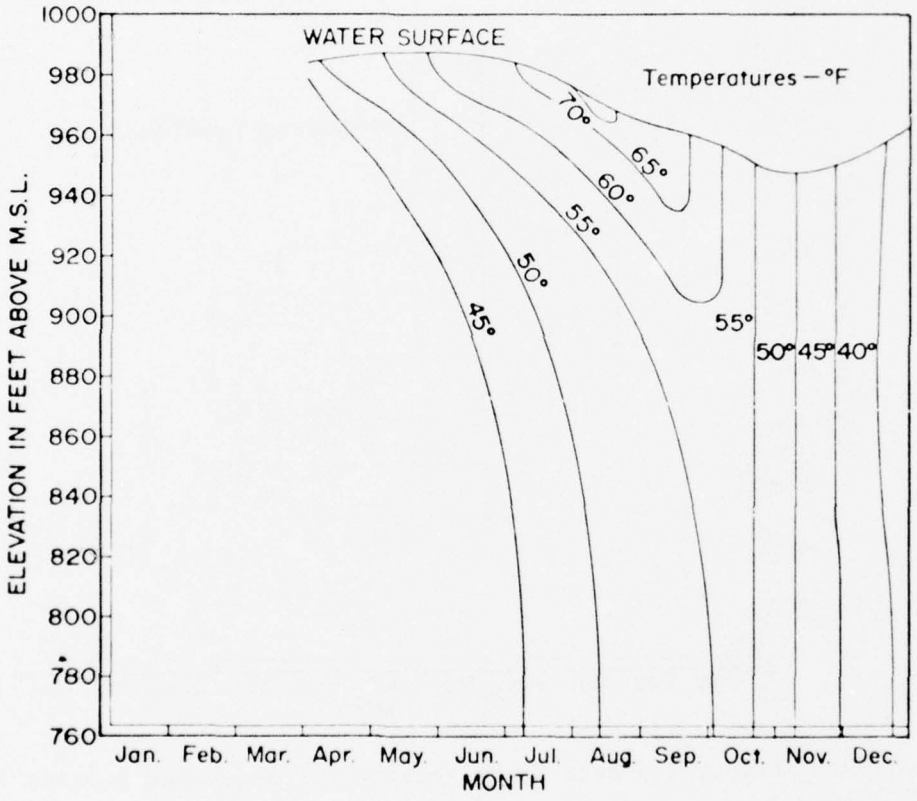


Figure 2 - Predicted Days Creek Reservoir Isotherms for Hydrologic Year 1941

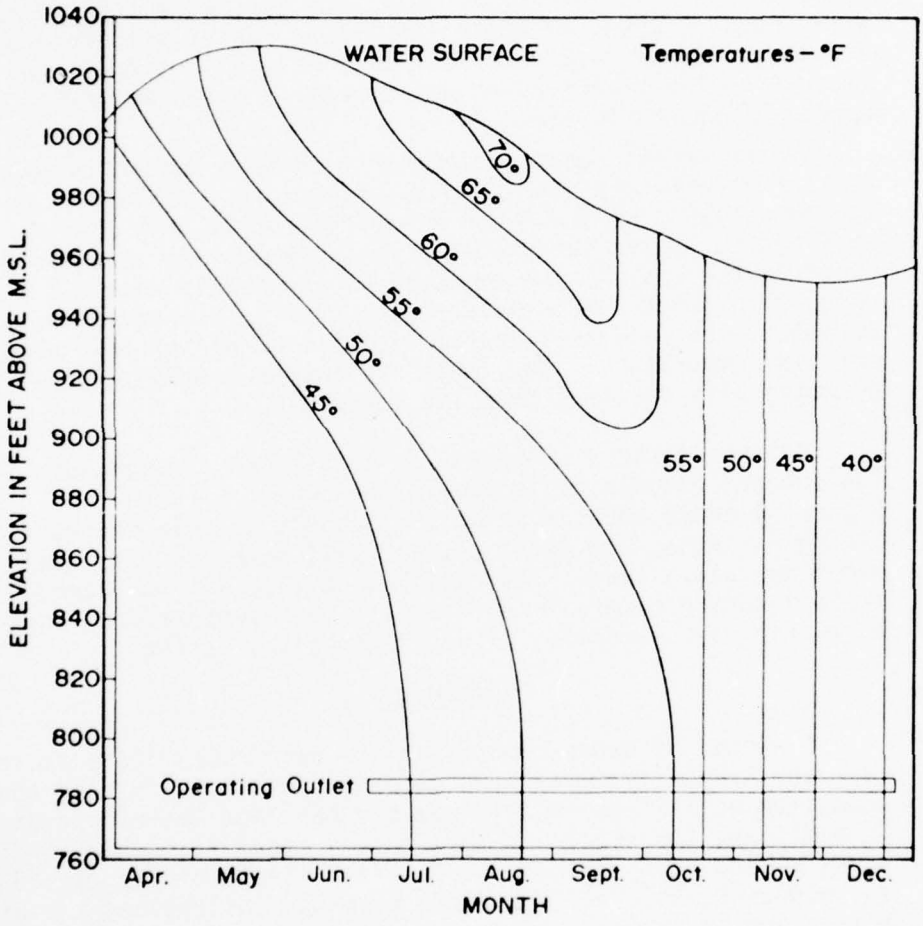


Figure 3 - Predicted Days Creek Reservoir Isotherms
for Hydrologic Year 1949

Calculated temperatures below the damsite and at a site immediately upstream from the North-South Umpqua River confluence, approximately 60 miles downstream from the reservoir, are shown on Figure 4. Figure 5 depicts monthly average temperature profiles for April, July, and September for the 60-mile reach between the above two sites. Water temperature effects of Days Creek Reservoir will have an insignificant influence on the Umpqua River downstream from the North-South Umpqua River confluence.

Water temperatures during April through August increase downstream with distance from the reservoir. A maximum average temperature of about 61° F would occur in July at the confluence. Water temperatures in September are approximately equal to the equilibrium temperature and remain within a 4° F range throughout the 60-mile reach. During October through December, the release temperatures will be higher than ambient air temperatures and, therefore, water temperatures will decrease with distance from the reservoir.

Optimum fishery temperatures from April through June in the subject 60-mile reach are in the 50-60° F range. As Figures 4 and 5 show, most of the subject 60-mile reach, utilizing a single, low-level outlet, will be below this optimum temperature range. Multi-level outlets will be needed to provide warmer reservoir releases to meet temperature requirements for the anadromous fishery during the spring.

Turbidity

A number of waste sources in the basin contribute to sediment and turbidity, including logging operations, mining and ore reduction activities, and stream-bed sand-and-gravel operations. In addition, the reservoir inflow is subject to turbid conditions caused by high, natural runoff. The turbidity caused by these sources will be maintained by pool fluctuations and wind action and is expected to continue throughout most of the year. Settling characteristics of typical examples of turbid water that is expected to fill the reservoir are given in Figure 6. The samples shown in Figure 6 were analyzed under quiescent conditions in a laboratory. These highly turbid conditions

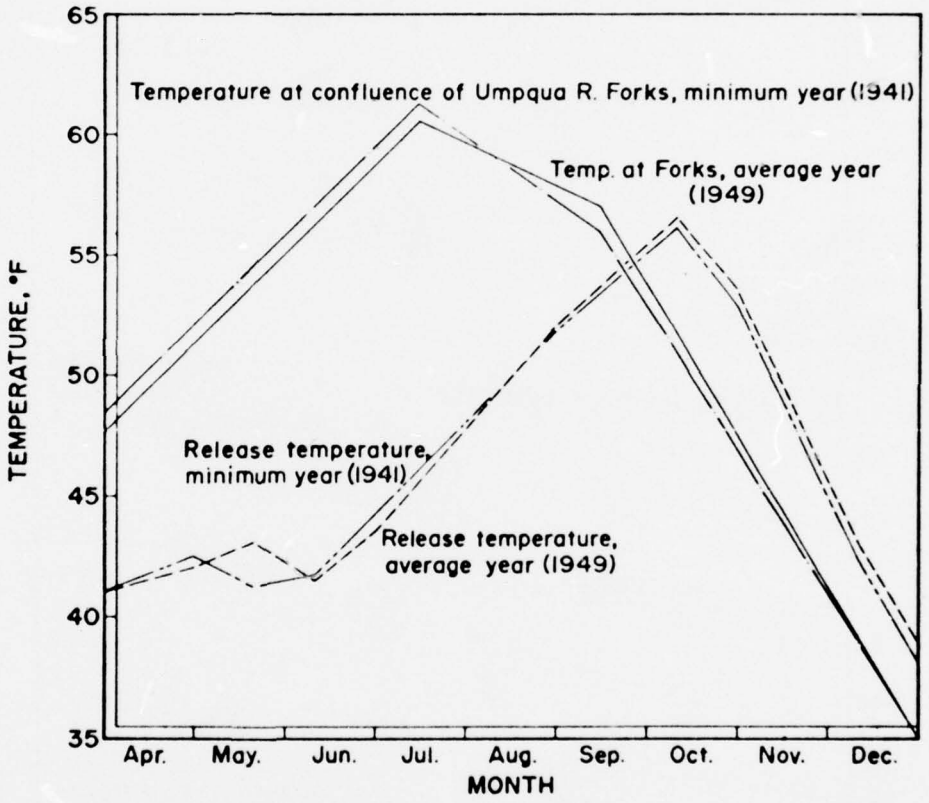


Figure 4 - Predicted Water Temperatures, South Umpqua River

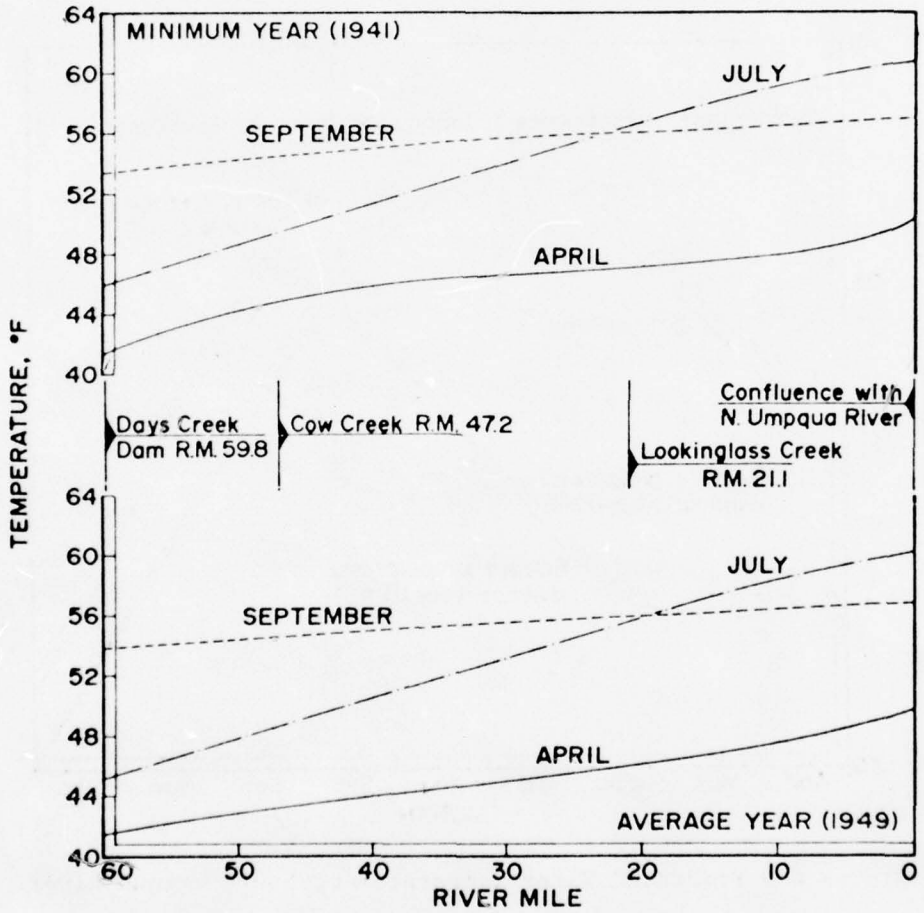


Figure 5 - Predicted South Umpqua River Temperatures Below Days Creek Reservoir

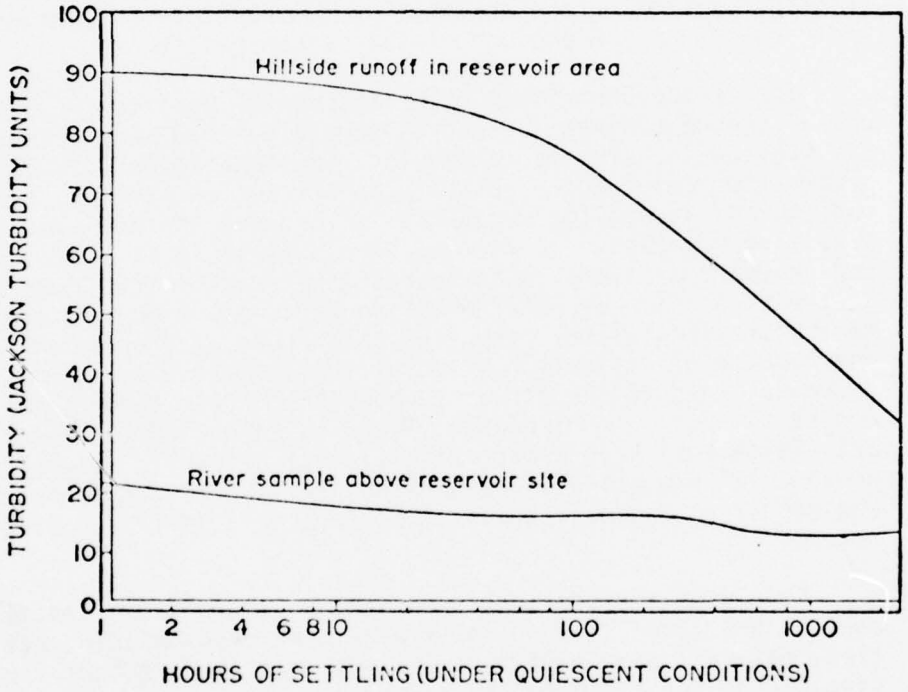


Figure 6 - Settling Characteristics of
Turbidity Samples of Days Creek Reservoir Inflow

will adversely affect the steelhead parr-smolt transformation[1/], the process whereby the steelhead changes from a bottom dweller to a fish-eating surface dweller. This process will be affected in both the reservoir and the downstream river. Release of turbid water during the summer months will also affect the utility of the South Umpqua River for some recreation purposes.

Large streamflows that occur during floods tend to remove much of the finer-grained sediments that settle out in the streambed during low-flow periods. The elimination of this flushing action during peak streamflows as the result of the proposed reservoir can encourage sediment accumulation over spawning beds and a change in the ecology of the stream system.

The Oregon Department of Environmental Quality (DEQ) has established a program to control turbidity from many sources. The logging industry is to develop, in cooperation with DEQ, a program to keep logging activity debris out of streams, leave undisturbed streamside vegetative cover, and thereby minimize resulting vegetative debris and eroded earth in streams. Sand-and-gravel operations must separate their activities from the active streamflow by water-tight berms at all times, promote maximum recirculation, recycling, and reuse of process waters, and require clarification of resulting process waters that are to be returned to the stream to meet the stream turbidity standard at the point of discharge. Road building and maintenance activities must keep waste materials out of public waters and prevent later erosion of cutbank and fills. Mining activities and resulting waste effluents must be separated from public waters.

Even with the application of the best available sediment control practices to logging, mining, and road-building activities, natural sources of sediment will continue to contribute significant turbidity to the reservoir. Additional studies are needed to resolve this problem, which will require continuing cooperative efforts among the Corps of Engineers and other Federal and State agencies.

Dissolved Oxygen

A dissolved oxygen analysis was conducted for the South Umpqua River below Days Creek. A mathematical computer model was used to simulate dissolved oxygen levels in the river system. The effects of municipal, industrial, and agricultural wastes were considered in the analysis.

1/ Fessler, J. L., and H. H. Wagner, "Some Morphological and Biochemical Changes in Steelhead Trout During Parr-Smolt Transformation," Journal of Fish Research Board of Canada 26(11), November 1969.

The total population in the basin served by municipal plants is about 36,400. A list of significant municipal waste sources is included in Table 3. At the present time, most communities provide secondary treatment of their waste waters. The estimated overall treatment efficiency for each of the plants is at least 85 percent removal of BOD. Future levels of waste treatment for municipalities will continue to be based on the present effluent standards of 20 mg/l BOD and 20 mg/l suspended solids during periods of low streamflow. During periods of high streamflow a minimum of secondary treatment or equivalent control will be maintained.

Industrial wastes in the basin are primarily from the lumber and wood products industry, with some wastes from small food-processing operations. The most significant wastes from the wood products industry are plywood glue wastes and log pond overflows. The treatment level for any new industries will be established by the Department of Environmental Quality on the basis of stream conditions and water uses to be protected. A minimum of 85 percent BOD removal will be required.

The major source of agricultural waste water is from irrigation return flow. Although relatively few acres are irrigated, the impact on South Umpqua River dissolved oxygen levels from this source is significant. The irrigated lands in the Umpqua River Basin, for the most part, are located in narrow strips along the river. The mode of water application is almost entirely sprinkler irrigation; therefore, most of the return flows are subsurface and are able to enter the water prism of the river without aeration. The rates of irrigation returns are based on application rates that reflect reasonable and efficient irrigation practices.

Waste load projections used in the dissolved oxygen analysis were developed for the years 1980, 2000, and 2020, based on population and economic projections developed for the 1966 FWQA report. Treatment to reduce the BOD in municipal and industrial wastes by 90 percent (approximately equal to the State implementation plan) was assumed. Stream temperatures predicted by the temperature model for the reservoir and river were used in the analysis.

Minimum flow requirements for the year 2020 to comply with the dissolved oxygen standards for the South Umpqua River were computed for conditions without the project. The required flows and the natural flows available for meeting the requirements are presented in Table 4. The critical reach of the South Umpqua River, the reach where the dissolved oxygen standard is most severely violated, occurs between Roseburg and the confluence of the North and South Umpqua Rivers. The critical month of the year is September, when streamflows are at a minimum and waste discharges are high.

TABLE 3

INVENTORY OF MUNICIPAL AND INDUSTRIAL
WASTES SOURCES IN THE UMPQUA RIVER BASIN

Municipal	Possible Receiving Stream	Sewered Population	Existing Treatment
Canyonville	South Umpqua River (R.M. 111.5-51.3)	1,200	Secondary (trickling filter and chlorination)
Glendale	Cow Creek (R.M. 111.5-47.3-41.0)	750	Secondary (trickling filter and chlorination)
Riddle	Cow Creek (R.M. 111.5-47.3-1.7)	1,100	Secondary (trickling filter and chlorination)
Myrtle Creek	Myrtle Creek (R.M. 111-5-39.0-0.2)	2,700	Secondary (trickling filter and chlorination)
Winston	South Umpqua River (R.M. 111.5-24.5)	2,350	Secondary (trickling filter and chlorination)
Green Sanitary	South Umpqua River (R.M. 111.5-17.0)	1,600	Secondary (3-cell lagoon and chlorination)
North Roseburg Sanitary District	South Umpqua River (R.M. 111.5-9.8)	7,750	Secondary (trickling filter and chlorination)
Roseburg	South Umpqua River (R.M. 111.5-7.8)	14,900	Secondary (trickling filter and chlorination)
Sutherlin	Ditch to Calapooya River (R.M. 102.9-9.0-1.5)	2,000	Secondary (trickling filter and chlorination)
Yoncalla	Yoncalla Creek (R.M. 48.6-26.6-2.8)	650	Secondary (two-cell lagoon and chlorination)

TABLE 3 (Cont.)

INVENTORY OF MUNICIPAL AND INDUSTRIAL
WASTES SOURCES IN THE UMPQUA RIVER BASIN

Municipal	Possible Receiving Stream	Sewered Population	Existing Treatment
Drain	Elk Creek (R.M. 48.6-25.0)	1,000	Secondary (trickling filter and chlorination)
Reedsport	Umpqua River (R.M. 11.0)	4,300	None
Oakland	Subsurface	850	Septic tank, drainfield
Tri-City	Subsurface	2,000	Septic tank, drainfield
Gardiner	Subsurface	500	Septic tank, drainfield

TABLE 4

FLOW IN SOUTH UMPQUA RIVER BELOW ROSEBURG (CFS)
FOR THE YEAR 2020

	June	July	Aug.	Sept.	Oct.	Nov.-May
Flow requirements without Days Creek Project	525	300	300	630	540	500
Natural flow (1-in-10 low-flow year)	520	130	65	65	150	Over 500
Natural flow (average year)	1,040	270	130	130	310	Over 500

Flow requirements to comply with dissolved oxygen standards criteria for conditions with a fully developed project are given in Table 5 for three locations. The critical reach of the South Umpqua River remains between Roseburg and the confluence with the North Umpqua.

TABLE 5

FLOW REQUIREMENTS WITH DAYS CREEK PROJECT FULLY DEVELOPED (CFS)
FOR THE YEAR 2020

Location	Jan.-June	July-Aug.	Sept.	Oct.	Nov.	Dec.
So. Umpqua below Roseburg	600	300	550	750	650	600
So. Umpqua above Cow Creek	50	50	100	100	60	50
Cow Creek at mouth	50	50	160	140	85	80

A comparison between the required flows given in Table 5 and the available flows under Project Plan II of the September 1969 Operation Study is given in Figure 7 for the South Umpqua River below Roseburg. As indicated by Figure 7, October is the critical

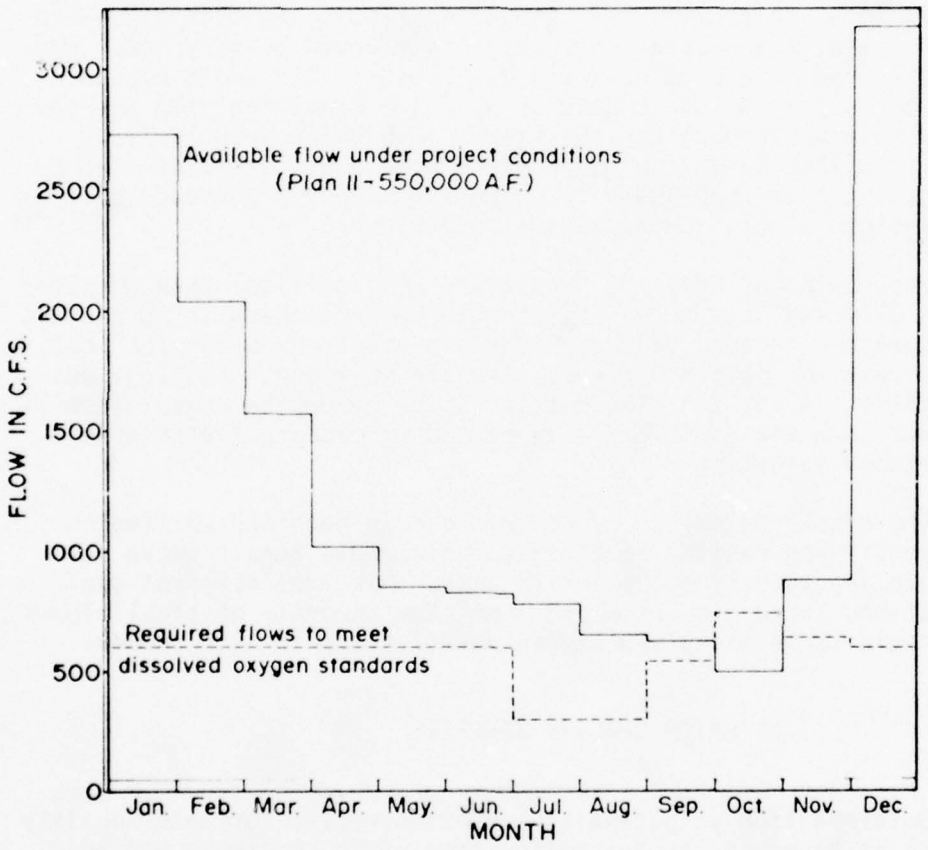


Figure 7 - South Umpqua River Streamflow Below Roseburg

month of the year and the only month when the dissolved oxygen standard is not likely to be met. During October, the temperature of the water released from the reservoir is higher than the equilibrium temperature. Such a condition causes the stream temperature to decrease and the dissolved oxygen saturation level to increase as the water moves downstream. Because the dissolved oxygen standard is a percentage of the saturation level, the standard rises in the downstream direction during this time of year. The dissolved oxygen standard criterion for the month of October is 95 percent of the saturation level. At this dissolved oxygen level, the natural reaeration rate would be very low. Consequently, additional flow would be needed in the South Umpqua River to assimilate waste discharges while complying with the dissolved oxygen standard for the river. The deficiency in flow shown in Figure 7 for the month of October could be eliminated by an adjustment in the reservoir operation schedule without additional storage for flow augmentation purposes.

The months of July and August are less critical than October. During July and August the dissolved oxygen standard is 90 percent of saturation instead of the 95 percent required during the rest of the year for salmonid fishes in their spawning, hatching, and fry stages. Also, the stream temperature below the reservoir will be lower than the equilibrium temperature, causing the reverse of the October situation.

The dissolved oxygen concentrations in both the epilimnion and hypolimnion regions of the reservoir would remain above acceptable levels during the entire year. Marginal nutrient concentrations in the inflow would limit the severity of algal blooms that could cause dissolved oxygen deficiencies in late summer.

WATER QUALITY BENEFITS

Determination of potential project benefits for water quality control is based on the assumption that waste treatment and control facilities will be provided as necessary to maintain water quality standards. Benefits can be assigned to the project for water quality control equal to the cost of the least expensive alternatives for meeting the water quality standards likely to be implemented in the absence of the project. Assignable benefits, then, are the savings to the locale (costs foregone) and are equal to the cost of the incremental treatment needed to maintain standards above and beyond those costs associated with present implementation plans. These benefits are based on the project maintaining the minimum flows given in Table 5.

If the Days Creek Project is not developed, the cities of Roseburg and Winston will likely be required to construct additional water quality control facilities for their municipal and industrial wastes. The additional facilities would be for control above the State implementation plan of approximately 90 percent removal of BOD, but necessary to meet the water quality standards criteria for the South Umpqua River. Alternatives considered for the needed control are advanced waste treatment, land disposal, holding ponds to be used during periods of low river flow, and a single-purpose reservoir for flow augmentation.

Additional control of agricultural wastes will also be needed in the future to meet water quality standards if the Days Creek Project is not constructed. Two alternatives were considered in the determination of benefits for control of agricultural wastes: a single-purpose reservoir for flow augmentation, and the collection and treatment of irrigation return flows. Irrigation return flows constitute the only significant agricultural waste source in the area.

In the analysis of benefits for water quality control, municipal, industrial, and agricultural wastes were considered as they interrelate with each other. When any combination of alternatives required flow augmentation for the control of municipal and industrial and agricultural wastes, one reservoir was assumed to provide water for both needs. The costs of the alternatives and combinations of alternatives are shown in Table 6.

The least costly combination of alternatives, as shown in Table 6, is land disposal of municipal and industrial wastes with collection and aeration of agricultural waste water. The total cost of this combination is estimated to be $80,000 annually.

Benefits accruing from control of municipal and industrial wastes are considered to be equal to the cost of land disposal for Roseburg and Winston. These benefits have been estimated at $45,000 annually. Benefits assignable to the control of agricultural wastes are considered to be equal to the cost of collecting and aerating agricultural wastes. As indicated by Table 6, the benefits have been estimated at $35,000 annually.

Water quality control in the Umpqua River Basin would enhance water quality for all recognized water uses. Recreation and anadromous fish production would be the major water uses receiving enhancement. The beneficiaries of the water quality control include residents of the basin, recreationists from the surrounding and distant areas, as well as sport and commercial fishermen in the basin, Columbia River, and Pacific Ocean.

TABLE 6

ALTERNATIVE METHODS FOR WATER QUALITY CONTROL

	M&I Wastes	Annual Cost	Agricultural Wastes	Annual Cost	Total Cost
1.	Flow augmentation from single purpose reservoir	$782,000	Flow augmentation from single purpose reservoir	$498,000	$1,280,000
2.	Land disposal	45,000	" " "	"	543,000
3.	Holding effluent through the summer	63,000	" " "	"	561,000
4.	Advanced waste treatment (95% removal of BOD) + flow augmentation	395,000	" " "	"	893,000
5.	Advanced waste treatment (97% removal of BOD) + flow augmentation	387,000	" " "	"	885,000
6.	Land disposal	45,000	Collection and aeration of irrigation returns	35,000	80,000
7.	Holding effluent through the summer	63,000	" " " "	35,000	98,000

Because the water quality control capabilities of the project are essentially incidental to operation for other purposes, no specific facilities need to be provided to maintain water quality.

WATER SUPPLY & QUALITY CONTROL STUDY

UMPQUA RIVER BASIN, OREGON

Tiller And Galesville Projects

SEPTEMBER 1966

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHWEST REGION

May 15, 1967

IN REPLYING ADDRESS:
REGIONAL OFFICE
ROOM 570 PITTOCK BLOCK
PORTLAND, OREGON 97205

Mr. B. E. Wilcox, Chief
Engineering Division
U. S. Army Engineer District, Portland
Corps of Engineers
628 Pittock Block
Portland, Oregon 97205

Dear Mr. Wilcox:

This is in response to Mr. Heidel's request in connection with Umpqua Project asking for M&I water supply and water quality control benefits computed on a 100-year project life basis. Our report on Umpqua Project dated September 1966 shows benefits on a 50-year basis but omits the 100-year analysis.

According to our computations which utilize least-cost alternative single-purpose storage as a measure of value, the annual M&I water supply benefit on a 100-year basis is $190,400 and the annual quality control benefit is $524,200. Both of these figures reflect capital costs amortized at 3.125 percent and include annual O&M expenses.

If we can be of further assistance in the matter of M&I water supply and water quality control benefits applicable to Tiller and Galesville Reservoir Projects in Umpqua Basin, please let us know.

Sincerely yours,

W. W. Towne

W. W. Towne, Director
Columbia River Basin Project

WATER SUPPLY AND WATER QUALITY CONTROL STUDY

TILLER AND GALESVILLE PROJECTS

UMPQUA RIVER BASIN, OREGON

An investigation defining present and potential water needs for municipal and industrial (M&I) supply and stream flow needs for maintenance of water quality in Umpqua River Basin has been made. A need for additional source development for M&I supply and for storage for regulation of stream flow for water quality control is revealed. Future water requirements and quality projections are based on economic, demographic, and engineering studies.

Prepared at the Request of the

U. S. Army Engineer District, Portland
Corps of Engineers, Portland, Oregon

By the

U. S. Department of the Interior
Federal Water Pollution Control Administration
Northwest Region, Portland, Oregon

September 1966

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I. INTRODUCTION

A. REQUEST AND AUTHORITY

The request for this investigation was made by the U. S. Army Corps of Engineers, Portland District, Portland, Oregon, in a letter dated May 25, 1965.

Authority for the investigation is: (1) the Memorandum of Agreement, dated November 4, 1958, between the Departments of the Army and Health, Education, and Welfare, relative to the Water Supply Act of 1958, as amended (43 U.S.C. 390b); and (2) the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.).

B. PURPOSE AND SCOPE

The purpose of this report is to define the need for and the value of storage for municipal and industrial water supply and for water quality control in the Tiller and Galesville projects, currently under study by the U. S. Army Corps of Engineers.

The study area considered is the Umpqua River Basin, but particular attention has been given to the service areas and stream reaches of the South Umpqua, Cow Creek, and the main stem Umpqua that could be influenced by storage releases from the Tiller or Galesville sites.

Projections of future waste loads, water quality, and water use have been developed for 1980, 2000, and 2020, based on the resource potential of Douglas County, which almost coincides with the boundaries of the Umpqua Basin. Data used in the evaluation of flow requirements is taken from the Oregon Coast comprehensive studies being conducted by the Federal Water Pollution Control Administration.

C. ACKNOWLEDGMENTS

Information for this report was provided by officials of the communities and water districts studied, the Oregon Water Corporation, Douglas County Department of Water Resources, Oregon State Board of Health, Oregon State Water Resources Board, the Oregon State Sanitary Authority, the Oregon State Game Commission, the Oregon State Fish Commission, the U. S. Bureau of Sport Fisheries and Wildlife, and the U. S. Army Corps of Engineers, Portland District office. The assistance of these individuals is gratefully acknowledged. The use of information contained in the bibliography is also acknowledged.

II. SUMMARY of Findings and Conclusions

A. SUMMARY OF FINDINGS

1. The Tiller and Galesville multiple-purpose reservoir projects, proposed by the U. S. Army Corps of Engineers, are located in the Umpqua River Basin in southwestern Oregon. Both projects are located in, and will serve, the South Umpqua subbasin and downstream main stem Umpqua River areas. Project purposes being considered are flood control, municipal and industrial water supply, irrigation, fish and wildlife enhancement, water quality control, recreation, and power generation.

2. The South Umpqua River has a drainage area of 1,780 square miles and an average annual runoff of about 2.0 million acre-feet. Critical flow in South Umpqua River near Roseburg on a one-in-ten year recurrence frequency is 80 cfs, occurring in August and September. Water quality during times of such flows is detrimental to use of the South Umpqua for anadromous fishlife and recreation. Dissolved oxygen concentrations during the summer and early fall have dropped to 5 mg/l for periods ranging from several days to several weeks, and temperatures have averaged 75°F, with maximums over 80°F.

3. Total population of Douglas County in 1960 was 68,500. Over two-thirds of the total population (47,000) resided in the South Umpqua Basin--about 35,000 of whom lived in the Roseburg service area, the county's largest population center. Future economic growth in the Umpqua Basin, dependent on forest products industries and food processing, is expected to occur primarily in the Roseburg area. Basin population is expected to increase to 85,000 by 1980, to 106,000 by 2000, and to 132,000 by 2020. The Roseburg service area is projected to contain about 90,000 persons by 2020.

4. Present municipal and industrial water use is about 11.0 million gallons per day (mgd); over 60 percent of the demand is in the Roseburg area. Surface water is the primary source and, with treatment, is of suitable quality for M&I use.

Future M&I demands are projected to be 22, 29 and 46 mgd for 1980, 2000, and 2020, respectively. Future needs are concentrated in the South Umpqua Basin where, aside from Roseburg and Myrtle Creek, existing supplies will not meet projected demands.

5. Diversionary uses of stream waters in the Umpqua Basin, in addition to M&I water supply, are irrigation, mining, and power generation. Instream uses are the anadromous fishery, resident fishery, water-contact and streamside recreation. The South Umpqua has an annual escapement of about 10,000 salmon and steelhead--less than half the anadromous fish population of the North Umpqua. Recreational use is intense, particularly on the stretch of the South Umpqua that meanders through the Roseburg area.

6. Municipal and industrial waste sources in the Umpqua Basin are spread throughout the South Umpqua region and the Roseburg area. Total raw waste production in South Umpqua subbasin in 1965 was about 37,000 population equivalents (PE), with over 85 percent of the total produced in the Roseburg area. After treatment, these wastes were discharged to streams of the basin with a total oxygen demand of 5,900 PE, a reduction in bio-chemical oxygen demand (BOD) of about 84 percent.

After adequate treatment--which, for design purposes, was selected to be at least 85 percent reduction of BOD--future waste loads are expected to increase to a maximum of about 41,500 PE by the year 2000. Increased treatment efficiencies to about 90 percent BOD removal are expected to maintain this level through 2020.

B. CONCLUSIONS

1. Municipal and industrial water demands will exceed the reliable supply at varying times and places throughout the study period. By the end of the study period, an annual draft-on-storage[1/] from proposed Tiller or Galesville Reservoir of 2,350 acre-feet to yield 7.65 mgd of supplemental supply (July-September) will be required to meet the 46 mgd demand. About 55 percent of the demand will be in the Roseburg service area where the North Umpqua supply is expected to meet the demand. First need for storage will begin about the time of assumed project completion (1975).

2. The annual value of storage in Tiller or Galesville Reservoir for M&I water supply is estimated to be $220,900, based on least-cost single-purpose alternative storage costs amortized on a 50-year basis at 3.125 percent interest.

3. Minimum DO concentrations of 7 mg/l must be maintained the year around in the South Umpqua to protect and enhance the existing anadromous fish runs. With control of temperature (see FIGURE VIII-3), as recommended by the fishery agencies, fish will be migrating, feeding, and spawning in most reaches of the river throughout the year. With temperature control, anadromous fish production is expected to be more than four times present production.

4. Water quality during low flow periods does not now meet the above objectives for the South Umpqua River. Computations utilizing present and projected waste loadings show that by 2000 DO levels may be expected to drop below 3 mg/l in the months of August and September, even after wastes have received adequate treatment.

5. There is an immediate need for an annual draft-on-storage from Tiller or Galesville Reservoirs of 16,000 acre-feet to provide a minimum average flow of 190 cfs for control of DO in the months of July, August, September and October. After adequate treatment of all wastes, a draft-on-storage of 51,000 acre-feet will be needed to deliver a minimum flow in South Umpqua below Roseburg of 340 cfs for this control through the same four critical months by the year 2000. Waste loads after 2000 are expected

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1/ Annual draft-on-storage is the sum of incremental excesses of needed releases over inflows during a climatic year (April to April).

to remain fairly constant, due to increased treatment efficiency; therefore, no additional storage requirements are anticipated through 2020.

6. Temperature enhancement can be accomplished in the South Umpqua with flows from the Tiller project. To meet fishery requirements, flow releases from Tiller Reservoir ranging from 1,200 to 1,400 cfs would be required to maintain temperatures of less than 70°F.

7. Storage releases from Tiller or Galesville Reservoirs for water quality control would benefit a potential population of 120,000 persons residing along 50-60 miles of South Umpqua River and would maintain conditions suitable for fishing and other recreational uses of the river. With control of DO, annual anadromous fish spawning can be maintained in numbers upward of 10,000. Releases for temperature control would increase these numbers to an estimated 46,000 annually.

8. The benefits derived from flow regulation for water quality control in the South Umpqua River are both tangible and intangible and would accrue after an adequate degree of waste treatment has been provided at all major waste sources. The riparian owners, downstream water users, and the population of the surrounding area would be the major recipients of the benefits of this control. As beneficiaries are widespread throughout Umpqua River Basin and the State of Oregon, the cost to provide quality control regulation in Tiller or Galesville Reservoirs would be non-reimbursable.

9. The cost of providing flow regulation on a single-purpose basis is considered to be a reasonable measure of the value of the widespread quality control benefits. Based on least-cost single-purpose storage costs in South Umpqua Basin, the minimum value of the benefit assignable to an annual draft-on-storage of 51,000 acre-feet in Tiller and/or Galesville Reservoirs is $640,000 or about $12.50 per acre-foot.

10. The value of the water quality benefit associated with storage releases for temperature control and flow stabilization is considered equal to the value of the enhanced anadromous fishery. This value will be calculated by the U. S. Fish and Wildlife Service.

11. After the project is in operation, a system of water quality and waste monitoring and stream flow forecasting will be needed to effectively regulate flow for water quality control.

III. PROJECT DESCRIPTION

A. LOCATION

The Umpqua River Basin, located in southwestern Oregon, drains an area of 4,560 square miles. The major drainage feature of the basin is the main stem of the Umpqua River, which extends 111 miles inland from the Pacific Ocean to the junction of its North and South Forks. The North Umpqua extends an additional 105 miles to its headwaters in the Cascade Mountains; the South Umpqua meanders through the densely populated Roseburg area and extends some 104 miles to the Rogue-Umpqua divide.

The proposed Tiller and Galesville project sites are located in the South Umpqua drainage, as shown on the foldout location map (inside back cover). The Tiller Reservoir site is located near the town of Tiller on the South Umpqua at River Mile 75. Drainage area at the site is about 450 square miles. The Galesville site is located on Cow Creek, a tributary of the South Umpqua, near Azalea at River Mile 60. Drainage area of the reservoir is some 76 square miles.

B. PROPOSED PROJECTS

Project purposes include irrigation, flood control, municipal and industrial water supply, water quality control, fishery enhancement, recreation, and power generation.

As proposed by the U. S. Army Corps of Engineers, the Tiller and Galesville projects will have storage capacities of 545,000 acre-feet and 71,000 acre-feet, respectively, about 11 percent of the Umpqua Basin's 5.4 million acre-feet annual yield. With this storage, one-in-ten low flows of 80 cfs in the South Umpqua could be increased to over 1,000 cfs; low flows in the main stem Umpqua could be augmented from 730 cfs to almost two thousand cfs. As discussed in succeeding chapters of this report, such increases in flow will directly benefit water quality in those streams.

IV. STUDY AREA DESCRIPTION

A. BOUNDARIES

The study area for this report is the Umpqua River Basin; the boundaries of the basin are nearly coincidental with the boundaries of Douglas County. (See location map.)

Study emphasis has been placed on the South Umpqua River drainage and on the main stem of the Umpqua River, since these areas can be served by the proposed projects, and since they contain about 70 percent of the study area population.

B. PHYSICAL FEATURES AND CLIMATE

Topographically, the basin is composed of three definable segments: the coastal range, the central valley, which includes the South Umpqua Valley, and the Cascades. Most of the basin is forested (89 percent), with agricultural and other non-forest areas limited to the valleys of the main tributary streams. There is a total of some 660,000 acres of farm land, with 150,000 acres in crops; about 12,000 acres are irrigated.

The climate is generally mild, with warm, dry summers and cool, wet winters. There is little snow, except in the high Cascades. Precipitation ranges from an annual total of 28 inches at Riddle to over 100 inches along the crest of the Coast Range of mountains. Average length of the growing season is about 200 days in the central valley.

V. WATER RESOURCES of the Study Area

A. SURFACE WATER

1. Water Resource Development

Existing water resources development in the Umpqua Basin is not extensive, consisting primarily of several hydro-power structures in the headwaters of the North Umpqua. There are no large impoundments on the South Umpqua River, Cow Creek, or Calapooya Creek. Irrigation and water supply developments consist of pumping stations, with few diversion or ponding structures.

A total of 400,000 acre-feet of surface water rights has been allocated in the basin; over 82 percent of this is for hydro-electric power and other non-consumptive uses.

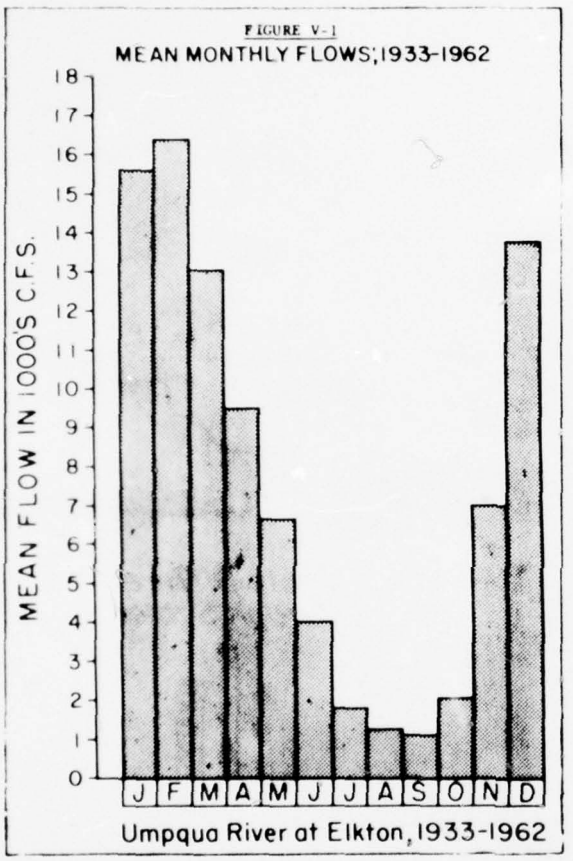
2. Hydrology

The hydrology of the pertinent streams in the Umpqua system is summarized in TABLE V-1. Figures are based on water records from 1933 to 1962.

TABLE V-1
UMPQUA RIVER BASIN HYDROLOGIC SUMMARY

Stream	Ann. Aver. Yield Million ac-ft.	Ann. Mean Flow cfs	Max. Flow of Record cfs	Min. Flow of Record cfs	1/10 Low Flow cfs
Umpqua River at Elkton	5.4	7,600	218,000	640	729
S. Umpqua at Brockway	2.1	3,000	102,000	36	79
Cow Creek nr. Riddle	0.7	820	38,000	20	20

The Umpqua system is characterized by high winter flows and summer droughts. Over eighty percent of the total annual yield occurs from November 1 to May 1, as illustrated by the hydrograph



of the Umpqua River at Elkton (FIGURE V-1). The critical months for maintaining adequate flows are July, August, September, and October.

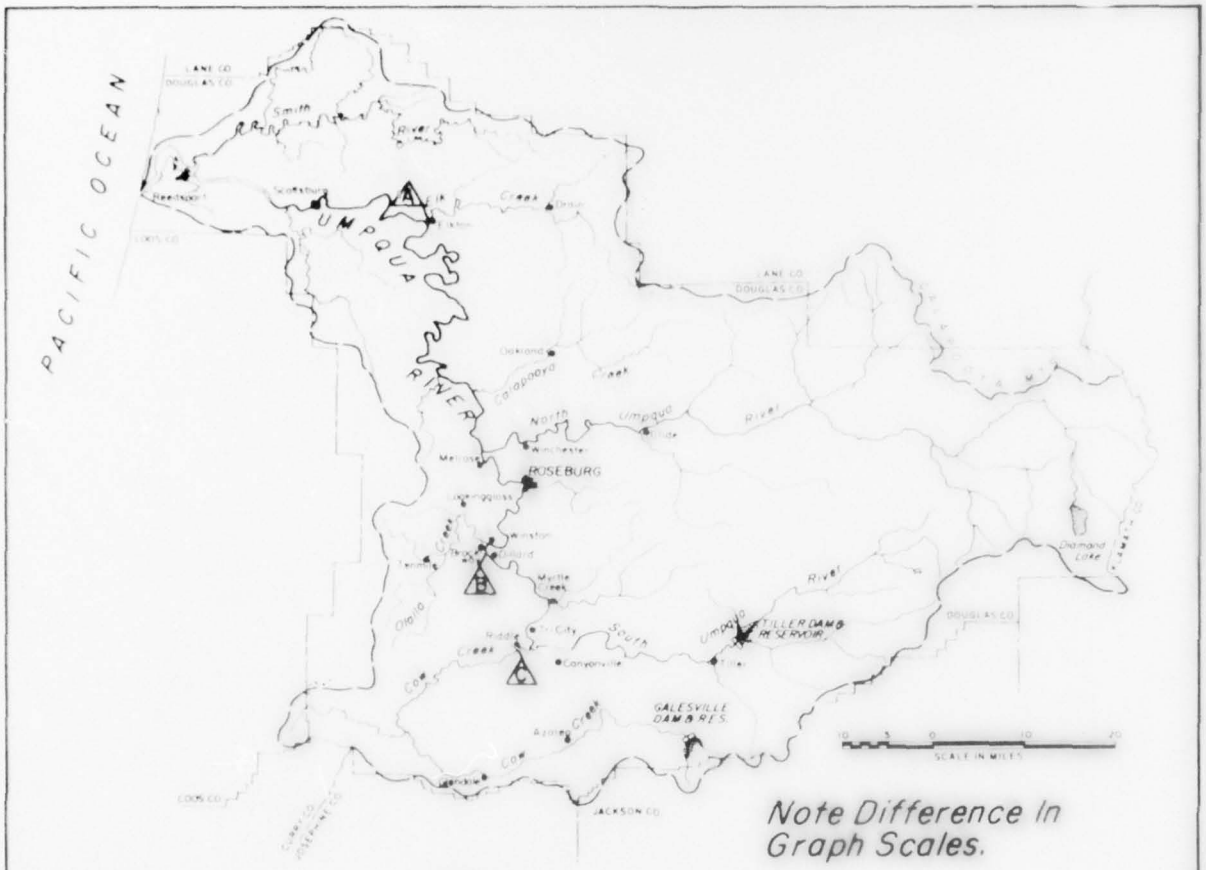
3. Frequency Analysis

Average annual yields for the Umpqua, South Umpqua, and Cow Creek for various recurrence periods are shown in TABLE V-2.

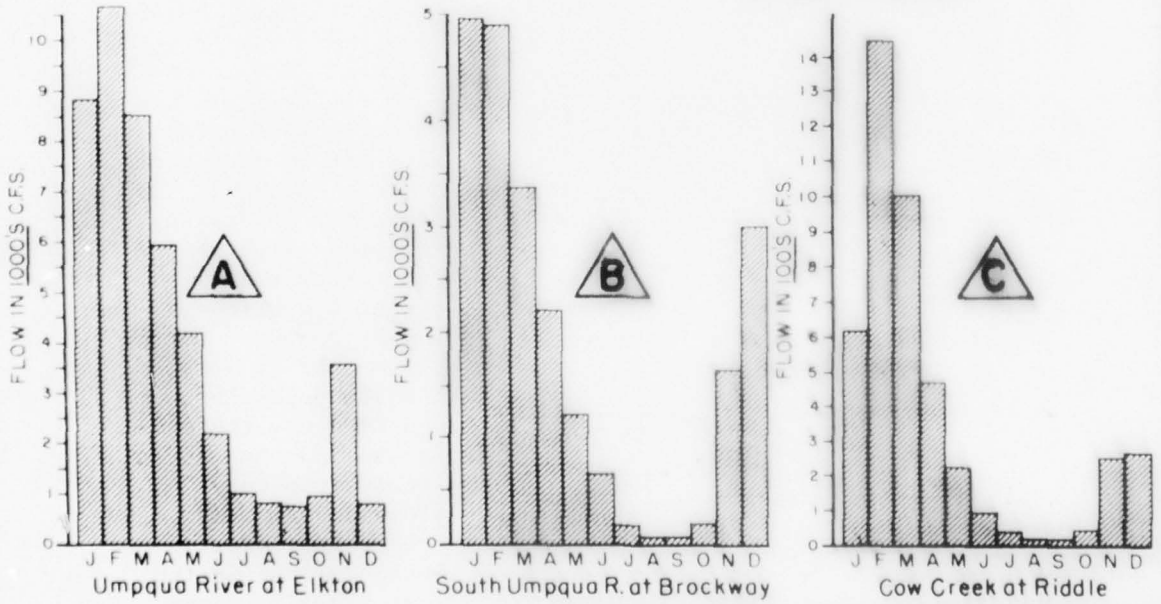
For design purposes, the one-in-ten recurrence period was selected to determine flow requirements and the resultant need for storage for water quality control. The basis for selection was protection of the anadromous fishery during the critical summer months. During the months of July, August, September, and October, the one-in-ten and the one-in-twenty frequency flows are similar. The monthly distribution of one-in-ten year flows is shown in FIGURE V-2 (following page).

TABLE V-2
EXPECTED AVERAGE ANNUAL YIELD
UMPQUA BASIN - CFS

Stream	Recurrence Interval - Years		
	5	10	20
Umpqua - Elkton	5,700	4,500	3,650
South Umpqua - Brockway	2,300	1,880	1,530
Cow Creek - Riddle	550	400	300



Note Difference In Graph Scales.



WATER SUPPLY & WATER QUALITY CONTROL STUDY
UMPQUA RIVER BASIN, OREGON

ONE IN TEN YEAR LOW FLOW RECURRENCES

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
REGION IX (DATE: 6/66) PORTLAND, OREGON

FIGURE V-2

4. Present Water Quality

The following table summarizes available data from the files of the Oregon State Sanitary Authority, U. S. Geological Survey, and the Federal Water Pollution Control Administration by presenting the ranges of several key water quality parameters for the critical summer months of July through September. Additional water quality data is appended.

TABLE V-3
WATER QUALITY SUMMARY
UMPQUA RIVER BASIN

Stream	DO mg/l	BOD_5 mg/l	Temp. °F	Coliform Bact. MPN/100 ml
Umpqua	8.6-9.7	1.1-2.2	82-51	400-2,000
South Umpqua	6.2-12.1	0.0-2.5	94-51	10-13,000
Cow Creek	7.3-9.5	0.8-1.2	85-55	10-800

As indicated, organic waste assimilation requirements are not high enough to cause severe dissolved oxygen (DO) depression. DO levels in the South Umpqua frequently drop below 7 mg/l, but concentrations below 6 mg/l are uncommon, except during extreme low flows, when values below 5 mg/l have been observed.

Temperature is a severe water quality problem in the Umpqua system, particularly in the South Umpqua drainage. Temperatures in the South Umpqua and Cow Creek during the months of July and August average about 75°F, well above the maximum temperatures recommended for anadromous fish. Maximums have reached 98°F. Temperatures in the main stem Umpqua average about 70°F.

Bacterial contamination resulting from discharge of inadequately disinfected sewage and from land drainage is evident. The most severe problems occur in the South Umpqua as it passes through the Roseburg area.

As indicated in the appended data, ranges of pH, hardness, and total dissolved solids are well within the limits for any raw water use anticipated in the basin. High sediment concentrations from soil erosion are a seasonal phenomenon associated with periods of high surface runoff and stream flow.

5. Water Quality of Projected Storage Releases

Steep slopes with sediment production ratings at 150-500 mg/l of particulate matter cause inflows into both Tiller and Galesville Reservoirs to be turbid and fairly high in nutrients. During periods of heavy logging, organic matter and nutrients are higher.

According to estimates made by the Oregon Water Resources Board (OWRB), mass average reservoir temperatures will be highest in September. Stratification will occur in both reservoirs with September bottom-to-surface temperatures ranging from 44 to 67°F in Tiller and from 53 to 74°F in Galesville.

Based on probable nutrient levels and temperature characteristics, it is reasonable to assume that both reservoirs will experience heavy algal blooms. These blooms, together with other settling organics, could eventually cause depletions of DO at lower levels, due to decay of organic matter and lack of reaeration. For this reason, multiple level outlets should be provided to permit control of DO in reaches immediately below these structures.

B. GROUNDWATER

Little information is available on groundwater hydrology in the Umpqua River Basin. The North Umpqua River has extensive areas of volcanic pumice, which act as reservoirs, soaking up large quantities of moisture during the wet season and releasing it throughout the dry summer months. The relatively high base flow of the North Umpqua River reflects these conditions. Primarily clay-type soils are found throughout the remaining areas of the Umpqua Basin; although clay soils are capable of holding more water than pumice, the water moves into, through, and out of the clay very slowly. Most winter precipitation runs off as surface flow, and little water is released during the summer.

Only the Milo Academy relies on groundwater for a community water supply in the South Umpqua River Basin. A few industries have developed well supplies, but quantities pumped are small.

VI. THE ECONOMY

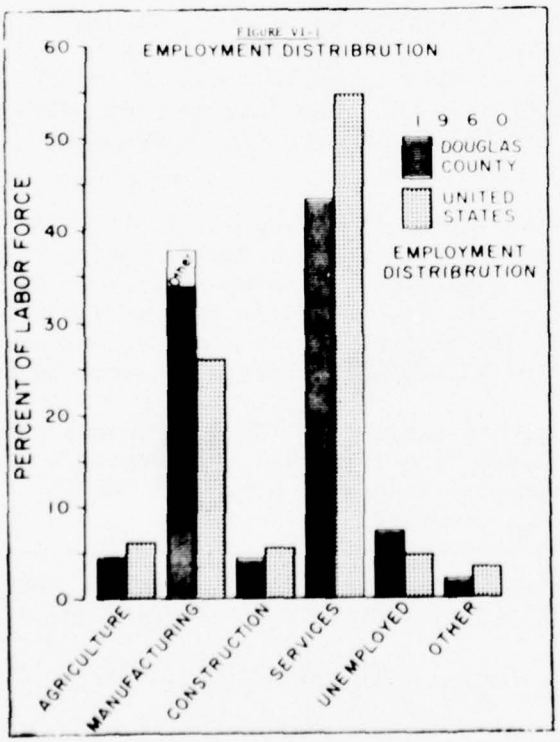
A. GENERAL

The demand for water for municipal and industrial purposes, and the amount and character of waste waters resulting from such uses, are determined largely by the activities associated with a region's economic base. The purpose of this section is to present economic and demographic data to be used as a basis for projecting the needs for water for municipal and industrial purposes and for estimating the future amounts and types of waste and land drainage material that may be expected to occur in the Umpqua River Basin with the expanded development anticipated in the future.

B. PRESENT

1. Industry and Employment

The economy of Douglas County is very heavily dependent on harvesting and processing the county's timber resource as shown in FIGURE VI-1. About 91 percent of all manufacturing employment in the county in 1960 was in lumber and wood products. Agricultural employment is relatively less important in Douglas County than in either the State or Nation as a whole. Aside from timber harvesting and processing, mining is the only other major industry sector in which Douglas County employment equals or exceeds the national average. The 234 persons employed in mining in April 1960 represented about the same percentage of total employment in Douglas County as that industry represented in the United States as a whole.



The U. S. Veterans' Hospital at Roseburg and tourism and recreation activities provide some employment in service industries; but, even so, total employment in service industries is well below the proportion in the State and Nation. This is due to the fact that Douglas County is within an area for which Portland and Eugene provide numerous services, such as trade, education, and finance.

2. Population

The total labor force of 24,289 in Douglas County in April 1960 supported a population of 68,458; that is, the ratio of population to labor force was 2.8 to 1. TABLE VI-1 shows the allocation of county population among the incorporated places and non-urban portions of the county. A large part of the population is concentrated in the narrow valleys near the junction of the North and South Umpqua Rivers. About 31,000 persons (45 percent of county total) live within a radius of ten miles from the center of Roseburg.[1/] Another 10,000 live in other towns along the main highway and railroad bisecting the county from north to south, and most of the remaining population is along this central artery, outside incorporated places but suburban in nature. The only significant population center outside this central strip is Reedsport, located on the Umpqua estuary, with a population of about 3,000. Most of the county is very sparsely settled, with large areas of virtually uninhabited and mountainous national forest land.

About 45,000 persons (two-thirds of county total) live in the portion of the county drained by the South Umpqua River. The North Umpqua subbasin is more rugged and has a population of only about 8,000. The main stem of the Umpqua, below the confluence of the North and South Forks and including such minor tributaries as Elk Creek and Calapooya Creek, has a population of about 16,000.

According to the most recent estimate,[2/] Douglas County population increased less than 2,000 from 1960-1964, or about 2.6 percent, compared with an increase of nearly 8 percent for the State as a whole during the same period.

1/ This includes the following Census Divisions: Roseburg, East Roseburg, Lookingglass, Riverdale, Wilbur, Winchester, and a portion of Melrose.

2/ Oregon State Board of Census estimate for July 1, 1964.

TABLE VI-1
POPULATION, BY SERVICE AREAS AND INCORPORATED PLACES
DOUGLAS COUNTY, APRIL, 1960

City or Area	Population April 1, 1960
Douglas County (Umpqua River Basin), TOTAL	68,458
Reedsport-Gardiner Service Area	5,246
Reedsport City	2,998
Unincorporated Portion	2,248
Roseburg Service Area	35,100
Myrtle Creek City	2,231
Oakland City	856
Roseburg Urban Area, Total	16,543
Roseburg City	11,467
"Barnes" (densely-developed suburb)	5,076
Sutherlin City	2,452
Winston City	2,395
Unincorporated Portion	10,623
Remainder of County	27,976
Drain City	1,052
Elkton City	146
Glendale City	748
Riddle City	992
Yoncalla City	698
Canyonville City	1,089
Unincorporated Portion	23,387

C. FACTORS INFLUENCING FUTURE GROWTH

The outlook for growth of the Douglas County economy depends on possibilities for (1) maintaining or increasing the annual timber harvest and (2) diversifying the economy, either by further fabrication or greater utilization of the timber harvest, or by development of new types of resources. It is assumed that the log cut in Douglas County will decline during the study period to about 80 percent of the present level. A redistribution of the use of the resource is expected, with smaller sawmills disappearing as a result of competitive pressures and output at the larger sawmills declining. This will be accompanied by an increase in output at plywood mills. However, due to increasing productivity per worker per hour, employment in lumber and wood products is expected to decline in the future. Therefore, expansion of the economy will have to come from diversification.

Raw materials are available within Douglas County to support additional pulp and paper manufacture. The possibility of the establishment of a new mill at the confluence of the North and South Umpqua Rivers by 1980 has been considered, but planned expansion of existing facilities at Gardiner, Coos Bay, Toledo, and Springfield should take up the available resource. It is assumed, therefore, that no new pulp and paper operations will be built in the Umpqua Basin within the planning period.

Other resources exist, but they do not appear to have a potential for providing large employment. Employment in mining is expected to remain at about its present level and to continue to occur primarily in the Riddle area. Increased irrigated acreage is expected to support a moderate-sized food-processing industry, located in the Roseburg area, by 1980. Although food-processing expansion is not expected to provide for large employment in the future, it will be a major contributor to future waste loads. By 1980, food-processing capacity in the South Umpqua is projected to increase by about 300 tons per day; further expansion to about 600 tons per day may be expected by 2020.

A moderate-sized meat-processing plant may also be located in the Roseburg area by 1980. Sheep grazing presently provides a raw material, but it seems probable that most of the animals will continue to go to established packing plants outside the county. Employment in service industries is expected to increase due to tourist and recreational development.

D. FUTURE

1. Projected Employment

On the basis of preceding considerations, a projection of future employment by major industry group in Douglas County is given in TABLE VI-2.

TABLE VI-2
PROJECTED FUTURE EMPLOYMENT, BY MAJOR INDUSTRY
DOUGLAS COUNTY, 1980, 2000, 2020

Industry Group	Employment, nearest thousand		
	1980	2000	2020
Agriculture	1.0	1.0	1.0
Forest Management & Fisheries	0.3	0.4	0.5
Mining	0.3	0.3	0.3
Manufacturing, TOTAL	9.9	10.9	11.5
Logging, Lumber, Wood Products	8.3	8.2	8.1
Primary Metals	0.2	0.3	0.3
All Other Durables	0.3	0.5	0.6
Food & Kindred	0.4	0.8	1.1
Printing, Publishing & Allied	0.3	0.4	0.5
All Other Non-Durables & Misc.	0.4	0.7	0.9
Construction	1.5	1.8	2.3
Services	14.7	20.1	27.3
Military	0.1	0.2	0.3
Unemployed	1.5	1.8	2.3
TOTAL LABOR FORCE	29.3	34.5	45.5

2. Projected Population

The projected labor force, as illustrated, would support a total county population of 85,000 in 1980, 106,000 in 2000, and 132,000 in 2020, based upon a labor-force-to-population ratio similar to the existing one. The allocation of this projected

future total county population to the cities and service areas within the county, while highly arbitrary, is required for planning purposes. A projected allocation is shown in TABLE VI-3. It is based upon the assumption that population in the rural portions of the county will remain at about the present level or decrease slightly, that population in the smaller incorporated places will increase at the average for the county, and that the remainder and largest part of the projected population increase would accrue to the larger cities, particularly Roseburg.

TABLE VI-3
PROJECTED POPULATION, BY SERVICE AREAS & INCORPORATED PLACES
DOUGLAS COUNTY, 1980, 2000, 2020

City or Area	Population, nearest thousand 1980	2000	2020
Douglas County, TOTAL	85.0	106.0	132.0
Reedsport Service Area	7.7	9.9	12.0
Reedsport City	5.5	7.7	9.8
Rural portion	2.2	2.2	2.2
Roseburg Service Area	48.0	66.0	90.0
Myrtle Creek City	3.4	4.9	6.8
Oakland City	1.3	1.9	2.6
Roseburg Urban Area	25.0	37.6	54.9
Sutherlin City	3.7	5.4	7.5
Winston City	3.6	5.2	7.2
Rural portion	11.0	11.0	11.0
Remainder of County	29.3	30.1	30.0
Drain City	1.3	1.6	2.0
Elkton City	0.2	0.2	0.3
Glendale City	0.9	1.1	1.4
Yoncalla City	0.8	1.1	1.4
Canyonville City	1.6	2.3	3.2
Riddle City	1.5	2.2	3.1
Rural portion	23.0	21.6	18.6

VII. WATER REQUIREMENTS
Municipal & Industrial

A. PRESENT WATER USE

The majority of the Umpqua River Basin's municipal and industrial (M&I) water needs are met from surface water sources. The following table summarizes the present M&I water use and sources of supply for the study area.

TABLE VII-1
PRESENT MUNICIPAL AND INDUSTRIAL WATER DEMAND

Subbasin User	Est. Popl. Served	Water Demand (MGD) Munic-ipal	Indus-trial	Total	Source
South Umpqua:					
Roberts Creek W.D.	3,000	0.24	0.06	0.30	South Umpqua
Winston-Dillard W.D.	3,000	0.19	0.06	0.25	South Umpqua
Tri-City W.D.	750	0.09	--	0.10	South Umpqua
Myrtle Creek W.D.	2,240	0.39	0.06	0.45	N. Myrtle Cr.
Canyonville	1,200	0.14	--	0.14	O'Shea Cr.
Roseburg	13,500	2.80	0.25	3.05	North Umpqua
Milo Academy	400	0.05	--	0.05	Groundwater
Industrial	--	--	2.96	2.96	South Umpqua
TOTAL	24,090	3.90	3.39	7.30	
Cow Creek:					
Riddle	990	0.10	0.03	0.13	Cow Cr.
Glendale	1,000	0.12	--	0.12	Cow Cr.
Industrial	--	--	3.18	3.18	Cow Cr.
TOTAL	1,990	0.22	3.21	3.43	
Calapooya Creek:					
Oakland	1,100	0.11	0.07	0.18	Calapooya Cr.
Sutherlin	2,500	0.40	0.03	0.43	Calapooya Cr.
Industrial	--	--	0.06	0.06	Calapooya Cr.
TOTAL	3,600	0.51	0.16	0.67	

B. EXISTING SOURCE DEVELOPMENT

Present demands are concentrated in the Roseburg Service Area. The City of Roseburg obtains its water from the North Umpqua, but its suburbs utilize the South Umpqua. The four separate water systems which supply the service area (Roberts Creek, Winston-Dillard, Tri-City, and Roseburg) provide chemical treatment, filtration, and disinfection because of seasonal turbidity, color and odor problems, and bacterial contamination. The major portion of industrial water used in the South Umpqua is supplied through these four systems. Other communities in the study area obtain municipal water from individual systems on the South Umpqua, Cow Creek, or Calapooya Creek. Industrial supplies on the Cow Creek have been developed by Hanna Nickel Smelting Company and Monroe Lumber Company.

C. PROJECTED M&I DEMANDS AND STORAGE REQUIREMENTS

The forecast of future demands is based on economic projections and present consumption rates for the various communities. Per capita consumption rates average 115 gpd with peak summer demands of over three times the average use. Average per capita rates are projected to increase to over 190 gpd by 2020. Future industrial demands are based on production forecasts with the heaviest users being food processing and forest products.

Study area demands for M&I water for the years 1980, 2000, and 2020 are projected to total 22.0, 28.8, and 46.0 mgd, respectively. About 55 percent of this demand will occur in the Roseburg Service Area. Industrial water demands will constitute about 60 percent of the projected M&I demand.

TABLE VII-2 shows the projected water demands and the supplemental storage requirements needed to meet these needs. Future demands for M&I water supply in the South Umpqua Basin will necessitate the most supplemental storage. Minimum natural stream flow of the South Umpqua is fully appropriated (240 cfs of consumptive rights); and, in fact, is over-appropriated during critical years. In addition, the Oregon Water Resources Board has established a minimum flow of 60 cfs at the mouth of the South Umpqua. (The minimum observed flow of record is 36 cfs.) Limited storage will be needed on Cow Creek to meet future demands.

Supplemental storage requirements for the Roseburg Service Area are based on the projections for suburban areas. The City's North Umpqua River supply is considered adequate to meet future demands for the urban area. However, consideration should be given to a South Umpqua supply to meet peak demands.

TABLE VII-2
PRESENT AND PROJECTED MUNICIPAL AND INDUSTRIAL WATER DEMAND
UMPQUA RIVER BASIN

Area and Consumer	Water Use (MGD)	Projected Water Demands (MGD)			Supplemental M&I Storage Requirements (ac-ft.)			
	Present	1980	2000	2020	Present	1980	2000	2020
South Umpqua:								
Roseburg	3.05	4.50	6.10	10.00				
Suburban Roseburg[1/]	--	0.60	0.83	1.28				
Roberts Creek	0.30	0.60	0.83	1.28	5	150	260	480
Winston-Dillard	0.25	0.60	0.83	1.28	--	--	90	310
Tri-City	0.10	0.15	0.21	0.46	--	--	--	15
Myrtle Creek W.D.	0.45	0.50	0.62	0.93	--	--	--	--
Canyonville	0.14	0.30	0.41	0.68	--	45	100	230
Milo Academy	0.05	0.10	0.16	0.18	10	30	60	70
Private industry[2/]	2.96	10.00	13.60	23.50	--	150	580	1,800
Cow Creek:								
Riddle	0.13	0.30	0.41	0.68	--	--	--	85
Glendale	0.12	0.15	0.21	0.46	--	--	100	125
Private industry	3.18	3.44	3.44	3.44	--	--	--	--
Calapooya Creek:								
Oakland	0.18	0.17	0.21	0.46	--	--	--	--
Sutherlin	0.43	0.50	0.83	1.28	--	--	--	5
Private industry	0.06	0.10	0.10	0.10	--	--	--	--
TOTAL	11.40	22.01	28.79	46.01	15	375	1,190	3,115

1/ This area will most probably be served from the North Umpqua River. A system study is underway currently.

2/ Pulp and paper not included.

Based on TABLE VII-2, total M&I storage needs applicable for inclusion in Tiller Reservoir are about 3,100 acre-feet. However, the Olalla Reservoir project (U. S. Bureau of Reclamation) has an appropriation of 760 acre-feet of storage for M&I water supply to supplement the Roberts Creek-Winston-Dillard supplies. When this is subtracted, a total of 2,350 acre-feet of storage is applicable for inclusion in the Tiller project. It should be noted, however, that there is no authority within the study area to contract for the storage.

VIII. WATER QUALITY CONTROL

A. NEED FOR CONTROL

Water uses requiring controlled water quality include municipal and industrial water supply, resident and anadromous fishery, and recreation. Although these uses are discussed for the entire Umpqua Basin, particular emphasis has been given to the uses on the South Umpqua and Cow Creek, which could be served by the proposed projects.

1. Municipal and Industrial

As discussed in the preceding chapter, both the existing and potential water supply sources for municipalities and industries are the surface waters of the main stem Umpqua, Cow Creek, South Umpqua, and Calapooya Creek.

2. Fishery

The Umpqua River and tributaries support extensive populations of anadromous fish, including Chinook and Coho salmon and steelhead and cutthroat trout. Resident trout also inhabit the river system. The anadromous fish, which spawn and rear in the basin, contribute to a large sport fishery along the various tributaries and in the ocean, as well as to the offshore commercial fishery. Preliminary figures from a survey conducted by Oregon State University in 1965 give some indication of intensity of the sport fishery in the basin. In that year, total effort by Oregon residents was estimated to be about 350,000 fisherman trips. The estimated sport catch was about 97,000 salmon and steelhead and over 200,000 trout. Some of the salmon caught in the ocean were probably produced in other streams. In addition to Oregon residents, fishing pressure from out-of-state tourists is increasing steadily with the completion of access roads and camping facilities.

As shown in FIGURE VIII-1, nearly every stream in the Umpqua Basin is used by anadromous fish for spawning, rearing, or migration. Present spawning population estimates for the North and South Umpqua are listed in TABLE VIII-1.

TABLE VIII-1 - PRESENT ANADROMOUS FISH SPAWNING POPULATIONS--UMPQUA RIVER BASIN

Species	North Umpqua	South Umpqua	Total
Spring Chinook	11,000	600	11,600
Fall Chinook	200	600	800
Coho	1,200	2,800	4,000
Summer Steelhead	4,800	--	4,800
Winter Steelhead	7,700	6,000	13,700
TOTAL	24,900	10,000	34,900

WATER SUPPLY & WATER QUALITY CONTROL STUDY
UMPQUA RIVER BASIN, OREGON

ANADROMOUS FISH SPAWNING AREAS

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
REGION IX (DATE: 6/66) PORTLAND, OREGON

FIGURE VIII-1

Although both streams still have extensive fishery today, there has been a deterioration of the stream environment in the basin, and particularly in the South Umpqua, which has reduced fish populations. The Oregon State Game Commission estimates that runs have been reduced by over 70 percent from historic populations. A considerable portion of this reduction can be attributed to degradation of the South Umpqua.

Anadromous fish activities in the South Umpqua are illustrated in FIGURE VIII-2. In general, summer and fall temperatures and stream flows in the lower South Umpqua are undesirable for salmonid species which are using the stream at that time. Low summer stream flows and high water temperatures restrict the rearing potential in the South Umpqua and delay fall Chinook and Coho from entering the river to spawn. Summer steelhead are not present in the stream for the same reasons.

FIGURE VIII- 2
ANADROMOUS FISH ACTIVITIES IN SOUTH UMPQUA RIVER

ACTIVITY	J F M A M J J A S O N D	LOCATION	QUALITY REQM'T D.O.	QUALITY REQM'T TEMP. °F
Adults Upstream	SCh; FCh; WSt; Coho; WSt; Coho; SSt	Mainstem and Tribs	7	43-55
Holding	SCh; FCh; SSt; WSt; WSt; Coho	Upper MS Lower MS	7	50-65
Spawning and Incubation	SCh; FCh; Coho; S&WSt; SCh; FCh; Coho	Upper MS Lower MS Tribs.	7	43-55
Juveniles in Streams	SCh Coho SSt WSt	Mainstem and Tribs	7	43-67
Fingerlings Downstream	SCh FCh Coho SSt WSt; SCh WSt SSt	Mainstem and Tribs	7	45-65

Species Legend: SCh - Spring Chinook; FCh - Fall Chinook; SSt - Spring Steelhead; WSt - Winter Steelhead; Coho - Coho.

With higher flows and resultant lower temperatures, the early segments of Chinook and Coho salmon runs would migrate and spawn about one month earlier, and the lower river could be used more extensively for spawning and rearing. With this stream regimen, the lower Umpqua River could be used much more extensively for spawning and rearing.

The present salmonid fishery and projected future populations with the Tiller project are shown in TABLE VIII-2.

TABLE VIII-2
PRESENT AND PROJECTED SALMONID FISH POPULATIONS

	Present	Projected with Tiller Project
Spring Chinook	600	7,400
Fall Chinook	600	21,000
Coho	2,800	3,000
Winter Steelhead	6,000	9,300
Summer Steelhead	--	5,000

3. Recreation

Recreational use of the Umpqua Basin streams is intense, a function of established recreational habits. Other than game fishing, recreational water uses include boating, water-contact sports, picnicking, and camping. Since each stream has many points of access, user statistics to show intensity of demand are only partially available. However, an impressive rise in the number of visits to State parks in the basin indicates a trend in water-oriented recreation. Day visits to all State parks have doubled between 1960 and 1965. Parks providing water activities show even more spectacular attendance growth.

In addition to State facilities, the South Umpqua is extensively used by Roseburg residents for picnicking, swimming and other water-contact recreation. Although several city parks are located on the lower South Umpqua, the stream is not aesthetically appealing during summer low flow periods. A combination of low flow, high temperatures, profuse algal growths, and floating solids damage the recreation potential of the stream.

B. WASTE LOADS

1. Municipal and Industrial

Because of the importance of dissolved oxygen content of water, both as a measure of pollution and as a requirement for fish life, municipal and industrial waste loads are expressed in terms of their oxygen consumption--the biochemical oxygen demand (BOD). This demand is expressed in terms of population equivalents (PE) for this report.

Present municipal and industrial waste loadings for the Umpqua Basin are shown in Appendix B and summarized in TABLE VIII-3 by major loading point.

TABLE VIII-3
MUNICIPAL AND INDUSTRIAL WASTE LOADS--1965
UMPQUA RIVER BASIN

Loading Point	Raw P.E.	Discharged P.E.	Receiving Stream
Canyonville	1,200	180	S. Umpqua
Glendale	900	150	Cow Creek
Riddle	1,000	250	Cow Creek
Roseburg Area	32,350	5,100	S. Umpqua
Drain	1,100	150	Elk Creek
Remainder of Basin	525	70	
Total	37,075	5,900	

The South Umpqua receives the major portion of basin wastes, with loading points concentrated in the Roseburg area. The Roseburg service area, as defined in Chapter VI, produces over 85 percent of the total basin wastes. Although Sutherlin is currently discharging to the North Umpqua, it is considered close enough to the Roseburg area to be included for planning purposes. Wastes from the coastal communities of Reedsport and Gardiner are not included because ocean outfalls remove wastes from the sphere of influence of the Umpqua streams.

There are no major industrial wastes with separate outfalls in the basin, except for the paper mill at Gardiner which discharges to the ocean. Food processing operations discharge to municipal systems and are included in the municipal loads listed.

Total waste production of the basin, excluding the coastal communities and industries, is about 37,000 PE. All basin wastes receive treatment before discharge; over-all reduction of wastes is about 84 percent, with about 5,900 PE discharged to the watercourse.

Future waste load projections are based on the economic forecasts presented in Chapter VI. The following assumptions have been made: (1) future food processing and other industries in the Roseburg area will be connected to municipal systems: (2) additional pulp and paper expansion will be located on the coast; and (3) municipal and industrial wastes will receive at least 85 percent treatment in 1980 and 2000 and at least 90 percent treatment by 2020. From these assumptions, projected future waste loads are shown in TABLE VIII-4. It should be noted that due to assumed increases in treatment efficiency, 2020 projected loads are less than those for 2000.

TABLE VIII-4
PRESENT AND FUTURE WASTE LOADS
DISCHARGED TO UMPQUA STREAMS
(Population equivalents)

Loading Point	1965	1980	2000	2020
Canyonville	200	300	400	400
Glendale	200	200	200	200
Riddle	300	300	400	400
Roseburg Service Area[a/]	5,100	22,600	39,800	38,800
Drain	200	300	400	300
Remainder of Basin	100	200	300	200
Total	5,900	23,900	41,500	40,300

a/ Includes the communities of Myrtle Creek, Winston, Dillard, Sutherlin, Winchester, and Oakland.

Increases in municipal and industrial waste loads are anticipated to occur primarily in the Roseburg area. Not only is population growth centered in this area but large increases in food processing wastes are forecast. Food processing wastes account for the large increase in waste loads between 1965 and 1980.

C. WATER QUALITY OBJECTIVES

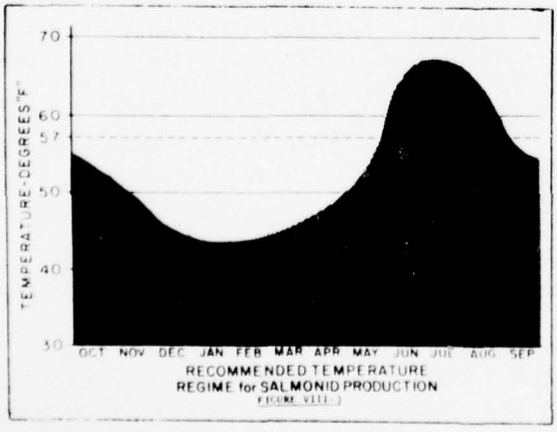
Water quality control evaluations consider primarily those water quality and water pollution control problems which can be improved or maintained by stream flow regulation. For the South Umpqua and its tributaries, these include dissolved oxygen, temperature, and nuisance aquatic growths and are associated with maintenance of fishlife, water recreation, and aesthetic environment. The benefits associated with water quality control for these uses are widespread. Water quality objectives have been developed for the various water uses based on the following indicators.

1. Dissolved Oxygen

The dissolved oxygen (DO) objective for the South Umpqua is delimited by anadromous fishery requirements--the use requiring the highest DO level. Other uses served at this level are recreation and aesthetic conditions. Since salmon and steelhead use the stream at all times of the year for either spawning, rearing, or migration, a minimum objective of no less than 7 mg/l must be maintained in the lower South Umpqua throughout the year. DO saturation is required in headwater areas for fish spawning and incubation.

2. Temperature

Temperature requirements for the South Umpqua are also governed mainly by the anadromous fishery, but recreation and general stream conditions benefit from cooler water temperatures. The following illustration (FIGURE VIII-3) shows the temperature regimen for anadromous fish production. Maximum temperatures should not exceed 70°F during July and August, to facilitate fish migration, holding and rearing; by mid-September, temperatures should not exceed 57°F to obtain optimum egg survival.



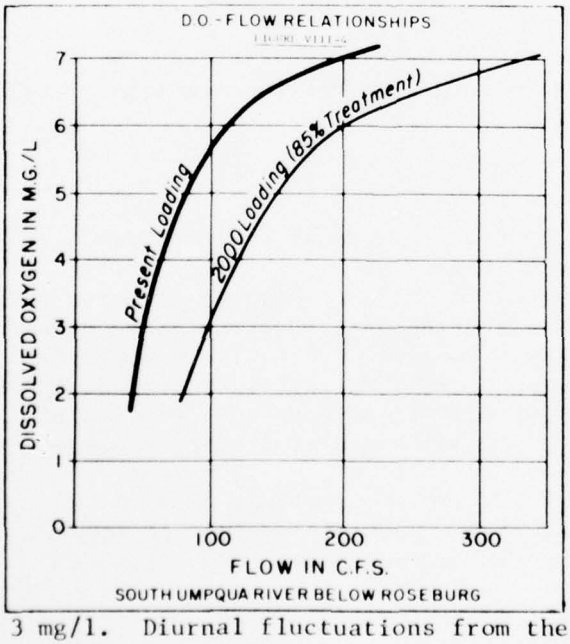
Maintenance of DO and temperature levels to protect and restore the anadromous fishery in the South Umpqua would aid in the abatement of biological nuisance problems.

3. Bacteria

Bacterial objectives for recreation and water supply use are 1,000 MPN and 5,000 MPN, respectively. Treatment, including disinfection, is required to reduce bacterial concentrations.

D. EVALUATION OF FLOW REGULATION REQUIREMENTS

Flow regulation for quality control is required in the South Umpqua River to maintain the present and future use of the stream. The maintenance and enhancement of the anadromous fishery is the critical use requiring additional flow. Controlled storage releases are needed to: (1) maintain dissolved oxygen concentrations of at least 7 mg/l during the months of July, August, September, and October and (2) lower downstream water temperatures during the same period.



1. Dissolved Oxygen

DO-flow relationships have been computed for the South Umpqua for present and projected loading conditions. Two of these curves are shown in FIGURE VIII-4. Under present loading conditions, the one-in-ten drought flows of 80 cfs in August and September would result in average DO levels of about 5 mg/l. Under projected loading conditions, the year 2000 with 85 percent treatment is the most critical. Without flow regulation, DO concentrations during the critical period would drop below 3 mg/l. Diurnal fluctuations from these values would be about 1 mg/l. Under minimum recorded daily flows (36 cfs) near-septic conditions would occur.

Flow requirements, in combination with adequate treatment, and storage requirements to meet deficiencies under *one-in-ten* drought conditions are shown for the four critical months in TABLE VIII-5. Reservoir releases are not needed during the rest of the year to maintain over 7 mg/l DO throughout the study period. However, it should be noted that, if future development of the basin significantly alters projected conditions, releases may be required during winter months.

TABLE VIII-5
FLOW AND STORAGE REQUIREMENTS
SOUTH UMPQUA BELOW ROSEBURG SEWAGE TREATMENT PLANT

Month	Base Flow Ave.Mo.1/ cfs	Dissolved Oxygen Objective mg/l	Present Flow Req'd cfs	Present Storage Releases Req'd AF	1980 Flow Req'd cfs	1980 Storage Releases Req'd AF	2000 Flow Req'd cfs	2000 Storage Releases Req'd AF	2020 Flow Req'd cfs	2020 Storage Releases Req'd AF
July	163	7	192	1,785	240	4,740	335	10,580	327	10,100
Aug.	79	7	192	6,950	240	9,900	335	15,750	327	15,250
Sept.	79	7	192	6,830	240	9,600	335	15,250	327	14,750
Oct.	186	7	192	370	240	3,320	335	9,150	327	8,670
TOTAL				15,935		27,560		50,730		48,770

1/ Based on one in ten drought recurrence at Brockway gage.

Based on this analysis, there is an immediate need for an annual draft-on-storage[1/] of 16,000 acre-feet and a maximum study period need of 51,000 acre-feet.

2. Temperature

As shown in Chapter V, Section 4, present temperatures during the summer months in the South Umpqua exceed those desirable for the existing and potential fish production. Fishery agencies have indicated that there would be considerable enhancement of anadromous fish runs in the South Umpqua if temperatures could be lowered. Although it is beyond the scope of this agency to recommend fishery enhancement, the feasibility of meeting fishery objectives with the Tiller project has been examined to assist fishery agencies.

Fishery enhancement criteria are temperatures of 57°F or lower by mid-September and as low as possible during the summer. Examination of the State Water Resources Board study entitled

1/ Annual draft-on-storage is the sum of incremental excesses of needed releases over inflows during a climatic year (April to April).

Water Temperature Prediction and Control - Umpqua River Basin 1964 shows that the recommended temperatures could be maintained almost to the mouth of the South Umpqua in all months except September and October with releases from the Tiller project. Fall temperatures could be met by allowing higher summer temperatures (up to 72°F) at the mouth and thereby conserving colder water for fall release.

A schedule developed by the Corps of Engineers showing probable releases from the Tiller Reservoir and the associated temperature regimen for the South Umpqua is shown in TABLE VIII-6.

TABLE VIII-6
SOUTH UMPQUA RIVER
TILLER RESERVOIR - STREAM TEMPERATURE CONTROL

Month	Probable Release Rate cfs	Recommended Criteria °F*	Predicted Temperature °F At the Dam	Max. at the Mouth	Mean at the Mouth
October	612	53	52	60	57
November	350	50	46	51	48
December	350	45	39	43	41
January	350	43	40	40	40
February	350	43	40	46	44
March	350	46	40	48	46
April	525	48	45	55	53
May	858	55	51	61	58
June	1,139	65	55	68	65
July	1,471	67	55	71	67
August	1,244	62	52	67	64
September	885	56	52	66	63

*Desired temperature at midpoint from dam to mouth.

IX. BENEFITS

A. WATER SUPPLY - MUNICIPAL AND INDUSTRIAL

A future need for storage for municipal and industrial water exists in the Umpqua Basin as described in Chapter VII. By the year 2020, supplemental storage to yield 7.65 mgd or 2,350 acre-feet will be needed. First need will begin at about the time of assumed project completion (1975).

The value of this storage has been estimated by approximating the single-purpose cost that would be required to develop the needed supply in the absence of the Tiller and Galesville Projects. The most likely alternative source available is on Jackson Creek (Sec. 2, T30S, R1E). Based on this alternative, the annual value of 2,350 acre-feet of storage in the project including operation and maintenance is estimated to be $220,900, with a 50-year amortization at an interest rate of 3.125 percent.

B. WATER QUALITY CONTROL

The various uses requiring controlled water quality (fishlife, recreation, and general aesthetics) were discussed in detail in Chapter VIII, and it has been shown that the anadromous fishery requirements are the most stringent. Other uses, however, will benefit from the higher DO and reduced temperatures. Storage releases from the Tiller and Galesville Projects are needed in addition to adequate treatment to protect and maintain these uses. Failure to provide flow regulation would allow further degradation in the stream environment and cause further reduction of the South Umpqua fish population.

Beneficiaries of flow regulation for water quality control are widespread throughout the Umpqua Basin and the State of Oregon; neither the polluters who contribute to the water quality degradation nor the users who benefit from the improved quality can be specifically identified. The cost of water quality control in these projects is, therefore, non-reimbursable.

The minimum value of storage for water quality control in the South Umpqua is considered to be equal to the least-cost alternative in the absence of the Tiller Project. Waste disposal underground, transmission of wastes downstream to the main stem Umpqua, and waste lagooning are not feasible in the Umpqua Basin. The least-cost alternative would be a single-purpose reservoir located on Jackson Creek below the confluence of Luck Creek in Section 2, T30S, R1E, which could provide the required flow regulation.

Based on this alternative, the minimum value assignable to an annual draft-on-storage of 51,000 acre-feet, based on a 50-year amortization at a rate of 3.125 percent, is estimated to be $640,000.

The value of storage for fishery enhancement (temperature control and flow stabilization) is assumed to be the value of the enhanced fishery as determined by the fishery agencies concerned.

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APPENDIX A

APPENDIX A

Table 1

OSSA-USGS BASIC DATA AND MONITORING STATION LOCATIONS
UMPQUA RIVER BASIN

Sta. No.	Stream and River Mile	Location Description	Sampling Monthly	Data Quar.	Data Available	Sta. Mon.	Type B.D.
SU5	S Umpqua U112-48	Hwy 22 Br. at Day's Creek	x	x 1/	7-14-59 to 11-9-61		x
SU4	S Umpqua U112-45	Co. Rd. 2 mi. No. of Canyonville	x		7-14-59 to 10-17-60	x	
CC4	Cow Creek U112-41-35	½ mi. upstream from Glendale STP	x		7-15-59 to 10-17-60	x	
CC3	Cow Creek U112-41-34	½ mi. dnstream from Glendale STP	x		7-14-59 to 10-17-60	x	
CC2	Cow Creek U112-41-3	½ mi. upstream from Riddle STP	x		7-14-59 to 10-17-60	x	
CC1	Cow Creek U112-41-1	½ mi. dnstream from Riddle STP	x		7-14-59 to 10-17-60	x	
SU3	S Umpqua U112-34	US Hwy 99 Br. at Myrtle Creek	x		7-14-59 to 10-17-60	x	
SU2	S Umpqua U112-18	Old Hwy 99 Br.6 mi. S of Roseburg	x		7-14-59 to 10-17-60	x	
SU1	S Umpqua U112-8	Melrose	x	x 1/	7-14-59 to 11-9-61		x
NU3	N Umpqua U112-27	Lone Rock Br.	x	x 1/	7-14-59 to 11-9-61		x
NU2	N Umpqua U112-15	Clover Creek Br.	x		7-14-59 to 10-17-60	x	
NU1	N Umpqua U112-2	Garden Valley Br.	x		7-14-59 to 10-17-60	x	
U5	Umpqua U86	Umpqua Bridge	x		7-14-59 to 10-17-60	x	
U4	Umpqua U74	Tyee Bridge	x		7-14-59 to 10-17-60	x	
U3	Umpqua U16	Kellogg Bridge	x		7-14-59 to 10-17-60	x	
EC1	Elk Creek U43-0.1	Elkton	x		7-14-59 to 10-17-60	x	
U2	Umpqua U43	Elkton	x	x 1/	7-14-59 to 11-9-61		x
U1	Umpqua U24	Scottsburg	x		7-14-59 to 10-17-60	x	

1/ Started 2-22-61

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REVIEW REPORT ON UMPQUA RIVER AND TRIBUTARIES, OREGON. SOUTH UM--ETC(U)
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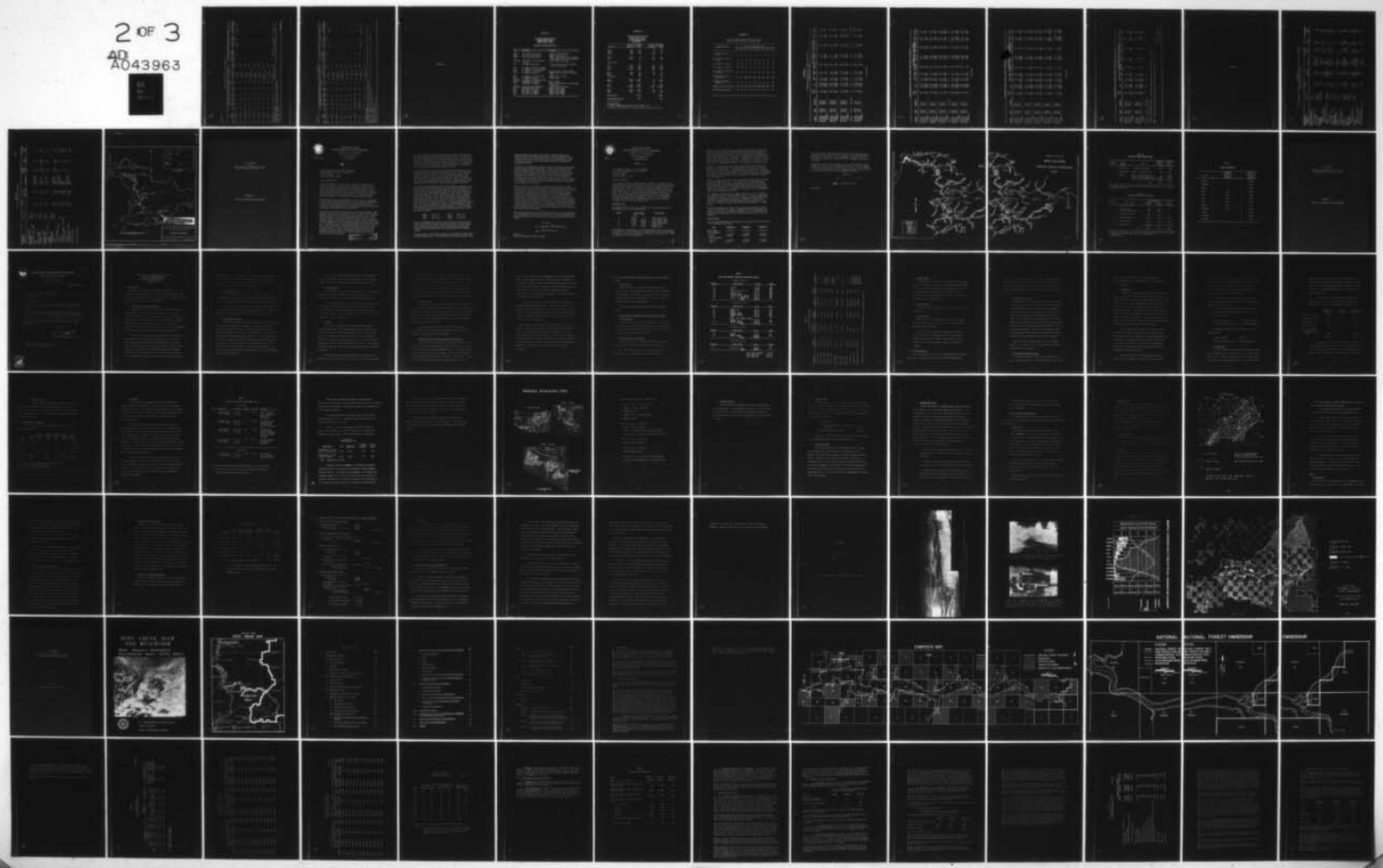


APPENDIX A

Table 2

UMPQUA RIVER BASIN WATER QUALITY SUMMARY

		Average July-September OSSA Water Quality Analyses								Significant Basic Data Overall Averages					
				DO			Cond.	M P N		Hard. as $CaCO_3$		C o l o r		Turbidity	
Sta.	River Mile	pH	Temp (°C)	(% Sat)	BOD_5 (mg/l)	PBI (mg/l)	(µmho/cm)	Value	Comment	(mg/l)	Comment	Units	Comment	Units	Comment
SU5	U112-48	8.3	22	110	0.4	<1	135	190 190 overall	(1)(2)	44	Soft	20 (80 max)	High	11 (74 max)	High
SU4	U112-45	8.3	23	110	0.6	<1	135	160 920 overall	(1)(5)	--	--	--	--	--	--
CC4	U112-41-35	7.4	23	102	0.5	<1	124	540 330 overall	(1)(3)	--	--	--	--	--	--
CC3	U112-41-34	7.3	23	112	0.9	<1	133	24,500 17,600 overall	(1)(4)	--	--	--	--	--	--
CC2	U112-41-3	8.1	24	113	0.4	<1	148	<260 180 overall	(1)(2)	--	--	--	--	--	--
CC1	U112-41-1	8.3	21	125	1.2	<1	150	2,180 6,700 overall	(1)(4)	--	--	--	--	--	--
SU3	U112-34	7.9	22	104	1.5	<1	150	>16,000 >7,500 overall	(1)(4)	--	--	--	--	--	--
SU2	U112-18	8.1	23	97	0.9	<1	160	560 1,320 overall	(1)(5)	--	--	--	--	--	--
SU1*	U112-8	8.0	22	105	1.7	<1	159	>4,000 >9,800 overall	(1)(4)	56	Soft to mod. hard	25 (140 max)	High	12 (58 max)	High

(1) Requires chlorination; (2) OK for all recreational purposes; (3) OK for all recreational purposes but swimming; (4) NG for all recreational purposes; (5) Questionable for recreation.

* Basic data stations.

(Continued)

APPENDIX A

Table 2 (Continued)

Sta.	River Mile	Average July-September OSSA Water Quality Analyses								Significant Basic Data Overall Averages					
		pH	Temp (°C)	DO (% Sat)	BOD_5 (mg/l)	PBI (mg/l)	Cond. (μmho/cm)	MPN Value	MPN Comment	Hard. as $CaCO_3$ (mg/l)	Hard. Comment	Color Units	Color Comment	Turbidity Units	Turbidity Comment
NU3*	U112-27	7.7	18	103	0.6	<1	64	120 107 overall	(1)(2)	24	Soft	10 (50 max)	Quest.	9 (61 max)	High
NU2	U112-15	7.8	18	105	0.6	<1	67	83 200 overall	(1)(2)	--	--	--	--	--	--
NU1	U112-2	7.8	20	98	0.4	<1	68	<140 <170 overall	(1)(2)	--	--	--	--	--	--
U5	U86	7.9	21	97	0.4	<1	78	<170 410 overall**	(1)(2)	--	--	--	--	--	--
U4	U74	8.1	22	102	0.4	<1	76	150 850 overall**	(1)(2)	--	--	--	--	--	--
U3	U61	8.2	22	105	0.5	<1	78	90 1200 overall**	(1)(2)	--	--	--	--	--	--
EC1	U43-0.1	8.1[a]	23[b]	109[c]	1.8[d]	<1	127	110 205 overall**	(1)(2)	--	--	--	--	--	--
U2*	U43	8.2[e]	23[f]	112	2.2[g]	<1	78	120 990 overall**	(1)(2)	32	Soft	24 (140 max)	High	17 (85 max)	High
U1	U24	8.0	23	107	0.5	<1	78	260 760 overall**	(1)(3)	--	--	--	--	--	--

(1) Requires chlorination; (2) OK for all recreational purposes; (3) OK for all recreational purposes but swimming; (4) NG for all recreational purposes; (5) Questionable for recreation.

a/ 9.4 max., 7-18-60. b/ 28 max., 7-18-60). c/ 72 min., 8-11-59. d/ >6.5 max., 8-11-59. e/ 9.1 max., 7-18, 8-15-60.
f/ 27 max., 7-18-60. g/ >9.0 max., 9-9-59.

* Basic data station.

**High counts during spring months.

APPENDIX B

APPENDIX B

PHS Water Quality Survey
Umpqua River Basin
August 18-21, 1963

Sampling Station Locations

No.	Location	Remarks
COW-1	Cow Creek near mouth	Sample from new bridge.
COW-2	Cow Creek above Riddle	Sample at USGS gage.
COW-3	Cow Creek near Azalea	Sample underneath bridge on Grants Pass Highway (99) near Quinos Cr.
COW-Spec	Cow Creek at Riddle Water Intake	Sample from new bridge.
SU-5	S. Umpqua above Milo	1 mile upstream of Milo Academy at Corn Creek Road.
SU-4	S. Umpqua at Riddle Bridge	
SU-3	S. Umpqua at Dillard Bridge	
SU-2	S. Umpqua at VA Hospital	Veterans Admin. Hosp. Bridge
SU-1	S. Umpqua at mouth	Sample from boat float at County Park.
NU-2	N. Umpqua at Lone Rock Br.	Bridge east of Glide.
NU-1	N. Umpqua at mouth	County Park.
NU-Spec	N. Umpqua at Winchester Dam	
CAL-2	Calapooya at Oakland	Water intake.
CAL-1	Calapooya at Umpqua	Sample from bridge ½ mile upstream from mouth.
CAL-Spec	Calapooya near Nonpareil	Sutherlin water intake.
EC-2	Elk Creek near Drain	Sample from bridge.
EC-1	Elk Creek at Elkton	Sample from bridge.
UR-2	Elk Creek at Umpqua	Sample from bridge.
UR-1	Elk Creek at Elkton	Sample from bridge.

APPENDIX B

PHS Water Quality Survey
Umpqua River Basin
Bacteriological Data
8/20-22/63

Sample 1/	Total Coliforms*		Fecal Coliforms*	
	Midnight	Noon	Midnight	Noon
COW-1	200	110	20	24
COW-2	800	<10	10	<2
COW-3	200	60	<10	12
SU-4	1,300	60	50	<2
SU-5	<100	10	<10	<2
COW Special		20		2
SU-1	7,000	700	120	100
SU-2	700	390	360	210
SU-3	13,000	490	240	176
NU-1	180	80	90	60
NU-2	220	80	12	4
NU Special		150		<2
CAL-1	1,800	2,300	14	310
CAL-2	200	620	16	520
EC-1	240	1,000	22	270
EC-2	16,000	7,200	2,900	6,400
UR-1	2,000	1,500	24	24
UR-2	490	410	28	144
CAL Special		3,200		1,000
Southerland Special		630		190

* Count/100 ml.
1/ List of sampling stations shown in Table 13-7.

APPENDIX B

STREAM DISCHARGE DATA, UMPQUA RIVER BASIN
PHS Water Quality Survey - August, 1963

Gaging Station	Date of Discharge (cfs)								
	15	16	17	18	19	20	21	22	23
Jackson Creek near Tiller	23	23	22	22	22	21	21	21	21
South Umpqua River at Tiller	75	72	70	68	68	66	66	66	66
Cow Creek near Azalea . .	15	15	15	15	14	14	14	15	15
Cow Creek near Riddle . .	55	55	52	50	50	50	52	52	52
South Umpqua River near Brockway	143	141	139	135	133	130	126	126	130
North Umpqua River at Winchester	940	913	868	814	832	877	886	895	868
Calapooya Creek near Oakland.	16	15	14	14	14	12	11	9.8	12
Umpqua River near Elkton.	1110	1160	1130	1120	1090	1080	1080	1090	1090
Elk Creek near Drain. . .	3.4	3.4	3.0	3.0	2.6	2.6	1.8	1.4	1.8

APPENDIX B

PHS WATER QUALITY SURVEY, UMPQUA RIVER BASIN
August 18-21, 1963

Date	Time	Station	Temp. °C	pH	Milligrams per liter (mg/l) DO	BOD_5	Hardness	$Sol.PO_4$	Total Solids	Cl	B
8/18/63	2330	COW-1	22	8.26	8.5	0.9	63	0.10	110	8.0	---
8/19/63	0655	COW-1	20	8.08	7.7	0.8	62	0.08	---	8.1	---
8/19/63	1205	COW-1	21	8.39	9.0	1.1	--	--	130	---	---
8/19/63	1735	COW-1	22	8.50	9.5	1.2	--	0.04	---	---	---
AVERAGE.			21	8.31	8.7	1.0	62	0.07	120	8.0	
8/19/63	0015	COW-2	20	8.00	7.9	1.0	65	nil	112	7.6	---
8/19/63	0710	COW-2	18	7.90	8.1	0.6	67	nil	---	7.6	---
8/19/63	1245	COW-2	21	8.44	9.5	0.9	--	---	118	---	---
8/19/63	1750	COW-2	22	8.45	9.4	0.8	--	0.03	---	---	---
AVERAGE.			20	8.20	8.7	0.8	66	0.01	115	7.6	
8/18/63	2145	COW-3	19	7.42	7.3	1.0	55	0.08	100	3.0	---
8/19/63	0450	COW-3	15	7.42	7.7	0.5	56	0.03	---	2.7	---
8/19/63	1030	COW-3	18	7.74	8.9	0.8	--	----	104	---	---
8/19/63	1555	COW-3	22	7.61	8.5	1.2	--	0.04	---	---	---
AVERAGE.			18	7.55	8.1	0.9	56	0.05	102	2.8	
8/19/63	1125	COW Spec.	21	8.38	9.4	0.9	62	0.05	102	---	Trace*
8/19/63	0045	SU-4	20	8.00	7.9	0.9	58	0.02	130	7.5	Trace*
8/19/63	0730	SU-4	20	8.08	8.0	0.5	59	0.08	---	7.7	---
8/19/63	1315	SU-4	22	8.92	9.9	1.2	--	----	120	---	---
8/19/63	1805	SU-4	23	8.74	9.5	0.0	--	0.06	---	---	---
AVERAGE.			21	8.44	8.8	0.6	58	0.05	125	7.6	

(continued)

PHS WATER QUALITY SURVEY, UMPQUA RIVER BASIN (continued)

Date	Time	Station	Temp. °C	pH	Milligrams per Liter (mg/l) DO	BOD_5	Hardness	Sol. PO_4	Total Solids	Cl	B
8/18/63	2240	SU-5	20	8.18	8.1	0.9	50	0.03	110	7.7	---
8/19/63	0545	SU-5	20	7.78	7.9	1.0	50	nil	---	7.6	---
8/19/63	1125	SU-5	21	8.50	9.3	1.1	--	----	120	---	---
8/19/63	1625	SU-5	23	8.70	9.7	0.4	--	0.03	---	---	---
AVERAGE.			21	8.29	8.8	0.8	50	0.02	115	7.6	
8/20/63	0030	NU-1	19	8.00	8.8	1.3	22	0.12	---	1.8	---
8/20/63	0735	NU-1	18	7.90	8.9	1.3	--	0.09	---	2.3	---
8/20/63	1300	NU-1	20	8.18	9.3	1.2	--	0.12	---	---	---
8/20/63	1845	NU-1	21	8.56	9.3	1.9	--	0.08	---	---	---
AVERAGE.			20	8.16	9.1	1.4	22	0.10	---	2.0	
8/19/63	2335	NU-2	17	7.78	9.4	1.8	23	0.14	---	1.5	nil
8/20/63	0655	NU-2	15	7.70	9.5	1.4	--	0.18	---	2.1	---
8/20/63	1217	NU-2	17	8.06	10.5	1.4	--	0.13	---	---	nil
8/20/63	1805	NU-2	18	8.60	10.5	2.0	--	0.14	---	---	---
AVERAGE.			17	7.88	10.0	1.6	23	0.15	---	1.8	nil
8/20/63	1700	NU Spec.	20	8.10	9.7	2.8	22	0.09	---	---	---
8/20/63	0050	SU-1	23	8.98	8.5	2.0	68	0.39	---	10.2	---
8/20/63	0745	SU-1	20	8.24	7.0	2.1	--	0.37	---	10.6	---
8/20/63	1310	SU-1	23	8.89	10.7	1.7	--	0.35	---	----	---
8/20/63	1850	SU-1	23	9.48	12.1	2.2	--	0.39	---	----	---
AVERAGE.			22	8.90	9.6	2.0	68	0.38	---	10.4	---
8/20/63	0110	SU-2	22	8.55	8.9	1.2	68	0.08	---	10.2	---
8/20/63	0800	SU-2	21	8.52	8.1	1.8	--	0.06	---	10.4	---
8/20/63	1330	SU-2	23	8.40	6.2	2.0	--	0.07	---	---	---
8/20/63	1910	SU-2	24	8.80	9.3	2.2	--	0.12	---	---	---
AVERAGE.			22	8.57	8.1	1.8	68	0.08	---	10.3	---

(continued)

PHS WATER QUALITY SURVEY, UMPQUA RIVER BASIN (...ued)

Date	Time	Station	Temp. °C	pH	Milligrams per Liter (mg/l) DO	BOD_5	Hardness	Sol. PO_4	Total Solids	Cl	B
8/19/63	2300	SU-3	22	8.30	8.2	1.8	67	0.11	--	9.1	---
8/20/63	0615	SU-3	20	7.89	7.7	1.5	--	0.07	--	10.0	---
8/20/63	1121	SU-3	22	8.18	8.7	1.6	--	0.10	--	--	---
8/20/63	1730	SU-3	25	8.90	9.8	2.5	--	0.09	--	--	---
AVERAGE.			22	8.32	8.6	1.8	67	0.09	--	9.6	---
8/20/63	2330	UR-1	23	8.62	9.1	2.2	--	----	--	---	---
8/21/63	0555	UR-1	22	8.56	8.6	1.5	--	----	--	---	---
8/21/63	1145	UR-1	22	8.62	8.8	1.4	--	----	--	3.1	---
8/21/63	1720	UR-1	23	8.78	9.7	1.5	--	----	--	3.1	---
AVERAGE.			22	8.64	9.0	1.6	--	----	--	3.1	---
8/20/63	2230	UR-2	20	8.20	9.2	1.3	--	----	--	---	nil
8/21/63	0500	UR-2	20	8.10	8.6	1.2	--	----	--	---	---
8/21/63	1045	UR-2	20	7.94	8.6	1.4	--	----	--	3.1	---
8/21/63	1630	UR-2	22	8.48	9.3	1.1	--	----	--	3.0	---
AVERAGE.			20	8.18	8.9	1.2	--	----	--	3.1	---
8/20/63	2350	EC-1	21	8.15	8.7	1.9	--	----	--	---	----
8/21/63	0605	EC-1	20	7.72	6.7	1.6	--	----	--	---	----
8/21/63	1200	EC-1	22	8.14	8.0	1.7	--	----	--	16.4	----
8/21/63	1730	EC-1	23	8.44	10.1	1.1	--	----	--	15.9	----
AVERAGE.			22	8.11	8.4	1.6	--	----	--	16.2	----
8/21/63	0030	EC-2	19	7.84	7.4	1.6	--	----	--	----	----
8/21/63	0630	EC-2	17	7.90	7.6	1.6	--	----	--	----	----
8/21/63	1245	EC-2	19	7.80	9.8	1.9	--	----	--	27.7	----
8/21/63	1800	EC-2	21	8.66	10.1	1.2	--	----	--	31.7	----
AVERAGE.			19	8.05	8.7	1.6	--	----	--	29.7	----

(continued)

PHS WATER QUALITY SURVEY, UMPQUA RIVER BASIN (continued)

Date	Time	Station	Temp. °C	pH	Milligrams per Liter (mg/l) DO	BOD_5	Hardness	Sol. PO_4	Total Solids	Cl	B
8/20/63	2240	CAL-1	21	8.06	8.9	2.1	--	--	--	---	---
8/21/63	0510	CAL-1	20	7.72	7.6	1.8	--	--	--	---	---
8/21/63	1100	CAL-1	20	7.62	8.1	1.0	--	--	--	5.2	---
8/21/63	1640	CAL-1	22	8.18	9.8	1.0	--	--	--	5.2	---
AVERAGE.			21	7.90	8.6	1.5	--	--	--	5.2	---
8/20/63	0110	CAL-2	22	7.84	8.9	1.5	--	--	--	---	---
8/21/63	0700	CAL-2	20	7.92	8.0	1.4	--	--	--	---	---
8/21/63	1315	CAL-2	22	7.90	8.2	1.5	--	--	--	4.9	---
8/21/63	1830	CAL-2	22	8.08	9.2	0.9	--	--	--	4.6	---
AVERAGE.			22	7.68	8.6	1.3	--	--	--	4.8	---
8/21/63	1340	CAL Spec.	19	8.10	8.7	1.0	--	--	--	2.2	--

* Trace = Less than 0.02 mg/l. Analytical procedure used not accurate for this amount.

NOTE: Tests were run on selected samples for the following ingredients and found to be nil: Turbidity, Color, Kjeldahl Nitrogen, & Suspended Solids.

APPENDIX C

APPENDIX C

1965 INVENTORY OF MUNICIPAL AND INDUSTRIAL WASTE SOURCES AND TREATMENT

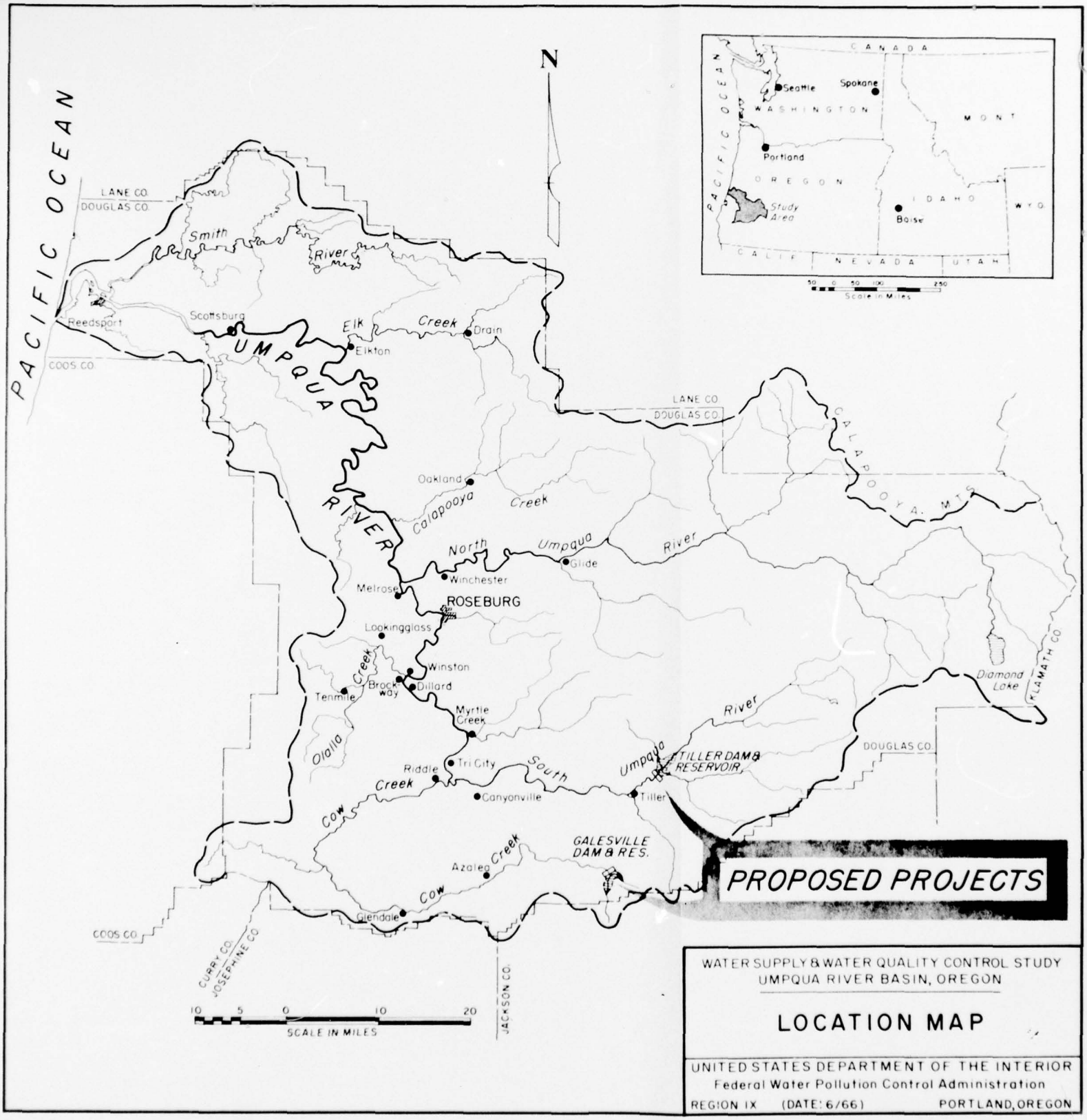
UMPQUA RIVER BASIN, OREGON

Watercourse Community or Industry	River Mile	Est. Pop. 1960	Untreated Waste PE	Treatment	Design Capacity PE	Const. Date	Discharged Waste PE
South Umpqua River	112						
Tiller	112-75						
Tiller Ranger Sta.		--	50	Septic Tank	n/a*	n/a	0
Milo Academy	112-69	300	300	Secondary	450	1956	45
Canyonville	112-51	1,089	1,200	Secondary	2,400	1961	180
Cow Creek	112-47.2						
Glendale	112-47-41	748	900	Secondary	1,000	1957	150
Glendale Plywood		--	n/a	n/a	n/a	n/a	n/a
Robert Dollar Co.		--	n/a	n/a	n/a	n/a	n/a
Hanna Nickel Smelting Co.	112-47-6	--	Inorganic	Ponds	--	--	0
Riddle	112-47-2	992	1,000	Secondary	2,000	--	250
C&D Lumber Co.		--	n/a	n/a	n/a	n/a	n/a
Myrtle Creek	112-38	2,231	2,400	Secondary	3,000	--	480
Myrtle Cr. Plywood		--	n/a	n/a	n/a	n/a	n/a
VanDine Creek	112-36						
VanDine Meat Co.		--	750	Lagoon	--	--	0
Dillard	112-27	--	--	No system	--	--	--
Forest Ind. Inc.		--	n/a	n/a	n/a	n/a	n/a
Roseburg Lumber Co.		--	n/a	n/a	n/a	n/a	n/a
Douglas H. S.	112-25	600	600	Secondary	800	1963	90
Winston	112-21	2,395	1,800	Secondary	3,500	1957	300
Green S. D.	112-17	1,200	1,600	Lagoon	2,000	1963	240
Deer Creek	112-11						
Dixonville	112-11-1	--	n/a	n/a	n/a	n/a	n/a
Douglas Veneer Co.		--	n/a	n/a	n/a	n/a	n/a
N. Roseburg S. D.	112-10	6,500	7,500	Secondary	4,000	1951	1,100
Roseburg	112-8	11,467	15,000	Secondary	20,000	1958	2,400
Umpqua Dairy Products		--	(360)	City Sewer	--	--	--
Evans Products Co.		--	n/a	n/a	n/a	n/a	n/a
National Plywood		--	n/a	n/a	n/a	n/a	n/a
Town & Country Trailer Park		125	125	Secondary	300	1960	15

APPENDIX C
UMPQUA RIVER BASIN INVENTORY

Watercourse Community or Industry	River Mile	Est. Pop. 1960	Untreated Waste PE	Treatment	Design Capacity PE	Const. Date	Discharged Waste PE
North Umpqua River	112						
Lake Creek	112-94						
Diamond Lake Rec. Area	112-94-12						
Susan Creek State Park		--	50	Septic Tank	--	--	0
Glide	112-29	260	--	No system	--	--	--
Eugene Veneer Co.		--	n/a	n/a	n/a	n/a	n/a
Sutherlin Creek	112-5						
Sutherlin	112-5-8	2,452	2,700	Secondary	3,500	1956	500
Nordic Plywood		--	n/a	n/a	n/a	n/a	n/a
Calapooya Creek	102-7						
Oakland	103-15	856	--	No system	--	--	--
Martin Bros. Timber Co.		--	n/a	n/a	n/a	n/a	n/a
Elk Creek	49						
Yoncalla Creek	49-26						
Yoncalla	49-26-3	641	--	No system	--	--	--
Drain	49-24	1,052	1,000	Secondary	2,000	1960	150
Drain Plywood		--	n/a	n/a	n/a	n/a	n/a
Cloverleaf Packing Co.		--	100	Septic Tank	--	--	0
Elkton	48	--	--	No system	--	--	--
Reedsport	11	2,998	3,000	None	--	--	3,000
Reedsport Creamery & Cheese		--	1,000	None	--	--	1,000
U. S. Plywood		--	n/a	n/a	n/a	n/a	n/a
Gardiner	9	550	--	No system	--	--	--
International Paper Co.		--	120,000	Ocean outfall	--	--	0
Winchester Bay	2	1,000	1,000	None	--	--	1,000

*n/a - Not available



PROPOSED PROJECTS

WATER SUPPLY & WATER QUALITY CONTROL STUDY
UMPQUA RIVER BASIN, OREGON

LOCATION MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
REGION IX (DATE: 6/66) PORTLAND, OREGON

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON
INTERIM REPORT, SOUTH UMPQUA RIVER

APPENDIX G

REPORT OF THE BUREAU OF RECLAMATION

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGIONAL OFFICE, REGION 1
BOX 8008
BOISE, IDAHO 83707

IN REPLY
REFER TO 700

JUN

Colonel Paul D. Triem, District Engineer
Portland District, Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Colonel Triem:

Your letter of May 18, 1971, to Mr. Carl Huish, Area Planning Officer in charge of our Salem office, requested an impact report which would present the position of this agency relative to your Days Creek Reservoir Project on the South Umpqua River. Since we do not normally prepare impact reports on other agency projects, we request that you consider this letter as our interim statement pending completion of our Rosealea Division feasibility report.

The Rosealea Division investigation is, as you know, a companion study to your investigation and was scheduled in part to identify the irrigation potential associated with Days Creek and Galesville reservoirs. Our proposed report on the Rosealea Division is presently scheduled for completion in fiscal year 1974.

Our studies to date have indicated a need for stored irrigation water supplies in the South Umpqua River valley, and Days Creek Reservoir appears to offer an efficient means of meeting these needs. There does not appear to be a viable alternative source of water for this irrigation unless a comparable amount of storage could be developed on South Umpqua River or its tributaries upstream from the Days Creek site. A summary of the acreages and locations of the lands involved, their water requirements, and benefit data were submitted to you in our letter of June 4, 1970. The data presented in that letter still represent the best available information, although several of the following comments relate to your interpretation of these data as indicated on your data sheets.

ACTION COPY

It is noted that each of the three plans you describe have included the same amount of irrigation water for project lands. Provided that the corresponding amount of storage is economically justified in each instance, it appears that the irrigation function does not significantly weight the relative desirability of the three plans and, consequently, the scope of the adopted project should presumably be established from considerations of the other project functions.

Irrigation benefits of $123,000 annually are claimed for each of the plans, which is the amount specified in our June 4, 1970, letter for Category 3 lands. In the case of a single-reservoir project with storage at the Days Creek site, however, these benefits can be increased by the amount stated for Category 2 lands, or $79,000 per year. The annual irrigation benefits for Days Creek Reservoir alone, without Galesville Reservoir, should consequently be $202,000.

The table of Potential Reservoir Operation Schedules attached to your letter of May 18 indicates that the only water to be released for irrigation below the Days Creek site would be a full water supply for 5,160 acres and a supplemental supply for 4,100 acres for which we provided benefit data. As we indicated on tables 1 and 2 attached to our letter of June 4, 1970, there is a total of 13,740 acres that would need an irrigation water supply from the South Umpqua River below the Days Creek site (reaches 2, 3, and 4). These lands are the 4,100 acres in Categories 2 and 3 in the supplemental column and the 5,160 acres presently dry on table 1 and the 4,480 acres with water rights from the South Umpqua in reaches 2, 3, and 4 on table 2. The estimated net irrigation requirements by months for the 13,740 acres are as follows:

April	29 c.f.s.	July	142 c.f.s.
May	48 c.f.s.	August	119 c.f.s.
June	82 c.f.s.	Sept.	63 c.f.s.

These net irrigation requirements consist of total diversion requirements less estimated irrigation season return flows. Usable downstream inflows can be used to meet a significant portion of these requirements, especially during the early months of the irrigation season.

Existing rights for nonirrigation purposes are entitled to natural flows of South Umpqua River. If no provision is made for these rights, they

will be entitled to use their share of the reservoir inflow that is passed to meet your fishery requirements. Our Area Planning Office in Salem will be glad to provide any additional information you need to recognize existing water rights and to provide for utilization of downstream inflows.

We note on your preliminary economic analysis sheet that water quality benefits would be $80,000 annually. Review of the November 1970 study by FWQA, Table 6, shows that a $35,000 annual benefit was associated with the project for eliminating the need for the collection and aeration of irrigation return flows. We assume this irrigation would be as a result of the Days Creek Project since on page 22 of the FWQA study it mentions that water quality benefits could be claimed for elimination of treatment costs which would otherwise be incurred in the absence of your project.

The entire question of whether or not irrigation return flows significantly reduce the quality of streamflows is presently under consideration by this Bureau, and as yet no firm conclusions have been drawn. A ramification of potentially great impact on the Reclamation program, should it be established that return flows are in fact detrimental to water quality, is the possible requirement under current policies of reimbursement by irrigation interests of costs allocated to water quality control. Until these matters can be resolved, we are unable to approve a concept which may culminate in a reimbursable allocation to irrigation of water quality control costs. We consequently reserve the right to reopen consideration of the water quality control function of your project if the need arises in the future.

We wish to again bring to your attention that we will, at the appropriate time, be prepared to furnish you estimates of the single-purpose annual irrigation storage costs for your use in allocating Days Creek Reservoir costs.

Sincerely,

R. Norman H. Moore

Assistant Regional Director

Copy to:
Area Planning Officer, Salem, Oregon

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGIONAL OFFICE REGION I
BOX 8008
BOISE, IDAHO 83707

IN REPLY
REFER TO 740

JUN 4 197[illegible]

Col. Robert L. Bangert, District Engineer
U. S. Army Engineer District, Portland
Corps of Engineers
P. O. Box 2946
Portland, Oregon 97208

Dear Col. Bangert:

This letter includes our reconnaissance estimate of irrigation water requirement and storage benefit data for your use in formulation studies for your Umpqua River Basin Report. These data supersede the data furnished to you in 1964. This estimate is based on updated irrigation water right data, more detailed land classification information, additional agricultural economic studies, and engineering designs and estimates. The Bureau of Reclamation feasibility study for the Umpqua River basin is scheduled for completion in April 1972; consequently, the data presented herein are subject to revision. The potential storage sites used herein are the Galesville site on Cow Creek and the Days Creek site on South Umpqua River.

Hydrologic Data

The Umpqua River basin has been divided into six reaches as shown on the enclosed map. They are defined as:

Reach	River Mile		Main Stream
	From	To	
1	171.50+		South Umpqua River
2	158.89	171.50	South Umpqua River
3	132.80	158.89	South Umpqua River
4	111.69	132.80	South Umpqua River
5	48.61	111.69	Umpqua River
6	0	48.61	Umpqua River

The lands which could benefit from storage water at the Galesville site on Cow Creek or the Days Creek site on South Umpqua River are summarized in table 1. The lands are located in reaches 2, 3, and part of 4. They are separated into three categories.

Category 1 lands could benefit from storage water from the Galesville site only. This category includes new dry lands along the upper Cow Creek area between West Fork Cow Creek and the Galesville damsite plus lands in the Riddle area along lower Cow Creek needing a supplemental supply. We estimate that 1,430 acres of presently dry lands will need a water supply from Galesville storage. In addition, 1,470 acres of land along Cow Creek with water rights to divert water for irrigation could benefit from a supplemental supply from storage at the Galesville site.

Category 2 could benefit from storage only from the Days Creek site. Category 2 includes lands along South Umpqua River between Cow Creek and the Days Creek damsite. We estimate that 2,060 acres of presently dry lands will need a water supply from the Days Creek site. In addition, 720 acres of land with water rights to divert water from the South Umpqua for irrigation could benefit from a supplemental supply from storage at the Days Creek site.

Category 3 lands could benefit from storage from either the Days Creek site or the Galesville site. These lands are located along South Umpqua River and the lower Cow Creek area in the vicinity of Riddle. We estimate that 3,100 acres of presently dry lands will need a water supply from either site. In addition, 3,380 acres of main stem water rights to divert water for irrigation could benefit from a supplemental supply from storage at either site.

The remainder of land within the Umpqua River basin will not benefit from storage water, but are included in table 2 to depict a basin-wide viewpoint of irrigation. Reach 1 is the area along South Umpqua River upstream from the Days Creek damsite. Presently dry lands in the vicinity of Umpqua River and North Umpqua River in reaches 5, 6, and part of 4 can obtain a water supply from unappropriated flow of these rivers.

The monthly schedules in table 3 can be used with the data in tables 1 and 2 to determine the average irrigation diversion requirement and return flows for both the lands in categories 1, 2, and 3 which could benefit from storage and also for the other irrigation water rights in the basin.

Economic Data

Annual irrigation benefits associated with storage for the several parts of the basin are shown below:

Item	Category 1	Category 2	Category 3
Water Supply	4,900 A.F.	6,100 A.F.	10,700 A.F.
Direct Benefits			
Per A.F.	$10.00	$13.00	$11.50
Total	$49,000	$79,000	$123,000
Indirect Benefits			
Per A.F.	$ 5.00	$ 6.50	$ 5.75
Total	$24,000	$39,000	$ 62,000

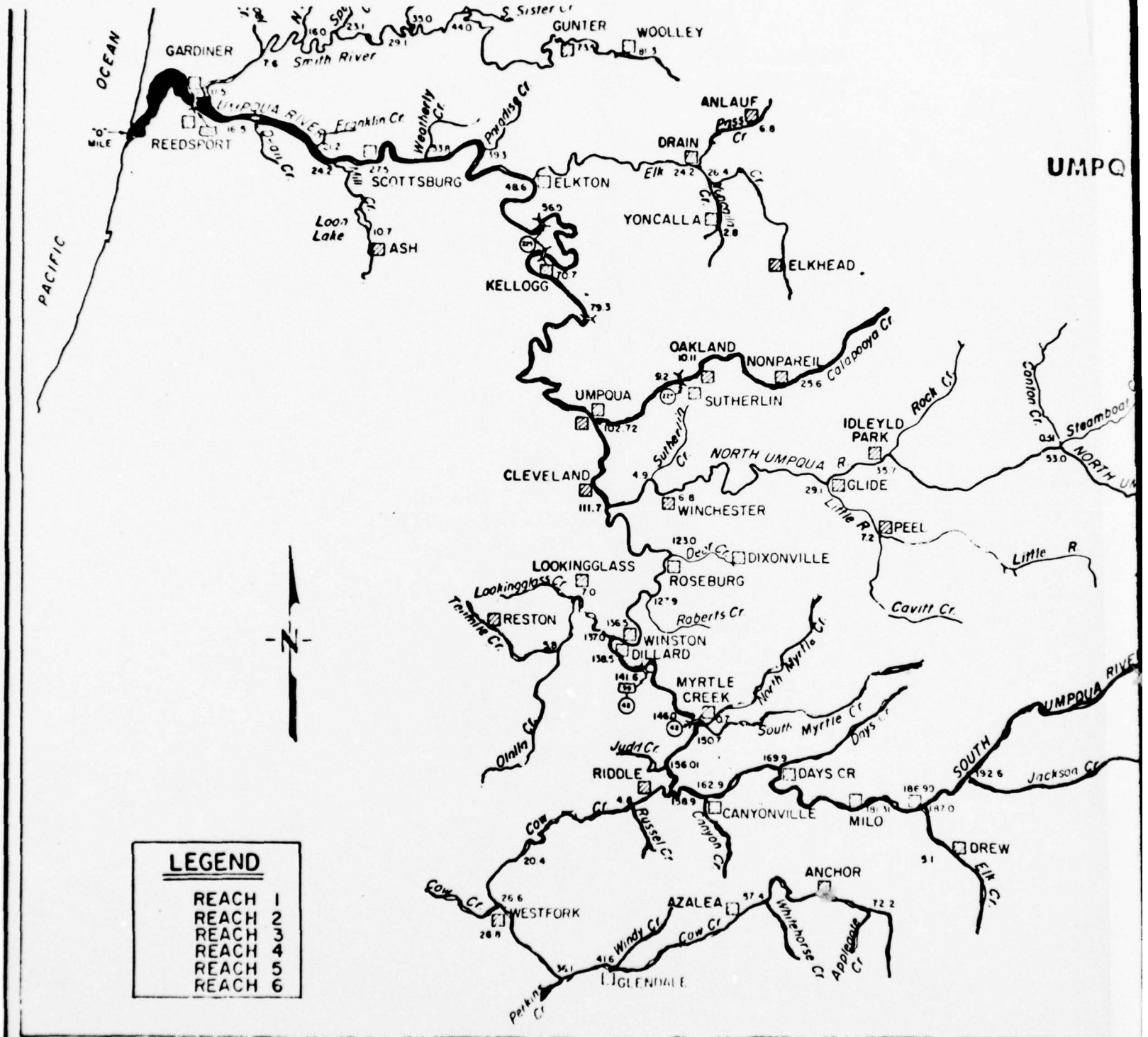
The costs of the irrigation distribution facilities have been subtracted from direct benefits on a 1:1 basis. The remaining benefits were then discounted for a time lag between construction of your multipurpose storage and construction of the irrigation distribution facilities.

For purposes of allocating storage costs, the single-purpose annual irrigation storage costs are dependent on the size of the irrigation function as determined by your formulation analysis. We will furnish you with the single-purpose annual irrigation storage costs as soon as we are informed of the size of the irrigation function.

Sincerely,

Assistant Regional Director

Attachments


OCEAN
PACIFIC
GARDINER
REEDSPORT
0 MILE
Smith River
GUNTER
WOOLLEY
ANLAUF
DRAIN
SCOTTSBURG
ELKTON
YONCALLA
ELKHEAD
ASH
Loon Lake
KELLOGG
OAKLAND
NONPAREIL
SUTHERLIN
UMPQUA
CLEVELAND
WINCHESTER
IDLEYLD PARK
GLIDE
PEEL
NORTH UMPQUA R
Steamboat
Little R
Cavitt Cr
DIXONVILLE
ROSEBURG
LOOKINGGLASS
RESTON
WINSTON
DILLARD
MYRTLE CREEK
South Myrtle Cr
RIDDLE
DAYS CR
CANYONVILLE
MILO
DREW
SOUTH UMPQUA RIVER
Jackson Cr
ANCHOR
AZALEA
WESTFORK
GLENDALE
Roberts Cr
Olalla Cr
Judd Cr
Cow Cr
Russel Cr
Canyon Cr
Elk Cr
Whitehorse Cr
Applegate Cr
Windy Cr
Parkins Cr
Rock Cr
Calapooya Cr
Sutherlin Cr
Deer Cr
Days Cr
Tenmile Cr
Looking glass Cr
Franklin Cr
Paradise Cr
Woolterly Cr
Elk
Little R
N
LEGEND
REACH 1
REACH 2
REACH 3
REACH 4
REACH 5
REACH 6

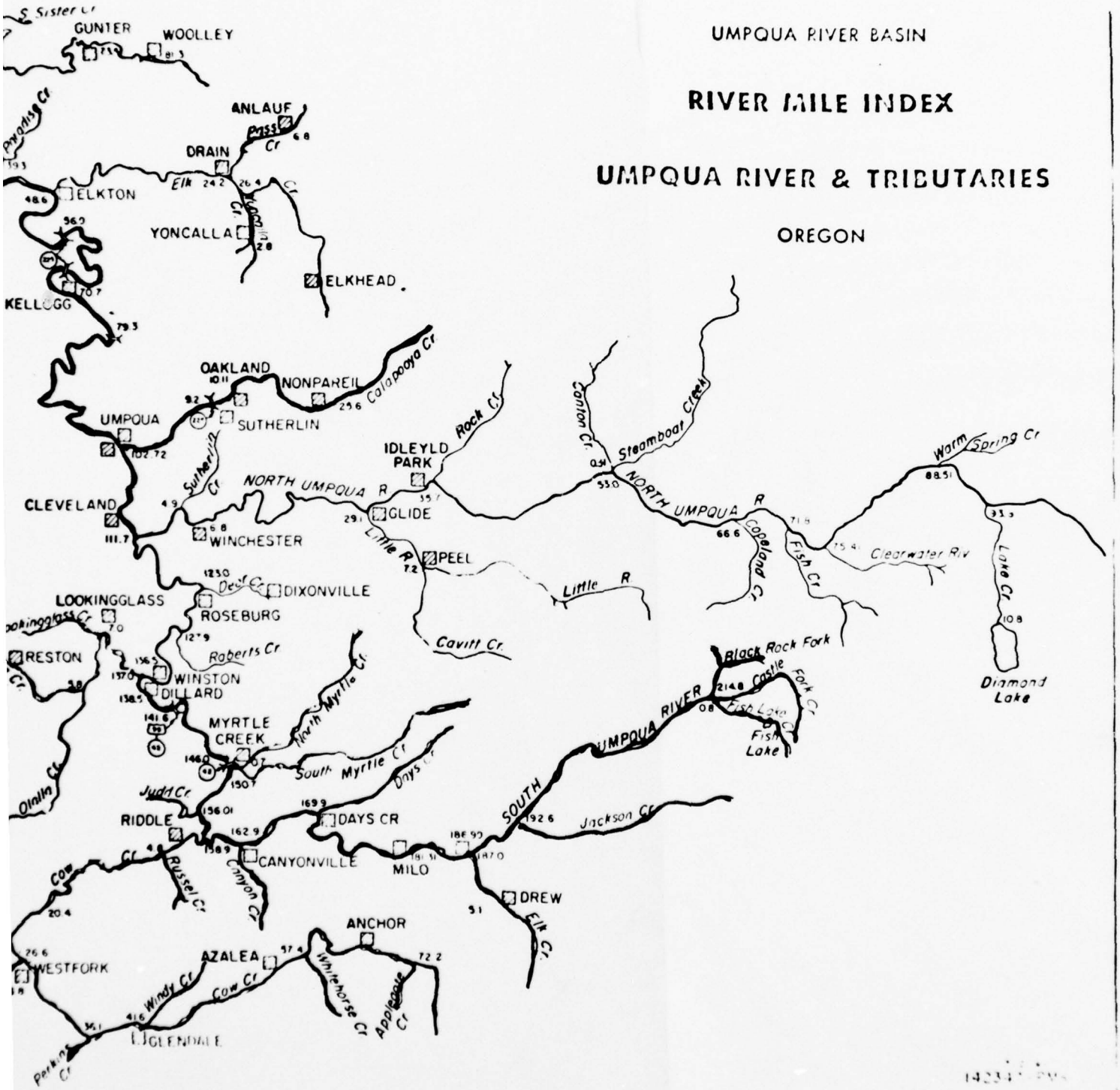

UMPQUA RIVER BASIN
RIVER MILE INDEX
UMPQUA RIVER & TRIBUTARIES
OREGON
S. Sister Cr
GUNTER
WOOLLEY
ANLAUF
DRAIN
Elk Cr
ELKTON
YONCALLA
Hood Cr
ELKHEAD
KELLOGG
OAKLAND
NONPAREIL
Calapooya Cr
UMPQUA
SUTHERLIN
Sutherlin Cr
IDLEYLD PARK
Rock Cr
Canton Cr
Steamboat Creek
NORTH UMPQUA R
Warm Spring Cr
CLEVELAND
WINCHESTER
GLIDE
Little R
PEEL
Copeland Cr
Fish Cr
Clearwater R
Lake Cr
Diamond Lake
Deer Cr
DIXONVILLE
LOOKINGGLASS
ROSEBURG
Lookingglass Cr
RESTON
Roberts Cr
WINSTON
DILLARD
Cavitt Cr
Black Rock Fork
Castle Fork Cr
Fish Lake Cr
Fish Lake
UMPQUA RIVER
MYRTLE CREEK
North Myrtle Cr
South Myrtle Cr
Days Cr
Olalla Cr
Judd Cr
RIDDLE
DAYS CR
SOUTH
Jackson Cr
Cow Cr
Russel Cr
Canyon Cr
CANYONVILLE
MILO
DREW
Elk Cr
ANCHOR
WESTFORK
AZALEA
Windy Cr
Cow Cr
Whitehorse Cr
Applegate Cr
GLENDALE
Perkins Cr

Table 1
Irrigation from Storage Water

Category	Storage Source	Area	Supplemental 1/ (acres)	Presently dry (acres)
1	Galesville	Reach 2 Cow Creek	1,470	1,430 2/
2	Days Creek	Reach 2 S. Umpqua River	720	2,060
3	Either	Reach 2 Lower Cow Creek	0	1,540
		Reach 3 South Umpqua River	1,750	1,010
		Reach 4 South Umpqua River	1,630	550
		Total	5,570	6,590

1/ Includes land with a water right and irrigated land without a water right.
2/ Upper Cow Creek only.

Table 2
Irrigation from Natural Runoff

Reach	Main Stream	Water Rights 1/ Tributary (acres)	Water Rights 1/ Main Stem (acres)	Presently Dry (acres)
1	South Umpqua River	360	650	0 2/
2	A) Cow Creek	1,770	1,160	0
	B) South Umpqua River	560	1,150	0
3	South Umpqua River	3,820	1,930	0
4	South Umpqua River	4,600	1,400	1,410
5	Umpqua River	3,670	5,470	4,950
6	Umpqua River	3,080	510	0 2/
	Total	17,860	12,270	6,360

1/ Includes land with an early priority date water right that has an adequate supply and nonarable land with a later water right.
2/ Not available.

Table 3

Monthly Schedules

Month	Average Diversion Schedule (A.F./A.)	Average Return Flow Schedule (A.F./A.)
January	--	0.033
February	--	0.030
March	--	0.029
April	0.17	0.045
May	0.28	0.064
June	0.44	0.085
July	0.76	0.124
August	0.67	0.137
September	0.39	0.118
October	--	0.073
November	--	0.050
December	--	0.039

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON
INTERIM REPORT, SOUTH UMPQUA RIVER

APPENDIX H

REPORT OF THE BUREAU OF LAND MANAGEMENT

IN REPLY REFER TO

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

1734
P-200

Portland Service Center
P. O. Box 3861
Portland, Oregon 97208

December 17, 1971

Colonel Paul D. Triem, District Engineer
Portland District, Corps of Engineers
P. O. Box 2948
Portland, Oregon 97208

Dear Colonel Triem:

Enclosed for your consideration is BLM's revised preliminary impact report for the proposed Days Creek Project, South Umpqua River, Oregon.

The BLM preliminary impact report forwarded to you on June 19, 1970, was based on a 4,300 surface acre reservoir at 1,050 feet mean sea level. This revision is based on a 480,000 acre-foot reservoir with 4,270 surface acres at a pool elevation of 1,022 feet mean sea level.

This report does not include the photographs and the two colored maps which are a part of our June 1970 preliminary report; however, we do refer to them.

Sincerely yours,

Edward G. Bygland
Director, Portland Service Center

Enclosure
Revised preliminary impact report,
Days Creek Project, Oregon

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
REVISED PRELIMINARY IMPACT REPORT
DAYS CREEK PROJECT, CE
DECEMBER 1971

I. INTRODUCTION

The purpose of this revised preliminary impact report is to show the impact that construction of the Corps of Engineers proposed Days Creek Dam and Reservoir would have on the resources, programs, and lands administered by the Bureau of Land Management.

A. BLM Authority and Responsibility

Management of the public lands administered by the Bureau of Land Management is in accordance with various public land laws, including the O&C Act of August 28, 1937, 50 Stat. 874; the Taylor Grazing Act of June 28, 1934, 48 Stat. 1269, as amended; the Federal Water Project Recreation Act of July 9, 1965 (P.L. 89-72); and a variety of other public land laws to provide for the use and management of the public lands under multiple use principles and practices.

The O&C Act requires that the revested Oregon and California Railroad grant lands be managed on a perpetual basis for multiple purposes including sustained yield timber management, protecting watersheds, regulating stream flow, stabilizing the economy of local communities, and providing recreational facilities for the public. Section 1.(c) of the Federal Water Project Recreation Act provides for BLM management of recreation on Federal water projects where such

lands are classified for retention in Federal ownership. Authority for BLM management of recreational resources on Federal water project areas is clarified and confirmed in a ruling by the Associate Solicitor of the Department of the Interior, dated June 7, 1968.

B. Location of Project

The proposed project is located in southeast Douglas County, approximately one mile south of Days Creek, Oregon, on the South Umpqua River. It is in the South Umpqua Master Unit of BLM's Roseburg District.

Primary access to the project is via Interstate 5 to Canyonville and east along State Highway 227 approximately eight miles to Days Creek. Highway 227 is a major travel route to Crater Lake National Park.

C. Description of Project

This would be an earth fill dam approximately 254 feet high with provisions for anadromous fish passage. It would be a multipurpose project providing flood control, recreation, irrigation, fisheries benefits, and water quality control. No hydroelectric power production is planned. BLM's preliminary impact report of June 19, 1970, was based on a 1,050 foot mean sea level pool elevation with 4,900 surface acres. This revision is based on a 480,000 acre-foot reservoir with 4,270 surface acres at a pool elevation of 1,022 feet mean sea level. No proposed project boundary is presently available; it will be established after project authorization.

The Corps has estimated from river studies of average water years that the maximum annual reservoir drawdown could be as high as 74 feet. During the recreation season it could be about 35 feet.

D. BLM Impact Area

The BLM impact area consists of the drainage of the South Umpqua River adjacent to and immediately above the proposed dam. BLM administers the largest single ownership acreage within this area.

Timber harvesting operations would be modified on lands visible from Highway 227 and the reservoir and also those operations near streams tributary to the affected drainage area. The BLM impact area is outlined on Map No. 1 in the addendum; part of the area can be seen in Photo No. 1 in the addendum.

E. Climate

The climate in Douglas County is characterized by warm, relatively dry summers with average temperatures in the high 60's and cool wet winters with average temperatures in the 40's at the lower elevations. Temperature extremes at Riddle, about 12 miles west of the dam site, range from an all time low of -3° F. to a high of 110° F. However, the long term average winter low is about 40° F., the average summer high about 68° F., with the long term annual average a moderate 54 degrees.

The long term average annual precipitation at Riddle varies between a low of .13 inches in July to a high of 5.56 inches in January

with an annual average of 32.48 inches. Flooding of the South Umpqua River during the winter months is common. During the summer and early fall the flow of the river frequently is very low. Figure No. 1 in the addendum to this report depicts the typical weather pattern of Douglas County and the usual peak in winter run-off of the Umpqua River near Elkton. The seasonal fluctuation in flow of the South Umpqua River is considerably more pronounced than that of the larger North Umpqua River.

F. Vegetative Cover

There are about 6,625 acres of privately owned land within the reservoir site, mainly either agricultural lands or cut-over timber lands. The agricultural lands are of two types: (1) irrigated crop or pasture land, and (2) hillside pasture lands or dry farm lands. The privately owned cut-over timber lands have returned to brush and second growth timber on a ratio of about 50:50.

Approximately 60 percent of the BLM land in the area is forested with old growth timber; the remaining lands are in forest plantations, second growth timber, and brush.

C. Summary of Project Effects on BLM Lands and Programs

The total BLM land affected by the proposed project is 40,735 acres. This acreage represents about 39 percent of the total acreage in the BLM South Umpqua Timber Management area of the Roseburg District. The proposed project could be the largest single factor influencing future BLM management in the area. The effect of the project on timber yields has been coordinated with the current allowable cut and is

shown in detail under the Forest Management section of this revised report. Approximately 675 acres of BLM land would be inundated by the proposed reservoir occupied by new road rights-of-way, or located in the narrow strip between the perimeter roads and maximum pool flow line. Of this 675 acres, 520 acres are commercial forest land supporting 14.5 million board feet of timber. This BLM land would be lost to future timber production.

About 7,450 acres of BLM timber land are in the primary and secondary resource management zones. Seventy-seven percent of the future timber production would be lost in the primary zone. In order to adhere to landscape management goals, BLM would also incur extra logging costs on the remaining 23 percent in this zone and on all of the timber in the secondary zone.

Major changes in the location of State Highway 227 and several BLM access roads would be required. Validity determination would be required on 14 unpatented mining claims. Inundated or destroyed public land survey corners would have to be replaced. Fish passage facilities should be installed. Special measures would be required to fully protect watershed values and prevent erosion and sedimentation wherever soil disturbance occurs as a consequence of project construction.

II. EFFECTS OF PROPOSED PROJECT ON BLM LANDS, RESOURCES, AND PROGRAMS

A. Lands

1. Classification

All but 40 acres of the lands directly affected by the proposed project were reserved for permanent Federal management by the passage of the O&C Act of August 28, 1937. The 40 acres of public domain land are classified for retention in public ownership and multiple use management.

BLM lands directly affected by the project are shown in Table I.

2. Area of BLM Land Removed from Timber Production by the Proposed Project

Based on a pool elevation of 1,022 feet above sea level, a total of 675 acres of BLM land would be taken out of production by the reservoir, perimeter roads, and the narrow strip between the perimeter roads and maximum flow line.

3. Existing Land Use Restrictions

BLM has issued leases, easements, and rights-of-way in the project area. The rights-of-way are listed in Table II.

The Corps of Engineers will be required to provide replacement access to the permittees where necessary.

TABLE I

BLM LAND DIRECTLY AFFECTED BY PROPOSED PROJECT

T. 30 S., R. 4 W.

Section	Subdivision	Acres	Type
15	Lot 16	32.65	O&C
21	Lot 2	39.80	O&C
23	Lots 13, 14, 15, 16	162.16	O&C
25	Lots 5, 8	75.12	O&C
27	NW¼NE¼; N½NW¼	120.00	O&C
29	Lots 8, 9, 13; NW¼SE¼	152.35	O&C
35	Lots 5, 6; NW¼NE¼, W½	215.35	O&C
	TOTAL	797.43	

T. 30 S., R 3 W.

Section	Subdivision	Acres	Type
19	E½NE¼; SE¼	240 00	O&C
23	E½SE¼	80.00	O&C
25	NE¼SW¼; N½SE¼	120.00	O&C
27	NW¼NE¼; NE¼SW¼	80.00	O&C
29	S½S½	160.00	O&C
31	Lot 1; NE¼; E½NW¼; NE¼SW¼; NW¼SE¼	410.38	O&C
33	NW¼NE¼, NE¼NW¼	80.00	O&C
	TOTAL	1,170.38	

T. 30 S., R. 2 W.

Section	Subdivision	Acres	Type
28	SE¼SE¼	40.00	PD
31	N½NE¼; NE¼NW¼	120.00	O&C
	TOTAL	160.00	

T. 31 S., R. 3 W.

Section	Subdivision	Acres	Type
3	Lots 3, 4, 5, 6	163.61	O&C
	TOTAL	163.61	

Total Public Domain	40.00
Total O&C Land	2251.42
Total BLM Land	2291.42

TABLE II

OUTSTANDING RIGHTS-OF-WAY

Permittee	Type Easement	Identification Number	Date Approved	Duration	Annual Rental	Remarks
Douglas County	Road R/W	ORE 011286	--------	Indefinite	None	----------
Pacific Power	Power Line	ORE 01123	--------	----------	$5/yr	----------
Pacific Power	Power Line	ORE 01123	3/26/43	----------	$5/yr	Formerly R022728
Pacific Power	Power Line	PP 281	3/29/23	----------	None	----------
Pacific Power	Power Line	ORE 01123	3/22/43	----------	$5/yr	Formerly R022728
Ore. State Hwy. Dept.	Road R/W	ORE 01590	7/21/50	Indefinite	None	----------
Ore. State Hwy. Dept.	Road R/W	R 022984	--------	Indefinite	None	----------
Ore. State Hwy. Dept.	Road R/W	R 022983	7/26/46	Indefinite	None	----------
L. Michaels	Road R/W	R-798	3/25/65	Perpetual	None	Delete by amendment*
Longview Fibre	Road R/W	R-656	4/3/62	Perpetual	None	Delete by amendment*
Roseburg Lumber Co.	Road R/W	R-851	11/5/63	Perpetual	None	Delete by amendment*

* Delete by amendment that part of the agreement area which is inundated by reservoir.

4. County Zoning

At present there is no form of county zoning in the project area. A comprehensive plan will be developed by Douglas County to zone this area in accordance with requirements of a state land use planning and zoning law. This may result in a differentiation of agricultural, grazing, forest production, and recreation land use classification.

5. Timber Trespass

No suspected timber trespass cases are on record in the project area.

6. Grazing Leases

BLM currently has one grazing lease for 177 animal unit months of forage in the impact area. The lessee since 1965 has been Lawrence Michaels.

The present BLM leasing rate per animal unit month is $0.88, which is on an escalating formula to more closely approach market value of forage. Grazing revenue cost is computed at $1.00 per animal unit month in the financial summary.

B. Forest Management

The South Umpqua Master Unit of the Roseburg District contains 103,843 acres of commercial forest land under BLM administration.

According to the 1970 inventory and allowable cut computation, this unit has an annual sustainable cut of 43 million board feet, which is based on a future growth rate of 414 board feet per acre per year. All forest management computations in this revised report are based on this data.

1. Flow Area of Reservoir

Approximately 675 acres of BLM land, of which 520 acres are commercial forest land supporting 14.5 million board feet of merchantable timber, are in the area to be inundated, occupied by new road rights-of-way, and in the narrow strip between the perimeter roads and maximum pool flow line. Removal of this acreage from the allowable cut of the South Umpqua forest management area will result in an annual timber production loss of 215,000 board feet (520 acres X 414 bd. ft. per acre annual growth). However, the merchantable timber below maximum pool elevation and in proposed road rights-of way will be harvested by BLM prior to project completion.

Based on current stumpage values of $50 per thousand board feet, the permanent loss of 215,000 board feet would approximate $10,750 annually.

2. Environmental Management Zones

A landscape management plan will be necessary for the public and acquired land in the proposed project area. This

plan should consider three zones: (a) primary zone, (b) secondary zone, and (c) background zone. (See Map No. 1 in the addendum.)

a. Primary Zone

The primary zone extends about 600 feet beyond the upper limits of the rights-of-way of the proposed perimeter roads. Approximately 450 acres of BLM commercial timber land are located within this zone. Primary management objectives in this zone will be the protection and maintenance of the esthetic and natural environment. To accomplish this, only dead, dying, and diseased trees will be salvaged to maintain a healthy stand of timber. The periodic removal of this timber would account for about 23% of the production capacity in the zone; the remaining 77% would be lost from sustained yield production.

The 450 acres of BLM commercial forest land in the primary zone includes 92 acres which have already been set aside by BLM as a scenic buffer along Oregon State Highway 227. The additional 358 acres represents an annual production of 148 M bd. ft. Based on 77% of the potential annual growth being lost to sustained yield timber production, the annual loss amounts to about 114 M bd. ft.

Salvage material in the primary zone would amount to about 43 M bd. ft. annually, which is 23% of the potential

annual growth. Above average logging costs, including increased costs for extensive cleanup and added safety precautions while logging in an area of high public use, would be incurred in this zone because of the very selective logging systems required to remove only the salvage material.

The foregoing figures are based on the following calculations, which were taken from the BLM 1970 inventory and allowable cut calculations.

450 acres BLM commercial timber land in the zone with an average potential growth rate of 414 bd. ft. per acre per year:

450 acres X 414 bd. ft. = 186 MBF (rounded)

92 acres buffer X 414 bd. ft. = 38 MBF (rounded)

Net annual production loss in zone because of the proposed project:

186 MBF - 38 MBF = 148 MBF

148 MBF X 77% actual loss = 114 MBF annual loss

b. Secondary Zone

This zone contains 7,000 acres of BLM commercial forest land. BLM expects that there will be no loss in timber yield from this zone. Careful silvicultural considerations relating to harvest methods, prompt regeneration of cutover lands, road

layout and construction to minimize soil disturbance and possible erosion, maximum tree utilization, and other requirements will be specified in BLM timber sale contracts in order to adhere to landscape management goals. This will result in added logging costs.

The following is a list of current average South Umpqua logging costs and their increase in the primary and secondary zones because of environmental considerations:

	Current Cost Per MBF	Percent Increase	Total Increase Per MBF
Falling and bucking	$ 4.00	-	$ -
Yarding and Loading	14.00	10	1.40
Transportation	6.00	5	.30
Road Construction	4.00	20	.80
Misc. - incl. admin., erosion control, revegetation, and cleanup	2.00	50	1.00
	$30.00		$3.50

The average size timber sale in the BLM South Umpqua forest management unit is about 3 M bd. ft. One timber sale of this size would be logged each year in the secondary zone. The annual loss for extra logging costs would amount to $10,500.

c. Background Zone

BLM land in the background zone, although within the watershed of the proposed reservoir, would rarely be seen from the reservoir or perimeter roads. Care will be taken in all BLM activities and programs within this zone to minimize soil disturbance and maintain optimum water quality.

Forest Management Summary

BLM annual production losses and increased logging costs in all management zones are:

Zone	Total Acres	Commercial Forest Acres	Timber Volume MMBF	Production Lost/Yr MBF	Extra Logging Cost/Yr	Total Annual Cost
Inundated	675	520	14.5	215	$ -	$10,750 1/
Primary	450	450	12	114	-	5,700 1/
						860 2/
Secondary	7,900	7,000	145	-	10,500	10,500 3/
Background	31,170		580	-	-	-
Total	40,735		751.5	329	$11,360	$27,810

1/ Based on current stumpage values of $50 per MBF.
2/ Based on $20 per MBF for 43 MBF.
3/ Based on $3.50 per MBF for 3 MMBF.

C. Recreation

The southern part of Douglas County is lacking in water oriented recreation opportunities. Construction of the proposed Days Creek Dam would help fill this void. The reservoir area is in a highly scenic setting surrounded by forested mountains with a good variety of coniferous trees, hardwoods, brushlands, and open areas near the proposed reservoir.

Several potential recreation development sites have been identified adjacent to the proposed reservoir. Final determination of the location of these sites will be made after more information about the proposed project is available. The criteria used in the selection of these sites were steepness of terrain, usable acreage, and summer drawdown. The sites are divided into north side and south side as shown in Table III. Developments would include camping units, picnic areas, boat ramps, and recreation roads and trails at a level to be determined by an intensive recreation plan.

Three Douglas County parks along Interstate 5, which offer overnight camping, showed a 30 percent increase in use from the 1968 to the 1969 season. Another park located along the North Umpqua highway route to Crater Lake showed a 74 percent increase in overnight use in one season. Sixty percent of the overnight use was contributed by traveling Californians.

TABLE III

POTENTIAL RECREATION DEVELOPMENT SITES

North Side

Site	Major Use	Location	Slope	Size 1/	Remarks
1	Overnight Fac. & Boat Landing	Sec. 29, T. 30 S., R. 3 W.	5%	30 ac.	Best north side site. Proposed road must be relocated.
2	Overnight Fac. & Boat Landing	Sec. 28, T. 30 S., R. 3 W.	5%	19 ac.	Second best site on north side. Proposed road must be relocated.
3	Picnicking & Boat Landing	Sec. 28, T. 30 S., R. 3 W.	10%	9 ac.	Too small for extensive development. Proposed road must be relocated.
4	Boat Launching and Parking	Sec. 25, T. 30 S., R. 3 W.	5%	10 ac.	Two way landing in saddle of peninsula.

South Side

1	Overnight Fac. & Boat Landing	Sec. 35, T. 30 S., R. 3 W.	5-10%	35 ac.	Milo Academy best and largest south side site.

1/ Acreage for initial intensive development. The acreage of each recreation area will be much larger, allowing for additional development and dispersed recreation use.

High recreation pressure from people traveling along Interstate 5, those going to and from Crater Lake, and the local pressure from Douglas and Josephine Counties should maximize the recreation use of the proposed reservoir.

The present population of Douglas County is about 70,000 (1990 projection - 95,000). Josephine County presently has 35,700 people (1990 projection - 58,000).

Table No. IV shows some average daily traffic counts at points along Interstate 5. Traffic is expected to be heavy along Highway 227 between the Lost Creek and proposed Days Creek Dams.

TABLE IV
LIGHT VEHICLE USE

Data Point	ADT*	Summer ADT	% Oregon Traffic	% Out of State
Interstate 5, 7 miles north of Grants Pass	5,500	8,000	77%	23%
Interstate 5, 4 miles north of Oakland	6,000	9,000	77%	23%

*ADT - Average Daily Traffic

Integrated resource management of the reservoir area and surrounding public and acquired land is needed to achieve maximum resource benefits. The Bureau of Land Management is the major land management agency in the vicinity of the project and is willing to assume responsibility for construction, operation, and maintenance of the recreation facilities developed in connection with the project.

Douglas County has a strong recreation program as evidenced by the quality and quantity of its parks. Douglas County's cooperation with Federal agencies, particularly with BLM in resource programs, has been excellent. BLM will coordinate its resource management program in the reservoir area with the County.

The Carl Hill Memorial Wayside, which is a Douglas County recreational facility, would be lost to the project. This is the only public recreational facility which would be inundated by the proposed reservoir.

PROPOSED RECREATION SITES

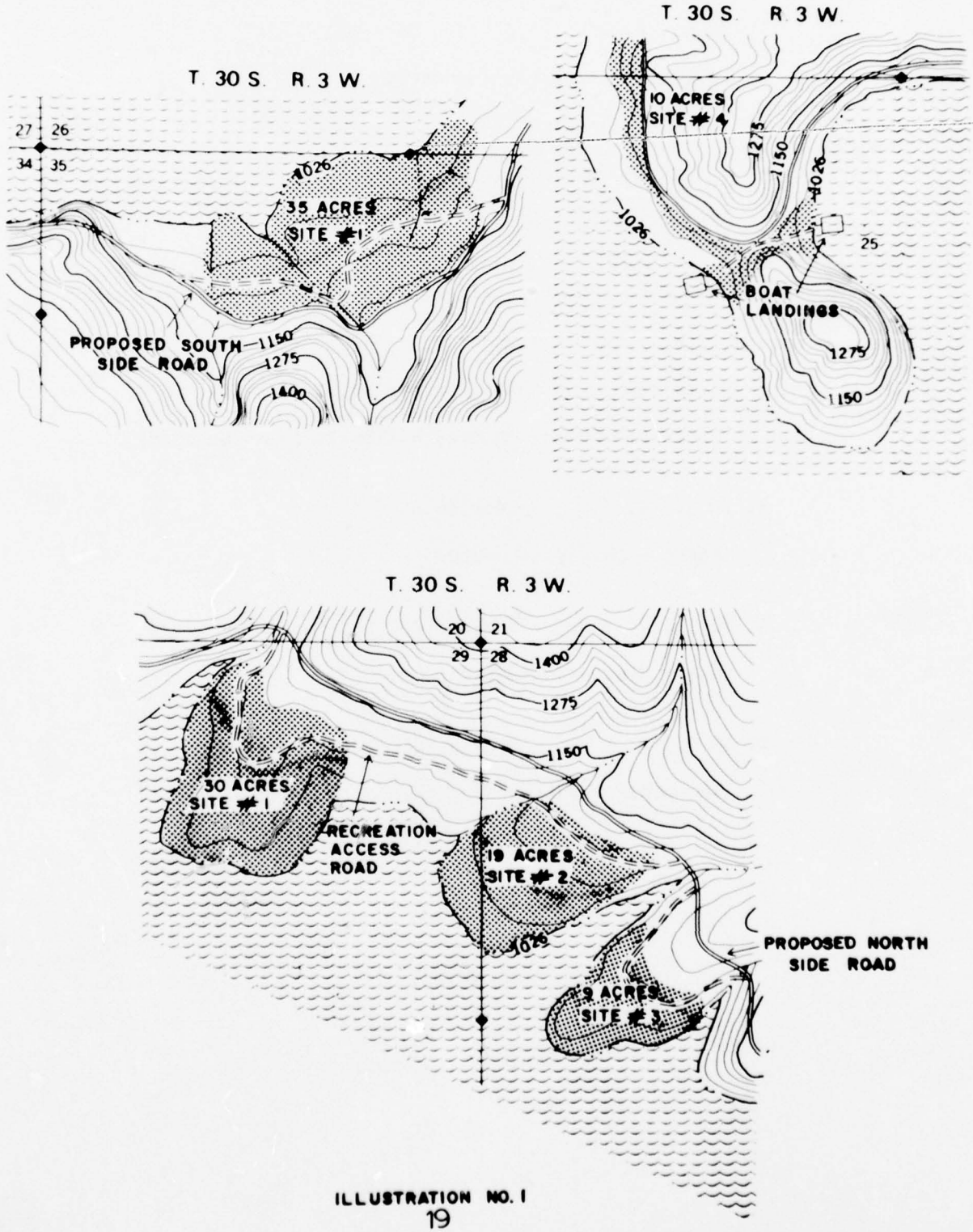


ILLUSTRATION NO. 1

Proposed Recreation Land for Acquisition

T. 30 S., R. 3 W., - Section 28 - NW¼

SW¼NW¼ - is partly inundated

NW¼NW¼ - acquire

SE¼NW¼ - may be partly inundated

NE¼NW¼ - acquire

T. 30 S., R. 3 W., - Section 29 -

N½SE¼ - partly inundated

Lots 1 & 2 (48.69A) (Corresponding to N½NW¼)

These should be acquired - flow line may be close

T. 30 S., R. 3 W., - Section 35

N½NW¼ - partly inundated

T. 30 S., R. 3 W., - Section 25

NW¼ - partly inundated

T. 30 S., R. 2 W., - Section 28 - Tiller vicinity

No specific recommendations for recreation areas

D. Fish and Wildlife

BLM has reviewed and endorses the Bureau of Sport Fisheries and Wildlife report, prepared under the authority and in accordance with the Wildlife Coordination Act, on the effects the proposed Days Creek dam and reservoir project would have on fish and wildlife resources.

E. Mining Claims

Douglas County does not have a tract index for mining claims. BLM district records indicate that 14 mining claims exist in the proposed project area. Validity determination, which would be done by BLM on a reimbursable basis at a cost of approximately $800 per claim, would be necessary on these claims.

Estimate of Costs:

Validity determination on 14 claims @ $800 each	$11,200
Estimated reimbursable charges	$11,200

Sufficient notice should be given in order for BLM to program the necessary manpower required for the minerals work.

F. Cadastral Surveys

Twenty-nine public land survey monuments will be inundated by the proposed Days Creek Reservoir. An estimated 40 miles of property line may have to be surveyed in order to establish property control. BLM will do this survey for the Corps of Engineers on a reimbursable basis. The cost of the survey will approximate $60,000 and should be chargeable to the project. BLM cadastral surveyors, if requested by the Corps, will also survey the project boundary on a reimbursable basis. This cost will amount to approximately $1,500 per mile of line surveyed.

G. Resource Protection

The BLM land within the proposed project area is protected under contract by the Douglas Forest Protective Association. The increased public use of the project area resulting from new road and recreational facility construction will require more intensive protection. However, any additional protection costs will probably be offset by the construction of roads on both sides of the proposed reservoir. These roads would provide improved access and also decrease initial attack time in case of wild fire. This is of particular significance as the proposed Days Creek Reservoir area is within a known lightning belt. To achieve maximum protection of the area, the following conditions should be adhered to during planning and construction phases of the proposed project.

1. Perimeter roads should be completed prior to the reservoir clearing operation. These will serve as access roads and as fire breaks.

2. Connector roads between perimeter roads and BLM timber access roads should be constructed prior to pool area clearing.

3. Salvage logging on peripheral lands should be done in conjunction with right-of-way and pool area clearing so that slash disposal can be completed on all areas at the same time.

4. Slash burning should be done under the minimum pool elevation level and in depression areas that can be covered with new earthfill.

H. Soils, Geology, and Watersheds

The following comments are based on an investigation of soils in the vicinity of proposed road locations and soils in major tributaries to the reservoir.

1. Sweat Creek

Two associated soils occur along BLM's existing road 30-4-21 (SE¼SE¼), Sec. 29, T. 30 S., R. 4 W. The Josephine soils are found on steep mountainous slopes ranging from 12 to 70 percent and underlain by metamorphosed sandstone and shale bedrock of the Galice formation (see Figure 1). They typically have dark reddish brown loam surfaces and reddish brown to yellowish red clay loam subsoils. Depth to bedrock is commonly between 25 and 40 inches.

The associated unnamed soil is underlain by thinly bedded sandstone and shale at 20 to 40 inches. This soil has typically brown silty loam surfaces and brown silty clay loam subsoils.

When disturbed, these soils are susceptible to high runoff, erosion, and slumping.

2. Slimwater Creek

Like soils in Sweat Creek, soils along road 30-4-22 in Sec. 22 and 26 are developing from shales. Bedding of the shale is more folded than along Sweat Creek Road. A small area of deep, grayish-brown silty clay soil is developing in unconsolidated mudstone in the $SE\frac{1}{4}SE\frac{1}{4}$, Sec. 22, T. 30 S., R. 4 W. Besides a moderate amount of erosion in side ditches, the mudstone is stable; however, if this soil is found on steep slopes, slumping can be expected.

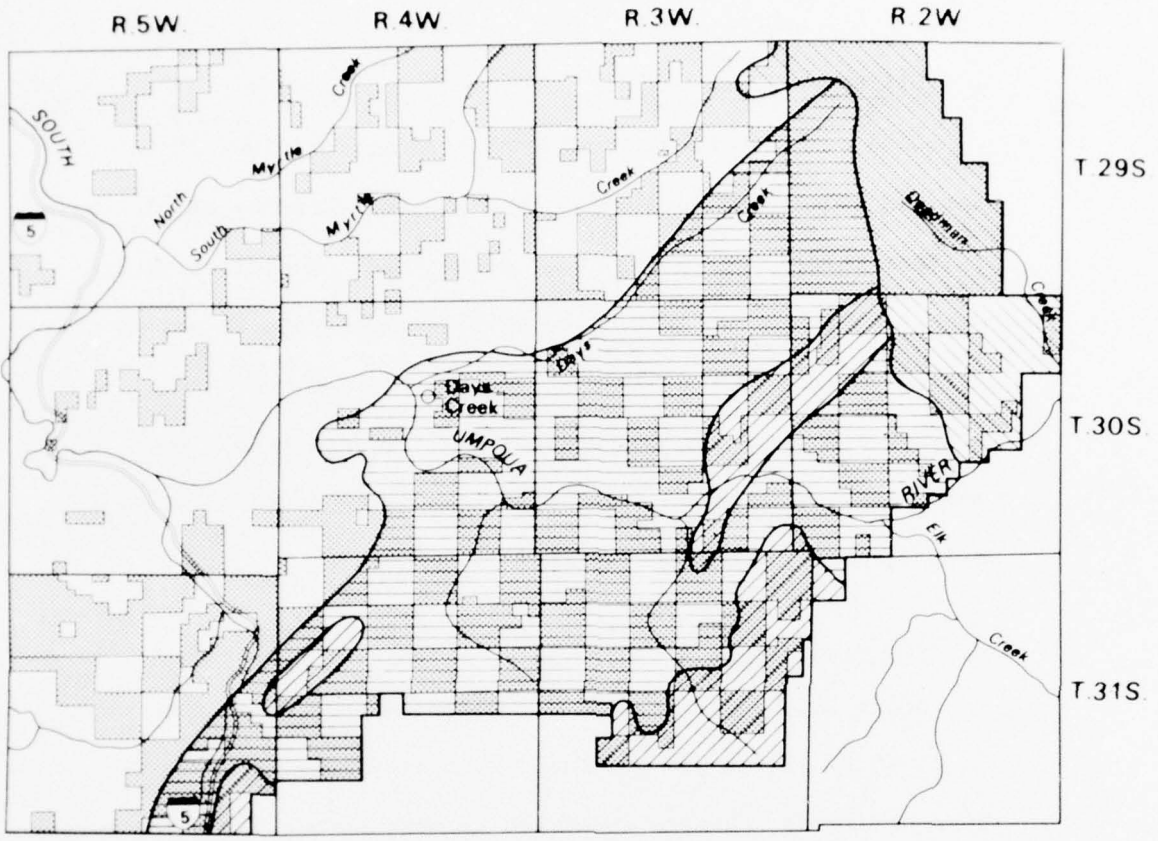
3. St. Johns Creek

Soils in the St. Johns Creek watershed are similar to those in 1 and 2. Soils are generally 20 inches deep on 50 to 75 percent slopes. Shales appear to be more strongly metamorphosed.

4. Corn Creek

Most of the west side of the Corn Creek watershed in Sections 23 and 14 is composed of deeply weathered intrusive granite (see Figure 1). Soils are brown to light brown, deep on slopes less than 30 percent, clay loam to silty clay texture in the B horizon. Experience from logging roads built in granite soils has shown that side cast is highly erosive. High sediment yields can be expected from disturbed soils in this area.

Figure 1
General Geology Map



Galice Formation — Dark gray, thin-bedded mudstone, commonly with slaty cleavage. Includes metamorphosed volcanic rocks.

Granite Intrusions — Highly weathered erosive granitic rocks.

Andesite and Basalt.

After Wells F.G. and Peck D.L. 1961, Geologic Map of the 12lst Meridian. State of Oregon, Map 1-325.

The following general statement summarizes soil conditions that may affect the Days Creek reservoir.

a. No large obvious sources of clay that would lead to a reservoir turbidity problem were found below Tiller.

b. More unstable clay soils occur along the South Umpqua River above Tiller than below. Studies of the proposed Tiller Dam indicate that high sediment yields plus turbidity problems could be expected from the upper reaches of the South Umpqua and Jackson Creek.

c. Lower Corn Creek and the upper part of Stouts Creek could be high sediment producers. Deeply weathered granitic rock in these drainages is highly erosive when disturbed; however, any sediment produced should not have a prolonged effect on reservoir turbidity.

d. Deep red clay soils have derived from shale of the Galice formation. These soils are scattered south of the proposed impoundment. Locating roads on these soils should be avoided wherever possible because they will slump. They could also produce turbidity in the reservoir.

I. Roads

1. Present Roads

A total of 8.5 miles of BLM roads would be inundated by the proposed reservoir. Provisions for a state highway on the north

side, a two lane road of BLM class DN 36 (double land, normal traffic, 36 foot subgrade before surfacing) on the south side, and connectors from these roads to BLM timber access roads would mitigate the loss of existing access.

The cost of constructing an estimated 4.3 miles of road to connect perimeter roads and existing BLM access roads is estimated at $150,000.

Photo No. 2 in the addendum to this report shows a typical BLM road of standard SN 20 (single lane, normal traffic, 20 foot subgrade before surfacing) which will be inundated by the reservoir. It also typifies the standard of connector roads which must be built to restore use to inundated roads.

2. Impact Area Road Construction

Future road construction plans and construction within the project impact area must be integrated with the other resource values, including scenic values, so that the end result is the least detrimental, and if possible, complementary. Roads should be located so that construction scars are invisible from the reservoir area or are minimized. Road construction measures such as additional end-hauling of fill material, cut and fill mulching and revegetation, riprapping, provisions for adequate drainage, and proper culvert installations will be necessary. Other considerations such as timbered buffer strips, scenic vista areas, and proper locations to service recreation users must be included.

3. Proposed BLM Road Projects

BLM plans to construct a bridge and a road to provide access to the Poole Creek drainage in fiscal year 1975. The bridge will be a single lane structure across the South Umpqua River, similar to the bridge owned by Roseburg Lumber Company which provides access to Stouts Creek. (See Photo No. 3 in the addendum.) Both this bridge and road would be inundated by the reservoir. The timely authorization of the dam project would save BLM $450,000. However, road access to the Poole Creek drainage will be provided as part of the reservoir project mitigating the loss of BLM access if timely authorization does not occur. A proposed Coffee Creek-Corn Creek access road is scheduled to be constructed in fiscal year 1974. This access road would not be completely lost but would require a connection with the reservoir perimeter road.

4. Comparison of Timber Hauling Cost

The dollar difference in transporting the background zone and other tributary timber over the present road system as compared with the proposed road system is shown in Table V.

TABLE V
TIMBER HAULING COST

Drainage	New Time	Old Time	Time Difference	Dollar Difference	Volume MMBF	Cost
Beals Creek	15.1	13.7	+ 1.4	+ $0.05	22	+$ 1,100
Shively Creek	40.6	48.0	- 7.4	- .25	93	- 23,250
Poole Creek	34.1	23.6	+ 10.5	+ .35	18	+ 6,300
Stouts Creek	49.6	36.8	+ 12.8	+ .43	196	+ 84,280
St. Johns Creek	30.6	29.4	+ 1.2	+ .04	31	+ 1,240
Corn Creek	38.7	38.6	+ 0.1	-	191	-
Deadman Creek	54.4	49.0	+ 5.4	+ .18	257	+ 46,260
Total timber hauling cost difference					808	+$115,930

This represents an average increased hauling cost of $0.143 per MBF at a harvest of 17 MMBF per year using the affected roads.

III. IMPACT OF PROJECT ON BLM PROGRAMS AND RESOURCES - FINANCIAL SUMMARY

A. Direct Costs Resulting from Project

1. Mining Claim Examinations	$ 11,200		
2. Cadastral Surveys	60,000		
3. Road Approaches to Restore Access	150,000		
Total			- $ 221,200

B. Savings to BLM Resulting from Project

1. Poole Creek & Stouts Creek Bridges	$800,000		
2. Approximately 10 Miles of South Side Access Road	300,000		
Total			+ $1,100,000

C. Irreplaceable Resources

1. Timber Production Lost Per Year			
Inundated Zone	$ 10,750		
Primary Zone	5.700		
Total	$ 16,450		
Opportunity cost of $16,450 @ 5 3/8%		$306,047	
2. Grazing Revenues Lost Per Year	$ 177		
Opportunity cost of $177 @ 5 3/8%		3,293	
3. Salable & Leasable Mineral Loss	Negligible		
Total (Resource Opportunity Cost)			- $ 309,340

D. Effects on BLM Program Costs

1. Additional Logging Cost Per Year			
Primary Zone	$ 860		
Secondary Zone	10,500		
Total	11,360		
Opportunity cost of $11,360 @ 5 3/8%		$211,349	
2. Additional Hauling Cost Per Year	$ 2,431		
Opportunity cost of $2,431 @ 5 3/8%		45,228	
Total (BLM Program Opportunity Cost)			- $ 256,577

TOTAL FINANCIAL COSTS	$ 787,117
TOTAL FINANCIAL BENEFITS	$1,100,000
NET FINANCIAL BENEFITS	$ 312,883

E. Benefits

The Corps of Engineers' proposal to construct a road on the south side of the reservoir would be a large benefit to BLM. BLM would save an estimated $1,100,00 in road construction, bridge construction, and easement acquisition costs if the south side road is constructed as a part of the project. If the project is not approved, BLM will eventually be required to develop access along the entire south perimeter of the project to the United States Forest Service boundary.

The recreational attraction of the proposed reservoir would fill a need in an area lacking in slack water oriented outdoor recreation opportunities in Douglas County. BLM has not estimated the recreation value in dollars of the proposed reservoir.

IV. GENERAL CONCLUSIONS AND RECOMMENDATIONS

In the event the project is authorized for construction, BLM's preliminary view and recommendations are as follows:

A. BLM will continue to manage the BLM land above maximum pool elevation within the proposed project area. BLM is also willing to assume full management responsibility for all acquired project land above maximum pool elevation. As a minimum, all private land between the proposed perimeter roads and the reservoir should be acquired.

B. BLM lands in the project area were dedicated to permanent Federal management by the O&C Act of August 28, 1937. No additional withdrawals are necessary to protect the land for project purposes, except to segregate them from mineral entry.

C. The 675 acres of BLM commercial forest land which will be inundated or occupied by new roads supports a presently merchantable timber volume of 14.5 million board feet. Based on current values, this volume represents a marketable resource worth approximately $725,000 which if not marketed would become an additional loss attributable to the project. If the project is authorized, BLM must be given sufficient advance notice so that orderly disposal and maximum utilization of merchantable timber can be accomplished prior to construction activities.

D. Proposed perimeter roads and connection roads should be constructed prior to reservoir clearing operations.

E. Power line rights-of-way should be relocated in accordance with esthetic guidelines and criteria covered in a landscape management plan. The booklet "Environmental Criteria for Electric Transmission Systems" should be used as a guide.

F. If the project is authorized, a working agreement should be consummated between the Corps of Engineers and BLM to cover such items as (1) reservoir zoning plan; (2) fire protection of the area during the construction period; (3) sale of merchantable timber; (4) supervision of clearing operations, road construction, and powerline relocations so as to protect esthetic values, retain scenic corridors, and provide for the rehabilitation of landscape scars; (5) provision for physical access to facilitate BLM resource development and

management activities; (6) planning and construction of replacement roads; and (7) provision for adequate notice to BLM to plan and implement the necessary project related cadastral survey and mining claim validity determination work.

Esthetic and environmental considerations are very important because of the high recreation potential on and around the proposed reservoir. Borrow areas, spoil areas, and other surface disturbing operations should be limited to elevations below the minimum pool level to the extent practicable. Unavoidable disturbance above minimum pool level should be restored as nearly as possible to its natural appearance.

G. BLM will, on a reimbursable basis, perform cadastral surveys to reference public land survey monuments that would be inundated by the proposed reservoir. BLM is also willing to survey, on a reimbursable basis, the pool flow line, project boundary, and any other cadastral survey work required by the Corps.

H. Some of the ranch properties in the general project area consist of both irrigated bottomland, which would be inundated, and cut-over timberland. Possibly some landowners would prefer to sell all of their holdings in one parcel. Some of the private land that would be acquired in this manner is located within the secondary and background management zones. These lands could serve to partially mitigate the loss of Federal timber production in the inundated and primary zones. They also would be valuable in preserving the scenic

backdrop for the reservoir. BLM would be willing to assume full management responsibilities for all such lands that may be acquired.

Addendum

Photos 1, 2, and 3

Figure 1

Map 1

(Copies from June 1970 Preliminary Impact Report)

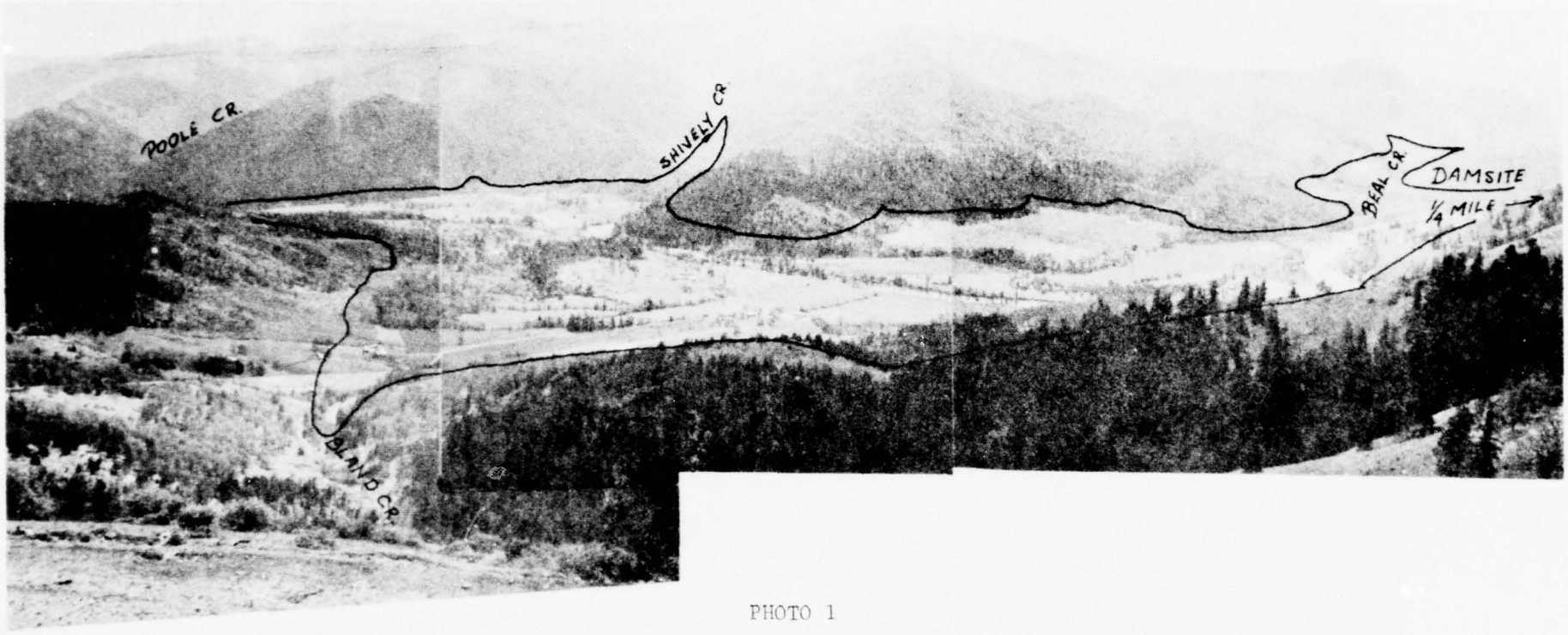
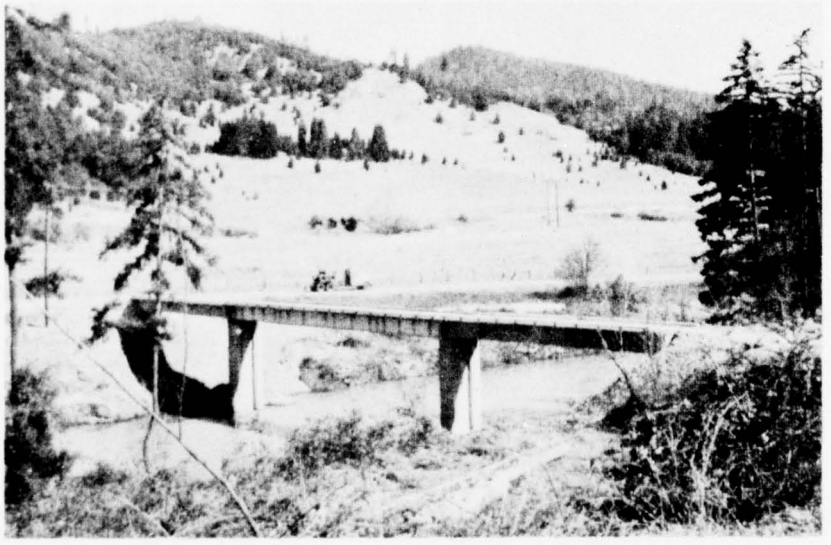


PHOTO 1

VIEW FROM BLAND MT. LOOKOUT SHOWING APPROXIMATELY ONE-THIRD OF PROPOSED RESERVOIR AREA

PHOTO 2 & 3

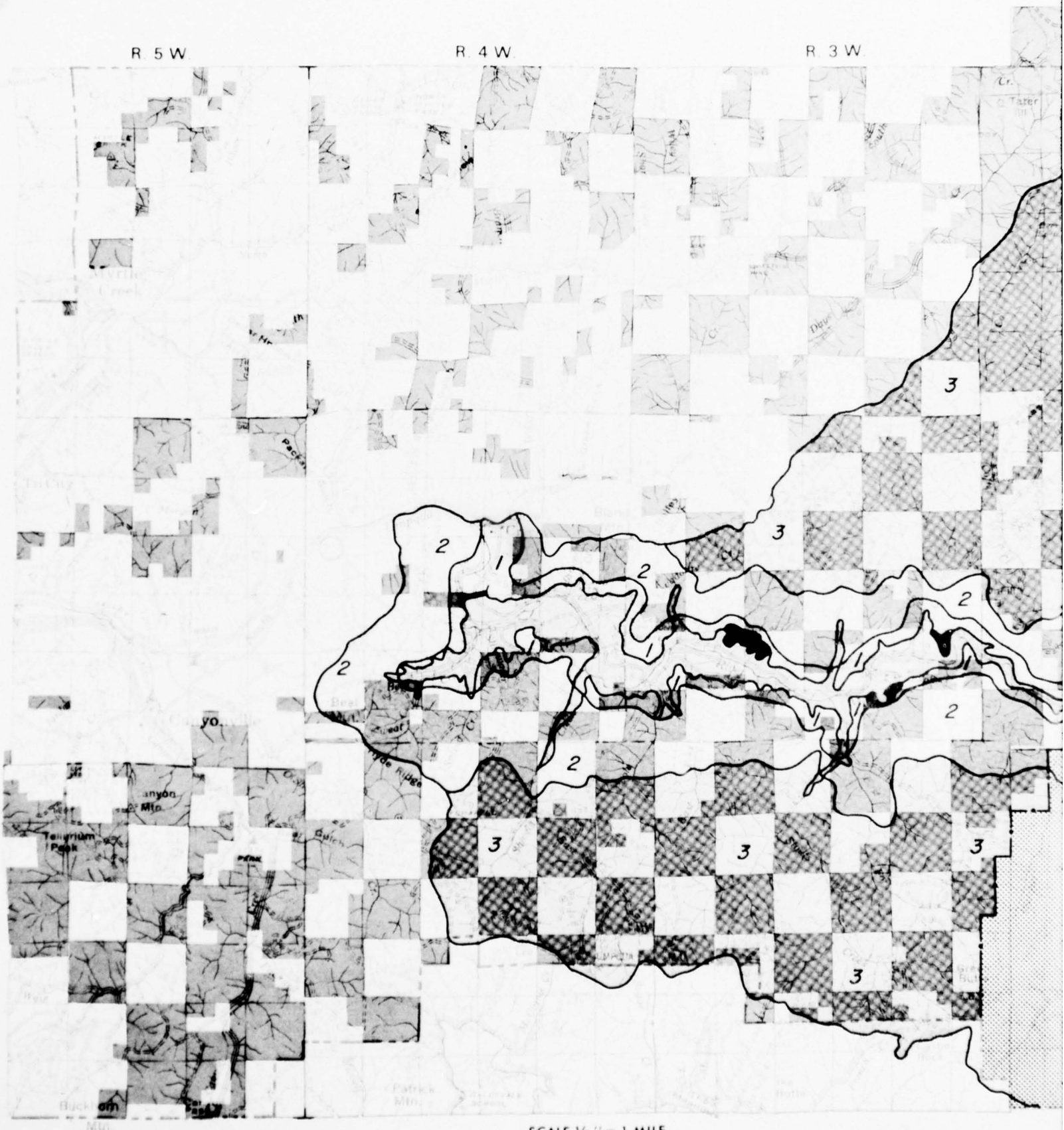
TYPICAL BLM ROAD WHICH WOULD BE INUNDATED BY THE PROPOSED RESERVOIR



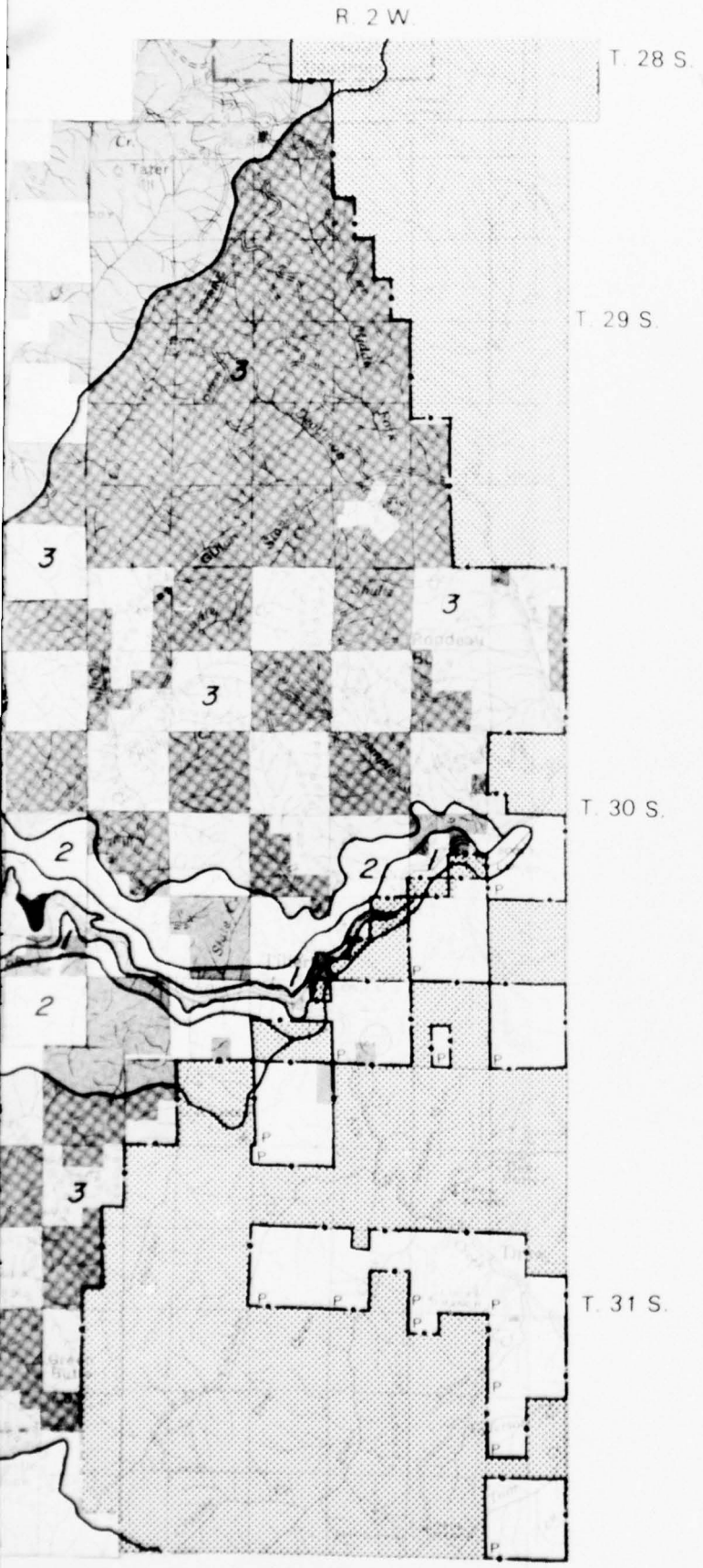
TYPE OF TIMBER ACCESS BRIDGE PLANNED FOR CONSTRUCTION BY BLM ACROSS SOUTH UMPQUA RIVER IN AREA TO BE INUNDATED

FIGURE NO.1

MONTHLY DISTRIBUTION OF PRECIPITATION, TEMPERATURE & RUNOFF
UMPQUA RIVER near ELKTON 1929-53
RUNOFF-THOUSANDS ACRE FEET PER MONTH
0
500
1,000
1,500
2,000
2,500
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
TEMPERATURE
PRECIPITATION
0.0
1.0
2.0
3.0
4.0
5.0
PRECIPITATION-INCHES PER MONTH-ROSEBURG 1929-53
20
30
40
50
60
70
MEAN MONTHLY TEMPERATURE °F-ROSEBURG 1929-53
RUNOFF
MAXIMUM
AVERAGE
MINIMUM
446-119-12



SCALE: ½ " = 1 MILE



1 PRIMARY ZONE

2 SECONDARY ZONE

3 BACKGROUND ZONE

INITIAL RECREATION DEVELOPMENT SITES

B L M LANDS

U S F S LANDS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

DAYS CREEK RESERVOIR PROJECT
SOUTH UMPQUA RIVER

LAND USE ZONE MAP

MAP 1

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON
INTERIM REPORT, SOUTH UMPQUA RIVER

APPENDIX I

REPORT OF THE FOREST SERVICE

DAYS CREEK DAM AND RESERVOIR

Water Resource Development Environmental Impact Survey Report

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

PACIFIC NORTHWEST REGION

VICINITY MAP

DAYS CREEK DAM

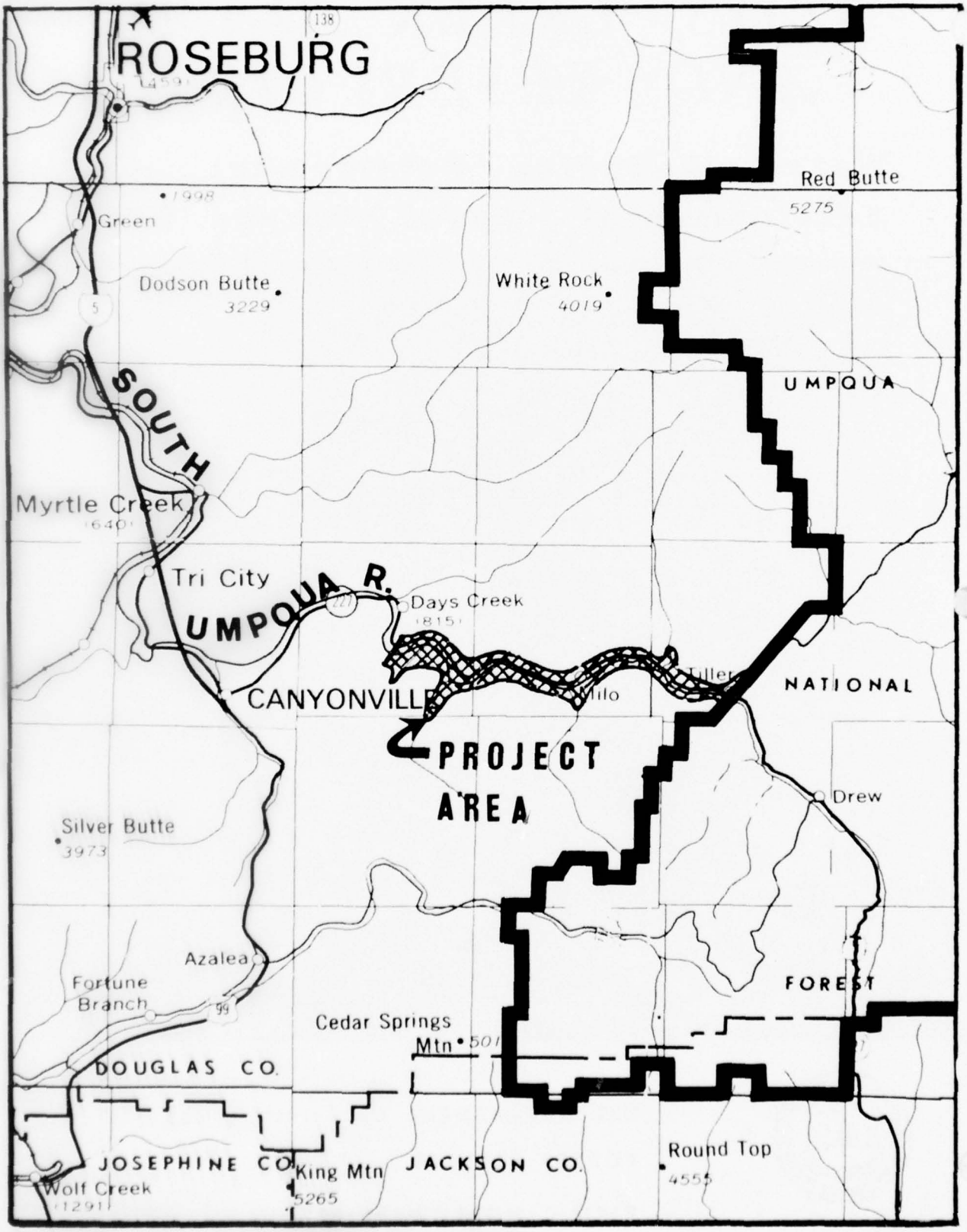


TABLE OF CONTENTS

I. INTRODUCTION

The Days Creek Dam and Reservoir is being proposed on the South Umpqua River in Southwestern Oregon by the Corps of Engineers. The largest benefit of the project would be flood control. Other benefits would be fishery-resource enhancement, recreation, water supply, water-quality control, and irrigation. The project is in the preauthorization stage.

The large reservoir would barely touch Forest Service land at the upstream end of the pool. The primary effect on the Forest Service is the possible need for relocation of the Tiller Ranger Station and related buildings and facilities. The cover photograph shows the Tiller Administrative Site and the adjacent South Umpqua River.

This report details those aspects of the project which would have an effect upon management of National Forest lands. Also discussed are the overall effects of the project on the environment, resources, and the local economy.

II. GENERAL DATA ON PROJECT

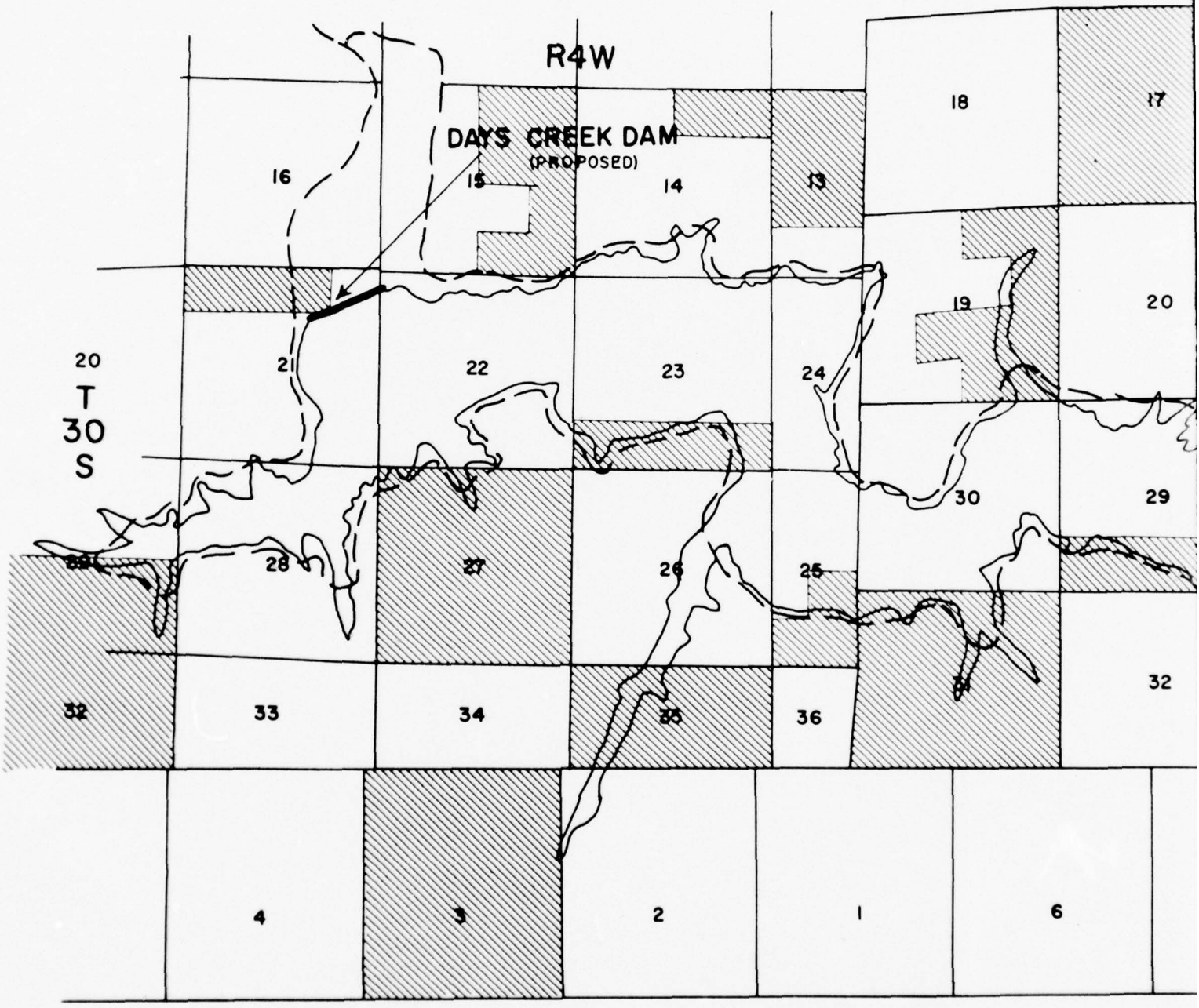
A and B. Name of Project, Project Proponent. This proposed project's official name is Days Creek Dam and Reservoir. The U.S. Corps of Engineers, Portland District, North Pacific Division, Portland, Oregon, is the proponent.

The Corps of Engineers was authorized by Congress to study the Umpqua River Basin in the late 1930's, following passage of the Flood Control Act of June 22, 1936. The study was delayed until after World War II, and is now nearing completion. The proponent has focused on the Days Creek site since 1967, after it was decided that reservoir turbidity would be too great at a site above Tiller. Preliminary studies indicate that no combination of small headwater projects would be capable of providing a reasonable degree of service to the total present needs for flood control and water conservation in the South Umpqua River Basin. Tiller and Days Creek were found to be the only feasible sites to meet these needs. With the exception of the continuing study of the turbidity problem, study of the Days Creek project is in its final phases. The Corps of Engineers has placed a high priority on the Days Creek project, and the report has been scheduled for completion and submission to Congress in December 1971.

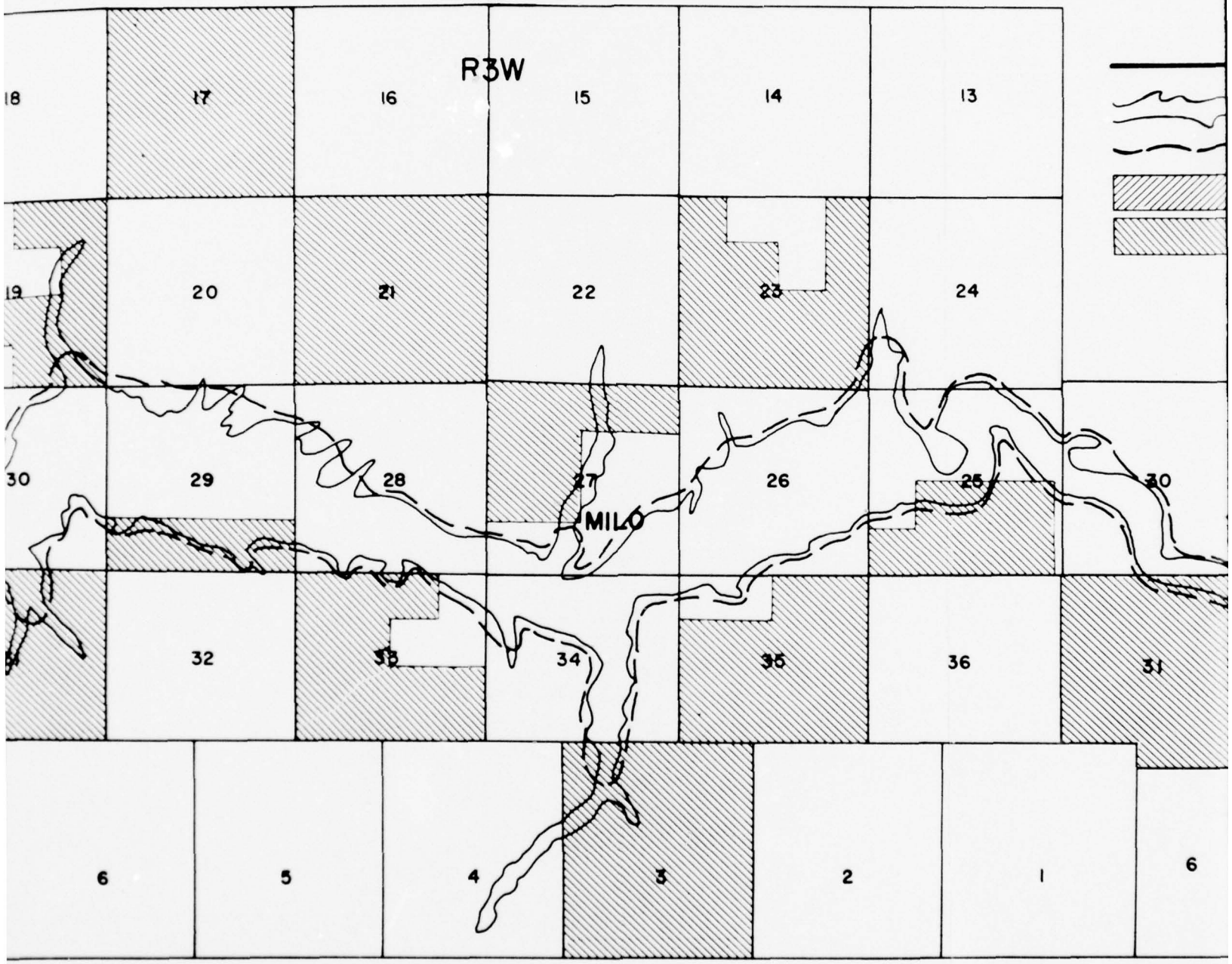
C. Location. The project is located in the State of Oregon, County of Douglas, Fourth Congressional District. A small portion of the proposed reservoir is in the Tiller Ranger District, Umpqua National Forest, Pacific Northwest Region.

The damsite is in the NE1/4, Section 21, T. 30 S., R. 4 W., Willamette Meridian, surveyed. This site is approximately nine miles east and up stream from Canyonville, Oregon, on the South Umpqua River, and 171 river miles from its confluence with the Pacific Ocean at Winchester Bay near Reedsport, Oregon.

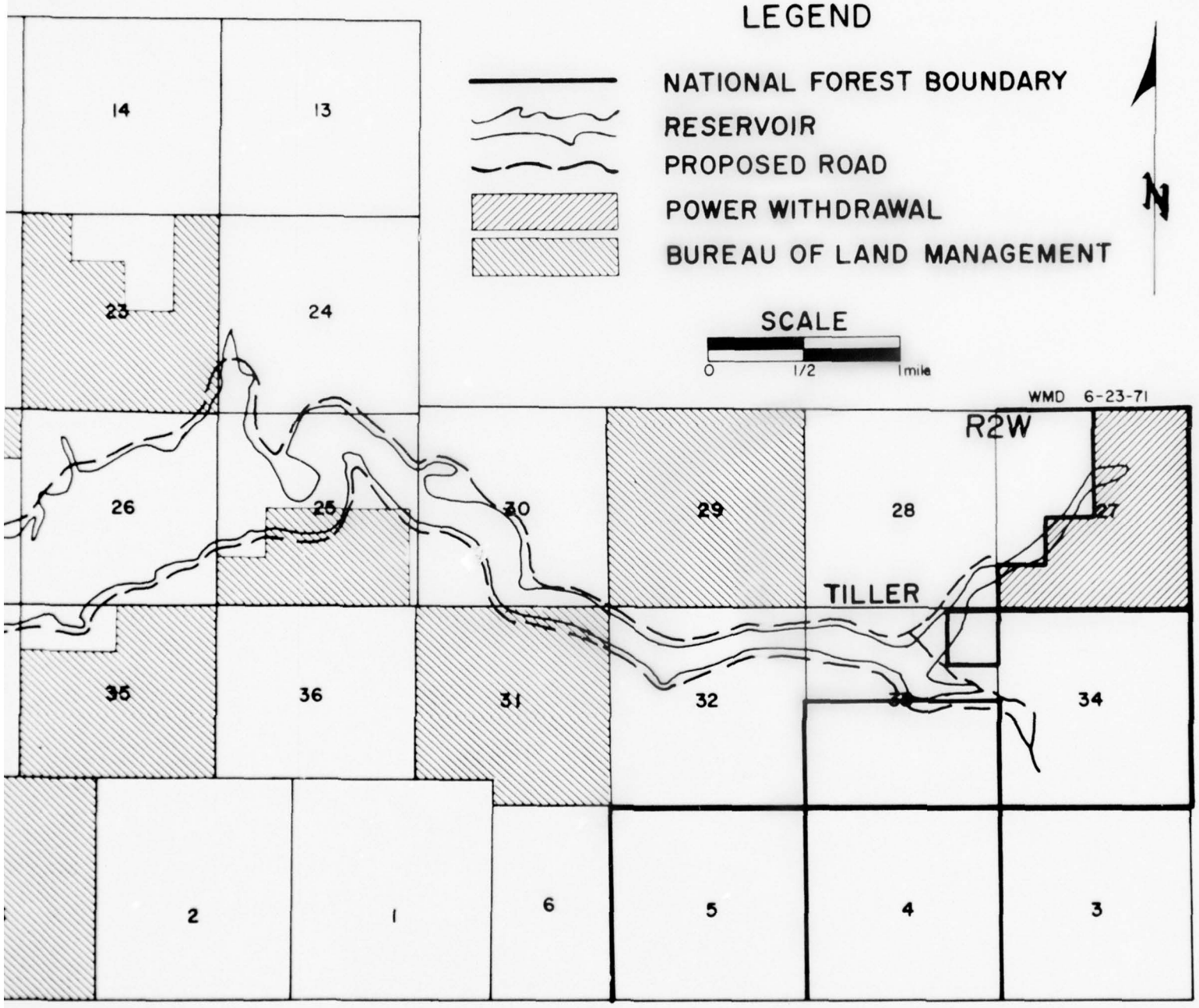
The drainage area tributary to the Days Creek Reservoir is approximately 387,000 acres. Eighty percent of this area is within the Umpqua National Forest boundary. The Days Creek Dam would control runoff from one-third of the South Umpqua River drainage area.


R4W
DAYS CREEK DAM
(PROPOSED)
T
30
S
16
15
14
13
18
17
19
20
21
22
23
24
30
29
28
27
26
25
32
33
34
35
36
31
32
4
3
2
1
6

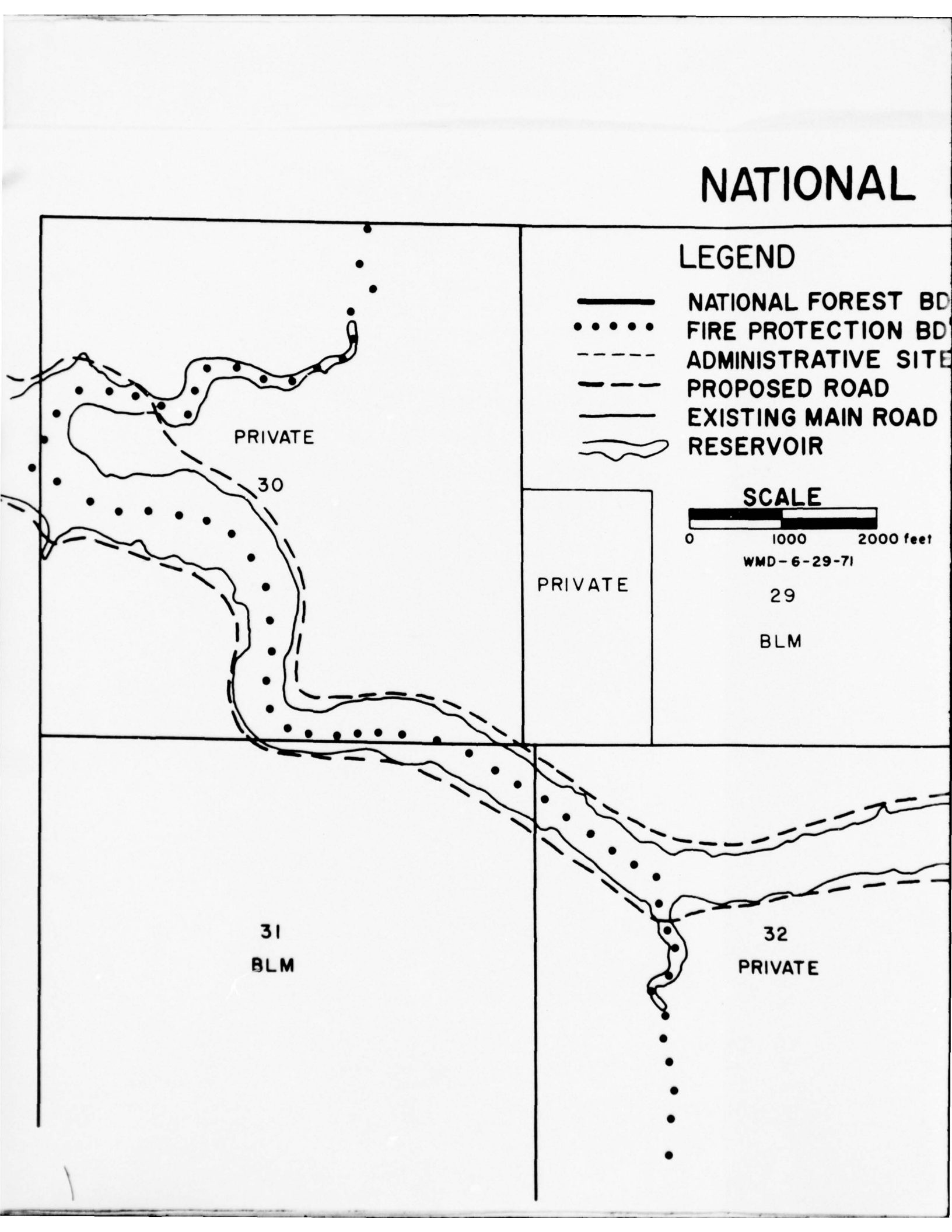
COMPOSITE MAP



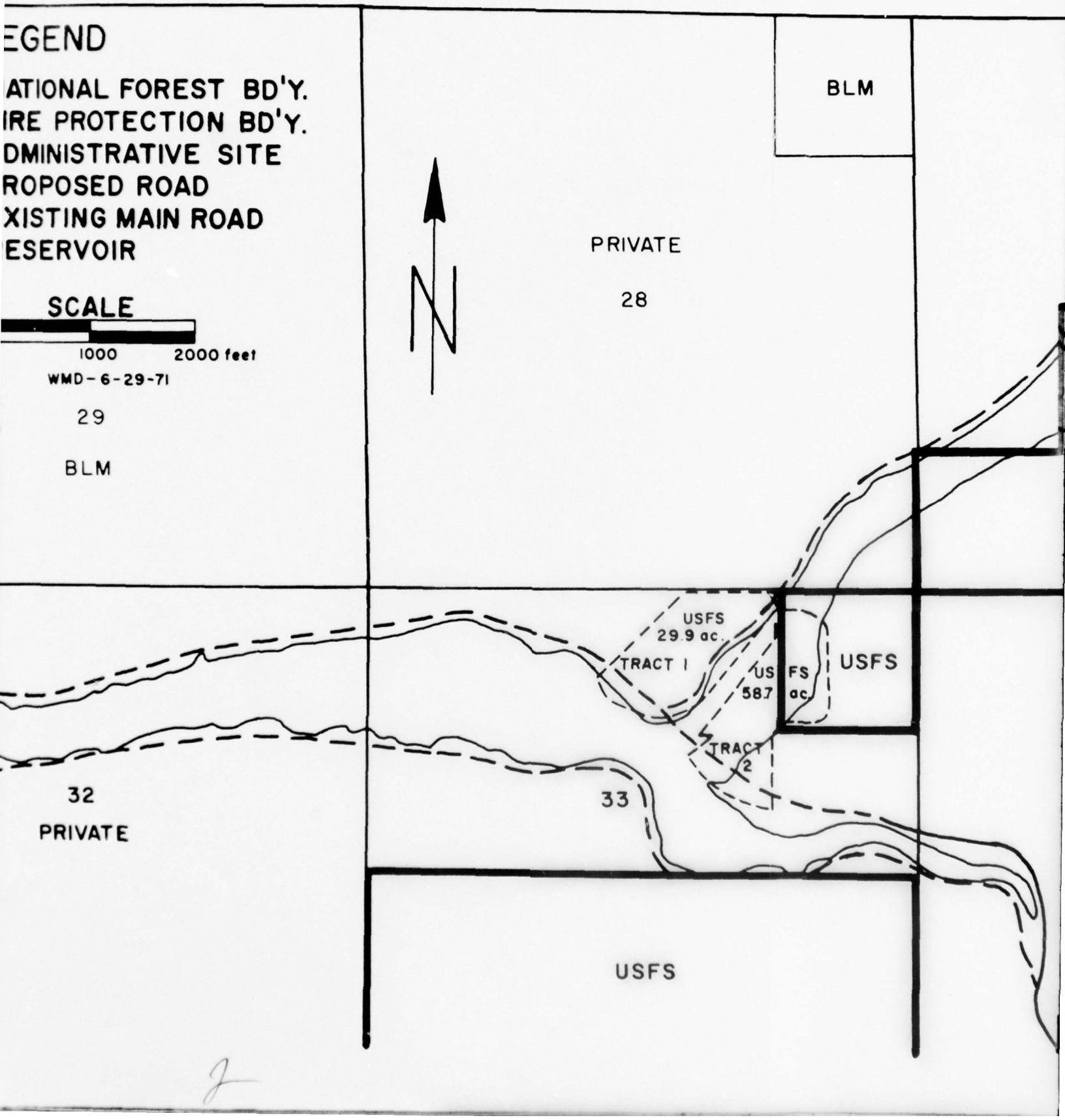
2


LEGEND
NATIONAL FOREST BOUNDARY
RESERVOIR
PROPOSED ROAD
POWER WITHDRAWAL
BUREAU OF LAND MANAGEMENT
N
SCALE
0
1/2
1 mile
WMD 6-23-71
R2W
TILLER
14
13
23
24
26
25
30
29
28
27
35
36
31
32
34
2
1
6
5
4
3

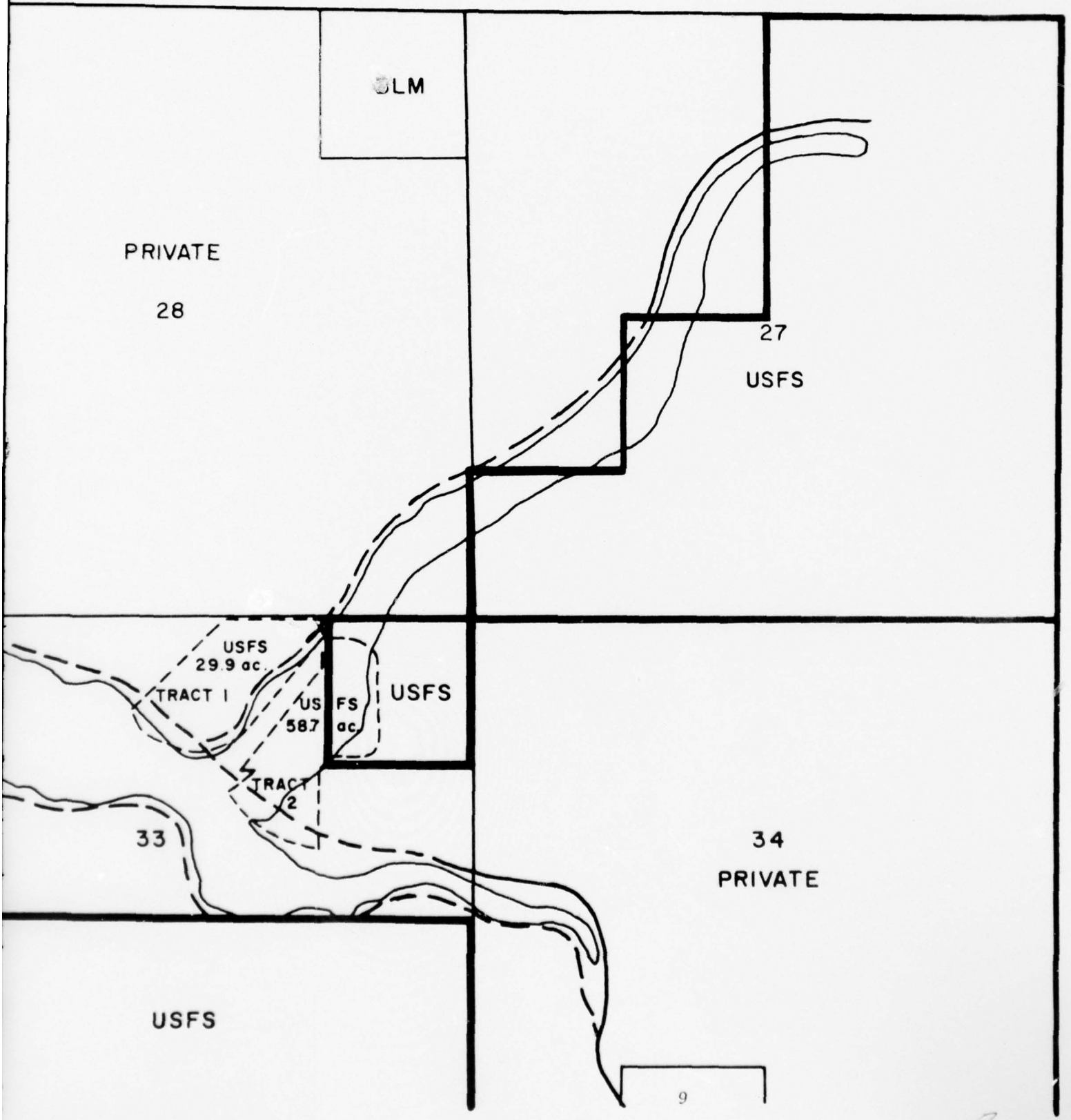
3


NATIONAL
LEGEND
NATIONAL FOREST BD
FIRE PROTECTION BD
ADMINISTRATIVE SITE
PROPOSED ROAD
EXISTING MAIN ROAD
RESERVOIR
SCALE
0
1000
2000 feet
WMD-6-29-71
PRIVATE
30
PRIVATE
29
BLM
31
BLM
32
PRIVATE

NATIONAL FOREST OWNERSHIP



OWNERSHIP


BLM
PRIVATE
28
27
USFS
USFS
29.9 ac.
TRACT 1
USFS
58.7 ac.
TRACT 2
33
34
PRIVATE
USFS
9

D. Description of Project. A final pool elevation has not been selected. Three storage plans are being considered. If the largest reservoir plan is chosen (maximum pool elevation 1,053 feet) the reservoir would extend 17.2 miles upstream from the damsite at full pool to a point approximately 1.5 miles upstream from Tiller. Fifty-seven miles of shoreline would be created.

The statistical data that follows has been furnished by the Corps of Engineers.

TABLE I

DAYS CREEK SITE
Summary of Reservoir Data

May 1971

Plan	STORAGE				POOL ELEVATION[1]		POOL AREA[1]		DAM DIMENSIONS	
	Maximum Acre-Feet	Spring & Summer F.C. Regulation Acre-Feet	Conservation Acre-Feet	Usable Acre-Feet	Maximum Ft. MSL	Conservation Ft. MSL	Maximum Acres	Conservation Acres	Approximate Height Above Streambed Feet[2]	Approximate Crest Length Including Spillway Feet
1	365,000	10,000	355,000	290,000	997	995	3,750	3,700	225	2,500
2	480,000	15,000	465,000	405,000	1,026	1,022	4,340	4,270	254	3,000
3	605,000	20,000	585,000	530,000	1,053	1,048	4,950	4,850	281	3,200

1/ Values have been rounded.
2/ Includes 5 feet freeboard.

TABLE 2

DAYS CREEK RESERVOIR
STORAGE DATA AT END OF MONTH
LOW WATER YEAR - 1941

May 1971

MONTH	STORAGE PLAN I, 365,000 Ac-Ft. (end of month)			STORAGE PLAN II, 480,000 Ac-Ft. (end of month)			STORAGE PLAN III, 605,000 Ac-Ft. (end of month)		
	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres
Jan.	165,000	934	2,490	205,000	948	2,840	245,000	962	3,080
Feb.	204,000	948	2,830	244,000	962	3,080	284,000	974	3,310
Mar.	219,000	953	2,930	259,000	966	3,160	299,000	978	3,392
April	234,000	958	3,020	271,000	970	3,230	308,000	981	3,440
May	249,000	963	3,110	282,000	974	3,300	313,000	983	3,470
June	250,000	964	3,110	276,000	971	3,260	298,000	978	3,386
July	210,000	950	2,880	229,000	957	2,990	244,000	962	3,080
Aug.	163,000	933	2,460	172,000	936	2,560	180,000	939	2,643
Sep.	129,000	918	2,120	131,000	919	2,132	131,000	918	2,120
Oct.	105,000	906	1,880	100,000	903	1,810	94,000	900	1,730
Nov.	105,000	906	1,880	101,000	904	1,820	98,000	902	1,780
Dec.	165,000	934	2,490	205,000	948	2,840	245,000	962	3,080

TABLE 5

DAYS CREEK RESERVOIR
STORAGE DATA AT END OF MONTH
AVERAGE WATER YEAR - 1949

May 1971

MONTH	STORAGE PLAN I, 365,000 Ac-Ft. (end of month)			STORAGE PLAN II, 480,000 Ac-Ft. (end of month)			STORAGE PLAN III, 605,000 Ac-Ft. (end of month)		
	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres	Storage in Reservoir Acre-feet	Pool Elevation Ft., M.S.L.	Pool Area Acres
Jan.	165,000	934	2,490	205,000	948	2,840	245,000	962	3,080
Feb.	225,000	955	2,970	286,000	975	3,320	352,000	964	3,120
Mar.	291,000	976	3,350	377,000	1,000	3,810	470,000	1,023	4,290
April	355,000	995	3,700	465,000	1,022	4,270	583,000	1,048	4,850
May	355,000	995	3,700	465,000	1,022	4,270	585,000	1,048	4,850
June	343,000	991	3,630	444,000	1,017	4,160	555,000	1,042	4,710
July	295,000	978	3,370	388,000	1,003	3,870	489,000	1,028	4,390
Aug.	245,000	962	3,080	328,000	987	3,550	410,000	1,008	3,990
Sep.	210,000	950	2,880	270,000	970	3,230	330,000	988	3,560
Oct.	185,000	941	2,690	230,000	957	3,000	281,000	975	3,290
Nov.	165,000	934	2,490	205,000	948	2,840	245,000	962	3,080
Dec.	165,000	934	2,490	205,000	948	2,840	245,000	962	3,080

TABLE 4

DAYS CREEK SITE
SUMMARY OF SHORTAGES
FOR THE PERIOD 1926-1965 May 1971

	SHORTAGES IN PERCENT					
	PLAN I		PLAN II		PLAN III	
YEAR	Sch. 1	Sch. 2	Sch. 1	Sch. 2	Sch. 1	Sch. 2
1926	56	35	44	25	32	18
1930	40	19	30	16	20	8
1931	15	11	24	8	35	25
1934	67	40	69	48	54	31
1939	17	12	4	0	--	--
1940	6	1	--	--	--	--
1941	40	0	40	5	39	10
1952	1	0	--	--	--	--
1965	17	7	15	2	17	4

Schedule 1 uses only stored water allocated for conservation use.

Schedule 2 uses a portion of stored water for temperature control to augment conservation released flows and should have little or no adverse effect on the temperature and quality of the release water.

E. Proponent - Forest Service Discussions. Preliminary impact survey reports were sent to the Corps of Engineers in 1963, and in March, 1970. As there is much interest in this project, frequent communications have ensued since the proposed Tiller site was abandoned in 1967. Thus far, no areas of disagreement are evident.

III. LANDOWNERSHIP AND PROJECT BOUNDARY

A. Landownership. Landownership and current land uses within the project boundaries of the three proposed reservior sizes are shown in Table 5 (data furnished by Corps of Engineers).

B. Prior Withdrawals. Powersite withdrawals exist along the South Umpqua River on National Forest lands in Sections 27 and 33, T. 30 S., R. 2 W., Willamette Meridian. There are additional powersite withdrawals on non-Forest Service lands in Sections 29, 31, 32, and 33, T. 30 S., R. 2 W.; Sections 19, 23, 30, and 33, T. 30 S., R. 3 W.; and Sections 15, 21, 22, 25, 29, and 35, T. 30 S., R. 4 W., Willamette Meridian.

TABLE 5

DAYS CREEK RESERVOIR SITE

Item	Plan I	Plan II	Plan III
Maximum Storage, acre-feet	365,000	480,000	605,000
Estimated Federal lands required for project, acres*	775	975	975
Estimated private lands required for project, acres	5,870	6,625	6,825
Estimated total lands required for project, acres	6,640	7,600	7,800
Estimated land uses in project area, acres:			
Irrigated lands	700	800	800
Pastures	320	320	420
Orchard	45	45	45
Wooded	4,680	5,215	5,415
Building and special-use sites	125	145	145
* Forest Service land	0	13	58

C. Project Boundary and Site Evaluation. Project boundaries have not yet been proposed by the Corps of Engineers. Discussion with their Portland office indicates that they generally acquire all land within 300 feet, horizontally, from the maximum pool elevation. If the finally selected maximum pool elevation is such that the Tiller Ranger Station can be saved, the Forest Service requests that the administrative site be delineated outside the project boundary, or that the Corps of Engineers approve occupancy inside the project boundary.

If the Tiller Ranger Station is not moved, the Forest Service also requests that some provision be made to permit continued operation of businesses and services in Tiller, where buildings and related facilities would not be affected by the reservoir.

IV. CHARACTERISTICS OF AREA.

A. Project Area and Immediate Vicinity. The Ranger Station is on a pumice flat, thinly overlaying solid rock. It is bounded on the east side by a steep hill rising 300 to 400 feet. The hill side contributes a high surcharge of moisture to the pumice flat during periods of continuing rainfall. The water passes through the pumice material and emerges along the river bank. If a high pool level prevented escape of the runoff, the pumice would saturate to an unstable condition. When the pool level recedes, the soil will begin to pipe fine particles creating subsurface voids, unless some structural design (possibly gabions) can be used to prevent this. This soil piping problem has been experienced at other sites.

Topography upstream from, and adjacent to, the proposed impoundment is quite rugged, except for the bottomlands along the river. Sideslopes above the bottomlands range from 15 to 100 percent, with the average about 60 percent. Sideslopes are highly dissected.

Vegetation within the proposed reservoir area is predominatly brush and timber. About 16 percent of the area inside the probable project boundary is in pasture, less than one percent is in orchards, and the rest in brush and timber. Scattered stands of timber occur on the hillsides, although most of the private land has been cut over. Douglas-fir is the principal timber species. Grasses form the only soil cover on some of the steep hillsides where soils are very thin. Except for alluvial deposits in the bottomlands, soils have developed from very old geologic materials.

Nearby soil surveys indicate soil textures are predominatly clay loams and silty clay loams. These soils appear to have moderate mass stability. Cutbanks and ditch lines indicate moderately high surface erosion. However, with a rising and falling reservoir and wave action, erosion may increase.

Deeply weathered intrusive granites occur in the Corn Creek drainage. A narrow bank of this rock type crosses the proposed reservoir into the lower reaches of Stouts Creek. Soils in these areas are highly erosive. Near the upstream end of the proposed reservoir gneisses, schists, and serpentine occur, and random inclusions of granites are expected. Pumice soils underlie the Tiller Ranger Station and occur locally along the South Umpqua River upstream from Tiller.

It appears that soils along the proposed reservoir will not cause appreciable shoreline turbidity. However, these soils do contain clays with particle size conducive to potential turbidity. Soils and geology differ from those above Tiller, where soils are derived chiefly from volcanic rocks of the Cascades some of which have very high turbidity producing potential once soil is detached.

B. Adjacent National Forest Area.

1. Key Values. The key values of the Forest Service administered lands included in the project area are--use as an administrative site for the Tiller Ranger Station, recreation and aesthetics.

Key Uses	Acres of Forest Service Administered Land Included in Project Areas. Plan I	Plan II	Plan III
Administrative Site (Tiller Ranger Station)	0	4	34
Recreation and Aesthetics[1/]	0	9	24
Total[2/]	0	13	58

Additional land will be visible from the reservoir. The key uses are recreation and aesthetics.

1/ Recreation is the key value for the area. However, the land is also managed for timber with restricted harvesting practices.

2/ Additional acreage could be included when final project boundaries are determined.

2. Special Classification. None of the Forest Service administered lands in and adjacent to the project are in special classifications, such as wilderness, wild, limited, primitive, scenic, research or administrative study areas.

3. Special Treatment Areas. Turbidity is an extremely important factor in determining the value of the Days Creek project. Most of the turbidity-producing soils tributary to the proposed reservoir are on Umpqua National Forest lands. It is important that Forest Service land management activities emphasize keeping turbidity to a minimum. Existing soil surveys indicate where turbidity potentials are greatest.

There are three special-use permits, issued by the Forest Service in the project area (see Section VG). The Forest Service in turn, has a special-use permit on the highway right-of-way to operate a log scaling ramp (see Section VIC).

It is known that there are several prehistoric aboriginal campsites within the area to be flooded. The Tiller Ranger Station is located on one of these sites. Some preliminary exploration of the South Umpqua Drainage above Tiller was done in 1963 by Dr. Wilbur A. Davis, then Assistant Curator of Anthropology at the University of Oregon, at Eugene. His unpublished preliminary report states, "evidence permits the conclusion that the South Umpqua drainage system east of Tiller contains rich archaelogical resources of considerable scientific significance." This might also apply to some of the area that will be flooded. A thorough search of the area should be made.

4. Multiple Use Zones and Plans. All of the Forest Service administered land is included in either the Tiller Ranger Station Administrative Site, or classified in a landscape management zone in the District's multiple-use plan.

Additional National Forest land is visible from the proposed reservoir. This land is currently being managed under landscape management practices with the key values being recreation and aesthetics.

The South Umpqua River and Elk Creek are identified for special consideration as anadromous fish habitat.

C. Zone of Influence of Project.

1. Immediate Drainage or Area Surrounding Project.

Estimated land required for Days Creek project in acres:

	Plan I	Plan II	Plan III
Forest Service Administered Land	0	13	58
Other Ownerships[1/]	6,640	7,587	7,742
Total Land Required	6,640	7,600	7,800

1/ Corps of Engineers data.

Only a small portion of the proposed project is on Forest Service administered lands. The National Forest lands involved are in the Pacific Northwest Region, Umpqua National Forest, Tiller Ranger District.

The project will have limited effect on the resources, uses, and activities of the National Forest.

The primary impact will be the possible flooding of the Tiller Ranger Station complex. The Ranger Station may have to be rebuilt at a new site. Estimated replacement cost is $1,014,000.

Outdoor recreation is expected to increase with the construction of the reservoir. Most of the impact will be on, and adjacent to, the reservoir. The overflow from the reservoir recreation sites and those recreationists who prefer to be away from crowds will be drawn to the National Forest Recreation areas. Development of recreation facilities will be needed on the National Forest to handle the additional visitors. At this time, the Forest Service does not envision recreational development on the reservoir.

The fisheries resource should benefit, if provisions are made for passage of anadromous fish and stream temperatures in the main stream are kept sufficiently cool from the dam to the confluence with the North Umpqua River.

The Days Creek project will have less impact on the Umpqua National Forest than the proposed Tiller project. The Days Creek Dam and reservoir will be compatible with management of the National Forest system.

2. Broad Area (Offsite) Effect of Project. A preliminary economic analysis of the Days Creek Reservoir site indicates a favorable cost-benefit ratio. Three possible storage plans have been proposed, along with an economic evaluation of these plans (plans I, II, and III), as shown in Table 6. These figures assume that the water will not be highly turbid. A Corps of Engineers study is being conducted to determine this. If the study indicates that turbidity will be a serious problem, fisheries benefits now anticipated will not be realized, and economic justification for the Days Creek project would be lacking. See Exhibit 1, Appendix.

Plan II has the highest cost-benefit ratio of the plans studied. It would control a 100-year flood, make substantial improvements in fish habitat below the dam (unless water is turbid), improve downstream water quality (decrease summer water temperatures and concentrations of bacteria and other pollutants), provide sufficient water to irrigate 9,000 acres, and enough water for industrial uses, and provide increased recreation use downstream, in addition to recreation use in the reservoir.

TABLE 6

PRELIMINARY ECONOMIC ANALYSIS
DAYS CREEK RESERVOIR SITE

May 1971

	ALTERNATIVE PLANS STUDIED		
	Plan I	Plan II	Plan III
STORAGE CAPACITY, ACRE-FEET:			
Flood control	200,000	275,000	365,000
Dead and inactive	75,000	75,000	75,000
Carryover and temperature control	90,000	130,000	165,000
Total storage capacity	365,000	480,000	605,000
BENEFITS ($1,000):			
Damage prevention	$ 4,838	$ 5,127	$5,287
Increased land use	794	794	794
Irrigation	123	123	123
M & I water supply	184	184	184
Water quality control	80	80	80
General recreation, lake	569	569	475
General recreation, downstream	843	843	843
Anadromous fish enhancement	627	730	852
Resident fish enhancement, lake	86	98	103
Downstream land enhancement from increased flows	149	149	149
Area redevelopment	804	840	878
TOTAL BENEFITS	$ 9.097	$ 9,537	$ 9,768
ANNUAL COSTS	7,127	7,267	7,860
NET BENEFITS	$ 1,970	$ 2,270	$ 1,908

Detrimental offsite effects which will occur are reduced employment from processing timber and agricultural products grown in the inundated area. The Bureau of Land Management (BLM) owns most of the commercial timber inside the project area. They estimate a reduced allowable cut of 342 MBF per year if the dam is constructed (plan II). Most of "wooded" acreage shown in Table 5 is cutover lands in private ownership. Due to adverse conditions for tree growth and poor silvicultural planning, timber productivity on these lands has diminished, although young Douglas-fir is coming back on much of the area. The annual cut which will be lost on private lands in the area, if the dam is constructed, probably exceeds 1,000 MBF, although no significant production losses would be realized for the next 40 or more years, since most of this in now young growth.

About 800 acres of irrigated agricultural land would be inundated by the Days Creek Reservoir, plus about 320 acres of dry pasture. Additional grazing takes place on some of the "wooded" acreage shown in Table 5.

The losses in timber and agriculture production caused by reservoir inundation are small relative to the other benefits gained by reservoir construction, so far as local downstream communities are concerned. To date, there has been no apparent political concern about the losses in timber and agricultural production which would result if the Days Creek Dam is constructed. Land in the project area is important, however, and substantial benefits must occur to offset the inundation of the valuable bottomlands. Plan I benefits seem too small in this regard, and anything smaller than this would be clearly undesirable, in the opinion of the Forest Service. Plans II and III appear most desirable for local and downstream communities.

3. Rural Environment Opportunity. The following USDA programs should have applicability in enhancing and stabilizing the rural socio-economic environment which would be affected by the Days Creek project. Effects of the reservoir, which would create needs for these programs are home and business relocation, improved irrigation opportunities, and increased recreation use, which will increase the need for relocated services.

The Farmer's Home Administration can provide low-interest housing loans to improve farming capabilities and loans to expand small businesses and services.

The Soil Conservation Service can provide technical assistance to assist in improving use of the land and water resources.

The Agricultural Stabilization and Conservation Service may be able to help finance irrigation facilities in the future, although they would not under current local policy.

V. RESOURCE VALUES AND NEEDED COORDINATION REQUIREMENTS

A. Outdoor Recreation. Present recreation use of Forest Service administered lands in the area influenced by the proposed project is relatively small. This is due in large part to the distance from large metropolitan areas, and limited access.

With the exception of a small County wayside park near Milo, which will be flooded, there are no camping or picnicking facilities within the project area.

Following is a tabulation of principal uses for 1970 and projections for the years 1976 and 2000. The figures are taken from the National Forest recreation survey statistics. The proposed project was not considered in the projections. The projections were made prior to 1964. Experience to date, refer to 1970 statistics, indicate that the estimates for camping, picnicking and swimming were conservative. Use has already surpassed the year 2000 projection.

Activity	Experienced Year 1970	Predicted Year 1976	Predicted Year 2000
Fishing	7,200	16,600	27,400
Hunting	7,200	15,200	28,800
Camping and Picnicking	24,300	8,300	18,000
Swimming	1,800	800	1,800
Sightseeing	10,400	19,000	25,300

The Corps of Engineers has proposed six possible recreation sites in the projected area. However, no attempt will be made at this time to detail the recreational aspects of the project. This will be done by the Corps of Engineers in their final planning.

Topography on the south side of the reservoir is steep and rugged, with very few areas suitable for recreation developments. The north side, although steep in places, has several areas of gently-sloping land which may be used for camping and picnicking facilities. Roads through the rugged area will make available viewpoints, thus providing additional scenic values, and, in the more gentle areas, provide access to swimming and boating facilities.

There are no potential recreation sites adjacent to the reservoir on the lands administered by the Forest Service. The Forest Service does not plan to develop reservoir recreation.

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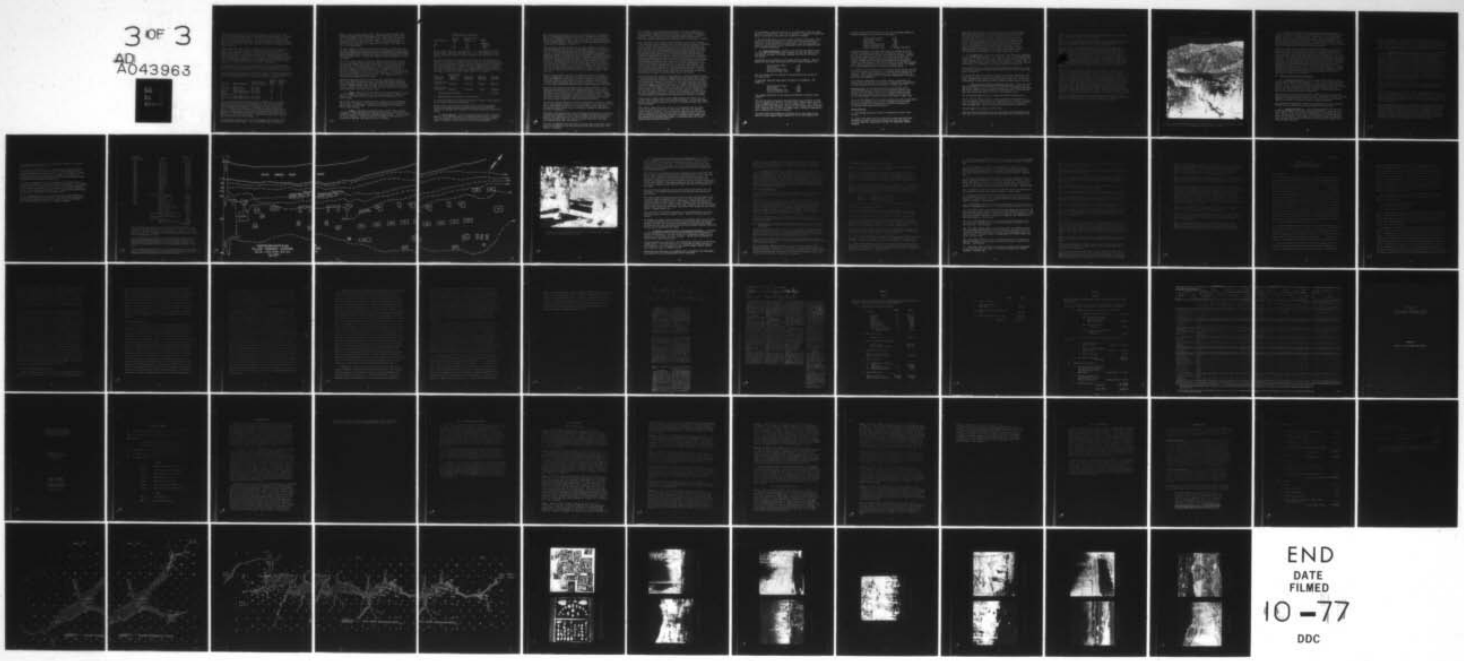

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During the winter, the pool level will be held at near its lowest level to insure maximum storage space for spring flood-control purposes. Filling of the pool will begin in February, and continue until maximum pool level has been achieved sometime in May. Draw-down will begin in June, and by the end of July the pool will reach a point well down river from the National Forest. This will limit the water-oriented recreation uses adjacent to the National Forest.

State Highway 227, which traverses the project, has as its termini, two heavily-traveled roads. Through Canyonville, nine miles west of the proposed dam location, Interstate 5 carries the majority of the west coast north-south traffic. To the east, through Trail, runs State Highway 62, the main access road from the south to Crater Lake National Park, Lost Creek Dam and Reservoir (currently under construction), and Diamond Lake recreation areas. Thus, highway 227 receives considerable through recreation travel, which will increase after the Days Creek Dam is constructed.

The reservoir will draw many recreationists to the area. The overflow of recreation users from the reservoir recreation sites, and those who like to be away from crowds are likely to be drawn to the National Forest facilities.

National Forest recreation improvements are limited. The existing facilities are overcrowded during much of June, July, and August. The existing National Forest recreation facilities in the influence zone of the project are:

Site Name	General Location	Distance North & East of Tiller	Capacity Camping Units	Capacity Picnic Units
Threehorn	Highway 227	12.7 miles	6	4
Cover Camp	Jackson Creek	18.3 miles	6	1
Dumont	South Umpqua River	12.0 miles	6	0
Boulder	South Umpqua River	14.0 miles	11	-
South Umpqua Falls	South Umpqua River	20.0 miles	-	8
Camp Comfort	South Umpqua River	26.4 miles	6	-

Only one of the available National Forest recreation sites is located on Highway 227 between Tiller and Highway 62. This is a small campground (Threehorn) which has six camping units and four picnic sites. It is designed to be enlarged to 12 camping units and seven picnic sites. Estimated cost of construction of the new units, reconstruction of picnic sites, comfort stations and needed sanitation facilities is $46,000.00. WRDRA Category II funds are planned for this work. The new site plan has already been designed. Construction by the Job Corps was planned, but this now seems unlikely.

Any additional recreation facilities along Highway 227 will have to be constructed on private lands. The first suitable land is located in

the Drew area five miles above Tiller. There are several ranches with holdings adjacent to both the highway and Elk Creek that would be suitable for recreation sites. Beyond Drew, (7-15 miles from Tiller) there are suitable sites on cut over timber lands. None of the possible recreation sites are posted for sale. However, several land owners in the area have stated that they would sell if the price were right. No prices have been quoted.

The Forest Service recommends that the Corps purchase a forty-acre tract of land suitable for recreation development along Highway 227 above Tiller. This land should then be transferred to the National Forest for development. WRDRA Category II funds would be applicable to finance construction of the recreation facilities. A twenty-unit campground will be needed at a cost of $60,000.

One site on Forest Service administered lands which should be developed to assist in handling the recreation overflow is the area known as the old CCC Camp. This is about three miles above the upper end of the proposed maximum on the South Umpqua River. It has good potential for fishing, swimming, picnicking, and camping. A portion of the site is presently occupied by a Forest Service scaling ramp. The scaling ramp may have to be relocated if a recreation site is developed. Estimated cost of constructing a twenty-unit camp is $60,000. The campground would be developed with WRDRA Category II funds.

Additional recreation units can be added to the South Umpqua Falls and Cover camp sites, if the need arises. Recreation facilities could also be constructed on private lands adjacent to the South Umpqua River above Tiller. Comfort stations and waste-water sumps are needed at all existing recreation sites as well as any new sites that are constructed to prevent water pollution in the South Umpqua system.

B. Range - (Domestic Grazing). Many areas inside and adjacent to the project boundary are suitable for cattle and sheep grazing. There is no grazing on the National Forest lands that will be incorporated in the project area.

None of the Forest Service permittee's home ranches will be affected by the project. No additions or adjustments in grazing permits on National Forest lands is anticipated. There will be no impact on the National Forest range resource.

C. Timber. The impact on National Forest timber volumes will be negligible. Timber harvest of all National Forest lands visible from the reservoir area is regulated under landscape management guides with recreation as the key resource. Estimated value of the timber on the land to be inundated or used for road right-of-way is as follows:

Commercial Forest Land Lost

Reservoir Plan	Area in Acres	MBF Commercial Timber	Value
III	4	60	$3,480.00
II	2	25	1,450.00
I	None	None	None

By commercial timber sale, the Forest Service will dispose of National Forest timber. This does not represent a loss. The allowable cut will not be affected by removal of timber producing land under Plans I, II, or III.

About 74 MM board feet of National Forest timber is annually appraised through the project area. Under reservoir Plan III, the relocation of the State highway around the reservoir will be approximately 1.3 miles longer than the existing route. Increases in route lengths should be slightly less under reservoir Plan I and II. Using the Forest Service appraisal procedures for timber haul, the annual timber haul cost over the existing and proposed routes from Tiller to Days Creek are as follows:

Round Trip Distance	Average Round Trip Haul Speed	Round Trip Haul Time	Haul Cost Per M/BF	Haul Cost Per Year
Existing Route 32 miles	49.2 mph	39 min.*	$8.112	$600,288
Proposed Route 34.6 miles	54 mph**	38.4 min.	7.987	591,038
Estimated annual savings				$ 9,250

* Timed haul for round trip over existing route.

** Timed haul for route on load with alignment similar to that proposed by the State, for the new construction.

Access roads to lands within the Forest Service protective boundary should be kept open and access through the project area should be suitable for hauling Forest products at all times during the construction period.

D. Water and Soil. In its present free-flowing status, the South Umpqua River is characterized by an unbalanced-flow pattern. Flooding is a major problem in the winter, and low flows are a problem in the summer. Turbidity is also a problem of the South Umpqua River.

This section of the report summarizes the implications of the proposed Days Creek Dam and Reservoir, with respect to information requested by the Corps of Engineers, along with discussion of the potentials which Forest Service management can be expected to have in enhancing the value of the proposed project. More detailed reference and background data is included in the appendix in Exhibit 1.

The preliminary economic analysis by the Corps of Engineers indicates that flood control is by far the most important benefit. Reservoirs are the only method by which flooding of the South Umpqua River can be controlled. It is the opinion of the Forest Service that the proposed reservoirs (Plans I, II, and III) are all compatible with National Forest management, but from a basin-wide resource management standpoint, Plan I, which would control only a 25-year flood, seems too small when compared to Plan II, which would control a 100-year flood, when the relative differences in inundation of valuable bottom lands caused by reservoir construction are considered. Plan III would appear even more desirable than Plan II from resource and environmental standpoints, when the overall water yield and water-quality benefits are compared to the small value of the additional low-value land which would be inundated. (See Table 5.)

With existing or improved levels of management on the Tiller Ranger District, management on the Forest Service lands will not significantly affect the magnitude or frequency of floods. The major objectives of the Forest Service in this regard will be to maintain soils in such a condition that infiltration and percolation rates will not be degraded, so that surface runoff and concentrations of surface water are minimized.

Reservoirs are also the only means by which summer streamflow can be substantially improved in the South Umpqua River Basin. Forest Service management will increase low flows slightly according to water-balance calculations, but any possible increases will be and have been so slight that they cannot be detected by evaluation of streamflow records. Corps of Engineers' Plans II and III appear most desirable from water quality and summer supply standpoints, with Plan III most desirable.

For Plan II, release schedule II would be preferable to schedule I, because of the magnitude and frequency of water shortages is less, and the increased flow release would have little or no adverse effect on the temperature and quality of the release water, according to information furnished by the Corps of Engineers.

Turbidity is the big question so far as the Days Creek project is concerned (reservoir and outflow). If the Corps of Engineers study now planned indicates that turbidity will be a serious problem, the Days Creek project would have neither social nor economic benefits sufficient to warrant construction of the dam. See Exhibit 1.

The Corps of Engineers will undertake a two-year study on the South Umpqua River to determine the turbidity potential at the Days Creek site. See Exhibit 2, appendix.

Soils adjacent to the Days Creek impoundment would not be expected to cause shoreline turbidity comparable to that at the previously proposed Tiller project, because they are not as high in clay content or slumping potential. Winter flows of the South Umpqua River at the proposed Days Creek site are generally more turbid than at the Tiller site, however.

Since the Forest Service manages about 80 percent of the area tributary to the Days Creek Dam, including soils with the highest turbidity potentials, special emphasis should be placed on minimizing turbidity production on Forest Service lands, while recognizing that natural turbidity has always been high, and that land management can only partially control turbidity. The greatest opportunities for controlling accelerated turbidity lie in proper planning and administering of logging and road location and construction. Elimination of sidecast waste in road construction, and prompt seeding, mulching, and fertilizing of road cuts and fills are two recent improvements in management policy which will help accomplish desired goals. Reduced amounts and better administration of tractor logging will also minimize the turbidity problem, as well as the now common practice of retaining buffer strips between roads or cutting units and streams. Soil surveys cover all National Forest lands tributary to the Days Creek Dam. These help determine where special practices are most needed. A reconnaissance level hydrologic survey report will be written for the National Forest lands tributary to the Days Creek project this winter.

Some restoration work should be accomplished on the Tiller Ranger District to minimize reservoir turbidity. WRDRA Category III funding needs, provided to the Forest Service for accomplishment of such work, would be in order, if the Days Creek project is constructed. Some needs have been identified in a low-intensity preliminary survey. It is roughly estimated that about $190,000 of WRDRA Category III money will be needed. Examination of eroded areas on the Tiller Ranger District indicates that many of the areas which could benefit from treatment will heal naturally, if given enough time, and that the highest turbidity-producing areas conducive to treatment are the most recently-eroded areas. Because of this timing factor, a highly-detailed restoration survey should be deferred until funding is probable.

Present Forest Service policy allows WRDRA Category III funding only for projects where construction funds have been allocated. For the Days Creek project, the turbidity question will have to be answered before these funds can be allocated.

When, and if, these conditions are met, it is suggested than an aerial survey be conducted following the first heavy fall runoff to identify source areas of turbidity. The following two summers a qualified person should be hired by the Forest Service (Tiller Ranger District) solely to work on surveying and planning treatment of turbidity source areas, under the direction of the Forest Hydrologist in cooperation with the Tiller Ranger District Resource Assistant.

For the present, needs will continue to be identified as they are found, incidently to other work. This type of approach is adequate to handle the amount of restoration work which can normally be financed.

If the Days Creek project is constructed, the Corps of Engineers should construct the adjacent highway in a manner that will avoid reservoir siltation. There should be no sidecast waste. All soil disturbed as a result of the reservoir-related construction should be revegetated the fall following disturbance.

E. Fish and Wildlife. Figures in this section are based on Plan II, which has a conservation pool elevation of 1,022 feet above M.S.L. with 480,000 acre-feet of storage, assuming this will be the size of the project.

Significant runs of anadromous fish spawn above the damsite. The proportion of this number that spawn within the proposed reservoir are:

Spring chinook salmon	100
Coho salmon	1,250
Winter steelhead trout	1,000
Sea-run cutthroat trout	1,000

The lost habitat will be replaced by hatchery facilities as part of the project cost.

In addition, many fish spawn above the area to be inundated. The number is:

Spring chinook salmon	900
Coho salmon	1,500
Winter steelhead trout	1,500
Sea-run cutthroat trout	1,000

Fish passage facilities at the project are expected to maintain these numbers.

There are 83 miles of stream on National Forest land available to these fish for spawning and rearing. An active sport fishery exists from the Forest boundary upstream to the mouth of Jackson Creek. This fishery is primarily for winter steelhead, and most of the fishing occurs on private land. Upstream from the mouth of Jackson Creek, fishing for anadromous fish is prohibited to protect spawners.

The Oregon State Game Commission estimates that if cool water is released to reduce maximum summer temperature of the South Umpqua River

to 70°F in most of the area below the dam, the following increase in spawning escapement will occur below the project:

Spring chinook salmon	3,300
Fall chinook salmon	6,900
Coho salmon	660
Winter steelhead troute	1,300
Summer steelhead trout	3,100
Sea-run cutthroat trout	No estimate available

Increased anadromous fish runs should supply an average of 78,500 man-days of recreation annually over the 100-year life of the project, and will also greatly benefit the commercial fishery. If downstream water releases prove to be turbid, this figure will need revision downward. These increases are predicted on the basis of improved rearing conditions and increased survival of downstream migrants in the main stem of the river because of cooler water temperatures, reduced flood mortality and better spawning flows. At present, high summer temperatures are the primary limiting factor.

The reservoir will be managed both for rearing spring chinook juveniles and for a resident trout fishery. By stocking spring chinook fry, an estimated 10,300 spring chinook salmon will return as spawning escapement. This fish represent an important contribution to the sport and commercial fisheries.

Full reservoir enhancement will depend largely on eradication of non-game fish at the time of dam closure. Treatment at approximately 10 year-intervals will also be required to control these fish.

Resident trout. On the South Umpqua River system above Tiller, there are 150 miles of fishable streams containing resident rainbow and cutthroat trout. Many of these streams support a summer fishery that is based on native fish; in addition, the main stem of the South Umpqua is stocked regularly with trout of legal size.

It is not anticipated that the proposed project will have a significant effect on the resident trout fishery on National Forest streams. The trout fishery on the reservoir will provide an average of 77,800 additional angler-trips annually.

Recommendations.

1. Fish passage facilities should be constructed as part of the project.

2. Clear, cold water should be released to reduce main stem water temperature in most of the South Umpqua River below the project to levels that will significantly enhance the anadromous fishery resource.

Wildlife. The reservoir will inundate significant big-game winter range, and some songbird and upland bird habitat. Animals will be displaced and the net result will be a loss of habitat. Some of the loss of wildlife can be mitigated through the management of project lands. However, these are insufficient to compensate for the loss and approximately 1,200 acres of additional land will be needed. National Forest winter ranges located upstream are presently fully occupied and long-term productivity trend is down because of developing second growth stands. These National Forest lands are needed to maintain present established big-game herds, and should not be considered for offsetting downstream losses.

F. Air and Noise. There are possibilities for pollution, especially during the construction phases of the project. Much of the proposed project area is in brush and timber land. The brush and slash, resulting from timber harvest, will be disposed before the reservoir is flooded. The smoke from burning will remain in the Umpqua valley for some time, causing smog conditions, if burning is done during periods of stable air.

Most pollution will be temporary during the project construction. It can be reduced by doing the burning under favorable conditions, or using other means of disposal.

It is expected that the reservoir will be used for water skiing and other motor-boat activities. The narrow canyons could reflect and amplify the noise, causing noise pollution during periods of heavy use. If too much noise occurs, it may become necessary to restrict areas of motor boat use.

G. Land Use--Mining, Farming, Industrial and Urban. There are three special-use permits in the project area on Federal lands administered by the Forest Service. The U. S. Weather Bureau has a telemetering rain gage, and Pacific Power and Light Company and California Pacific Utilities Company have special-use permits for power and telephone lines.

The special-use permits will not be affected under reservoir plan I.

In the event the Ranger Station is moved, the power and telephone line, with the exception of one main power transmission line, will not be needed, since they serve the Ranger Station. The main transmission line passes over the upper pool. It is high enough, and should not be affected.

The rain gage can be moved to another site.

Both the power and telephone lines for the upper South Umpqua River area will have to be relocated from private land, which will be located in the

project area, to Forest Service administered land (Tract 1, see ownership map). Special-use permits will be required.

There are several mining claims within the upper reaches of the South Umpqua River and Elk Creek drainages. There has been little, or no work, other than that needed for annual assessment on most of the claims.

Hanna Nickel Co. is removing 25,000 tons of silicate from the Quartz Mountain claims, located on the divide between the North and South Umpqua drainages, for use in processing nickel at their Riddle plant. They are currently in a testing stage to determine feasibility of utilizing the silicate. If the project is feasible, they will be removing 25,000 tons on annual basis. Little additional increase in activity is anticipated ess improvements are made in the recovery of low-grade ore. The distance the reservoir to Quartz Mountain claims, as well as the other claims, ake the possibility of damage by siltation of mineral wastes rather small. There are no known claims on Forest Service administered lands in the project area.

Reservoir Plans II and III will have a major effect on the community of Tiller. The Ranger Station, grade school, post office, church, private residences, and businesses (which include a store, two service stations, of which only one has been in business during the last two years, and a truck-weigh station), may be inundated, or included in the project boundary. If so, it is likely that the businesses will be discontinued, rather than relocated in the area. Some of the people will relocate in the surrounding communities, Drew, and upper South Umpqua River area above the reservoir. Residential sites are limited. Most of the people will probably move from the Tiller area. Even under Plan I, the Corps of Engineers will acquire everything within 300 feet of the reservoir. The Forest Service recommends that the Corps permit businesses and services in Tiller, inside the project boundary, to continue operation, if not physically affected by the reservoir.

The school would either have to be relocated, or the students would have to be bussed to Days Creek, some 16 miles down stream. Additional facilities would have to be constructed to handle the additional students.

Photo No. 1

The central community of Tiller will be acquired for the Days Creek project, regardless of which of the three proposed reservoir sizes is chosen.

H. Composite Evaluation of the Project Effects on Resource Values. So far as the Forest Service is concerned, the Days Creek Dam and Reservior would be compatible with National Forest management. If the impoundment and/or release water is found to have a serious turbidity problem, the overall effect on resources and the environment would be negative, however, and unacceptable to the Forest Service. Either Corps of Engineers' Plan II or III would be acceptable to the Forest Service from an overall resource and environmental aspect, with Plan III most desirable.

If the Days Creek Dam is constructed, fish passage should be provided for, and enough cold water should be released to substantially improve the fishery resource and downstream water quality. Wildlife habitat will be lost, and project lands should be managed to help mitigate this loss. On National Forest lands, restoration work should be accomplished to minimize turbidity, and management activities should give special emphasis to minimize turbidity. Two new campgrounds, and an enlargement of a third, should be constructed on National Forest lands upstream from the reservoir to handle increased recreation demand brought about by the reservior attraction. Recreation facilities adjacent to the reservior will be needed. The Corps of Engineers is planning this aspect of the reservior development. Forest Service does not plan to develop reservoir recreation. Favorable climatic conditions will be needed for burning debris resulting from reservoir clearing to minimize smog conditions.

VI. FOREST ADMINISTRATION AND PROTECTION

A. Transportation System. Forest Service Road No. 3000, serving Tiller Ranger Station, may be inundated. If so, it will not need replacing. No other Forest Service roads, bridges, or trails will be affected by the project. Access roads to lands within the Forest Service protective boundary must be kept open during the fire season (April 1 through October 31). These roads are the Coffee Creek Road in Section 30, Brown Ranch Road in Section 32, and Salt Creek Road in Section 28.

The relocation of Highway 227 could have a slightly beneficial effect on timber-harvesting costs (refer to Section VC). Relocation of county and state highways on Federal lands in Section 33, T. 30 S., R. 2 W., will require special-use permits, or easements from the Federal Government.

The relocation of Highway 227 should be constructed for a design speed of 55 miles per hour for maximum economic benefits for timber haul.

B. Communication Systems. There are approximately 1-1/2 miles of commercial telephone cable rented by the Forest Service, which ties into Forest Service lines, and provides communication to the primary fire look-outs. The Forest Service has plans to discontinue this system sometime in the distant future. The telephones will need to be kept in operation until the new radio system is installed. New lines may be needed if the station complex is moved.

The present Forest Service radio network has a 50 watt base station in operation at Tiller. The antenna and base station will have to be relocated if the Ranger Station complex is moved. It is possible that a relay station will be needed. Estimated cost for base station and antenna relocation and relay installation is $3,500. There may be additional costs for right-of-way, or land purchases, depending on the location of the antenna and relay.

C. Administrative Sites and Improvements. There are two administrative site improvements that will be affected by the project. The major one is the Tiller Ranger Station complex. It appears that, should the pool exceed elevation 1,030, as it does in Plan III, the existing complex will be affected to a point where a complete relocation and replacement will be necessary. From elevation 1,025 to 1,030 (Plan II), it may be feasible to stabilize the site. Due to the special problem of pumice soils (see section IVA), this would be a difficult problem. Gabions may be the solution, as they can be designed to pass the water, but not the soil particles. If this would work, not only would the station be saved, but the pumice would be prevented from eroding into the reservoir. The Corps of Engineers should study the feasibility of stabilizing the Tiller Administrative Site if Plan II is selected. If stabilizing the site is technically feasible, the Forest Service should decide whether to relocate. The following contour map and site plan depicts the Tiller Administrative Site in relation to the various potential maximum pool elevations.

If the complex does not need to be moved from a physical standpoint, special consideration will have to be made by the Corps of Engineers to approve occupancy in the project area, or to exclude the area from the project boundary.

If it is necessary to relocate the complex, land purchased by the Corps of Engineers for this purpose should be in the general vicinity of Tiller. The Ranger Station Office should be readily available to the forest cooperators and general public, and should be close to the Forest to keep administrative travel to a minimum. Moving some of the existing buildings to the new site should be considered.

One possibility is to relocate on the north side of the river at Tiller. Additional land will have to be purchased, as the existing Forest Service ownership (Tract 1, see ownership map) is not large enough to accomodate the whole complex. Additional private land is available in the area. However, there may not be sufficient suitable land, both Forest Service and private, at the one site to accomodate the whole complex. It may be necessary to have the administrative and residential areas at different locations. Each site would require water and sewage systems.

This proposed location may be in conflict with the Corps of Engineers proposed Tiller recreation site.

The number of acres needed will be determined upon final selection of the site location. It is estimated that a complete Ranger Station complex will require 30 acres of usable ground. While Tract 1 contains 30 acres, not all of it is suitable. Suitable land is that with gentle terrain of dimensions which can be efficiently developed without excessive access roads and alienated areas.

The Corps of Engineers should be responsible for financing the site planning and development of the new Ranger Station complex. Site planning should be done by the Forest Service, except that the Corps of Engineers should furnish contour maps for the new site. The Corps of Engineers should also be responsible for removing facilities from the existing site and return it to an aesthetically desirable area.

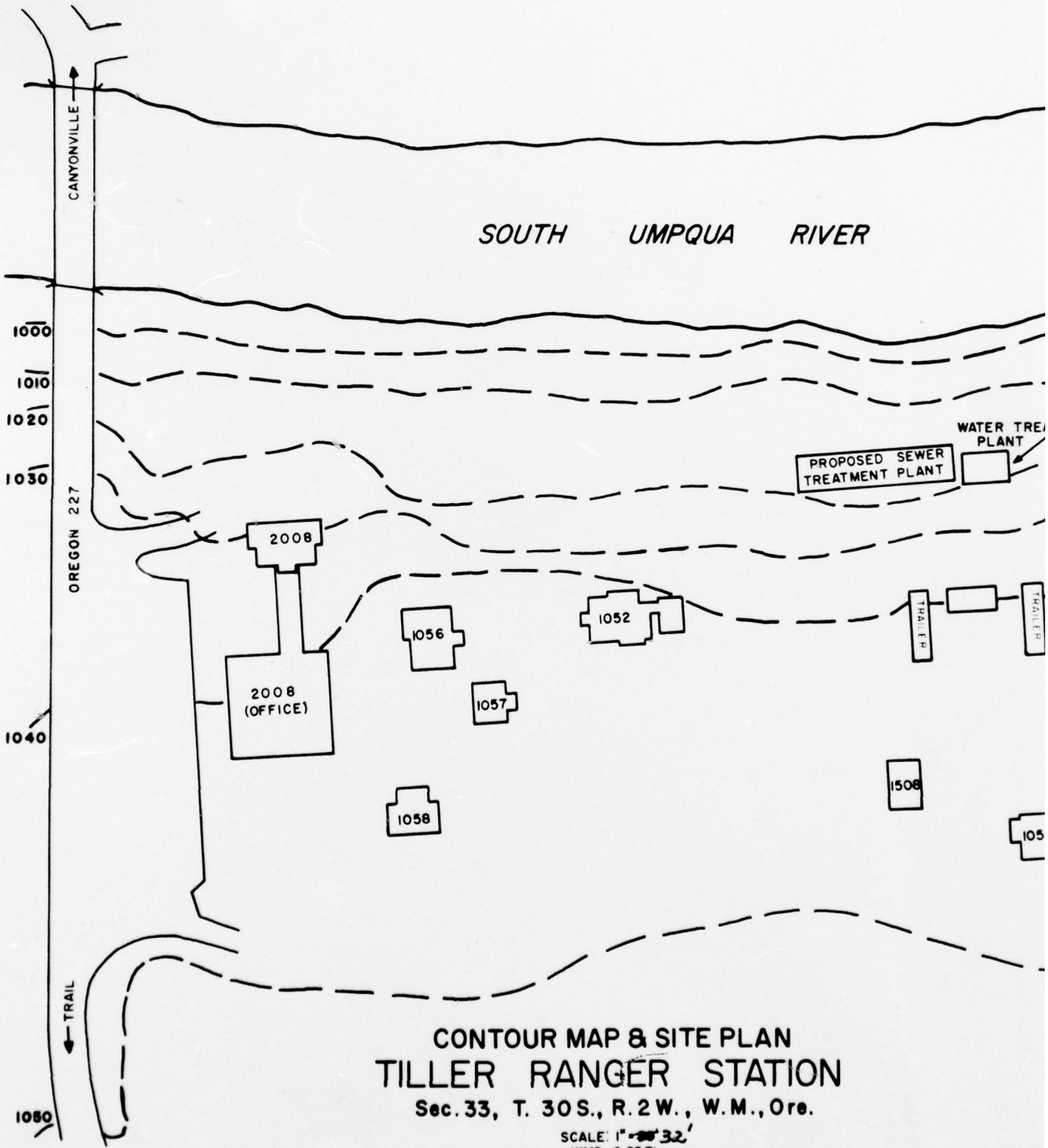
On the following page is a list of needed facilities and replacement costs, should relocation be necessary. These replacement estimates are firm only at this writing and do not include a factor for increased costs that may occur as a result of continued inflation.

Existing Building No.	Type	Replacement Costs
1050	Residence	$ 24,000
1051	Residence	24,000
1052	Residence	24,000
1054	Residence	24,000
1055	Residence	18,000
1056	Residence	18,000
1058	Residence	18,000
1085	Residence	24,000
1086	Residence	24,000
1087	Residence	24,000
1088	Residence	24,000
1090	Residence	24,000
1092	Residence	24,000
1210	Residence	24,000
2005	Office	140,000
1507	Garage	---
1508	Garage	---
1512	Garage	---
1053	10-man barracks/kitchen	25,000
1308	10-man barracks	14,000
2400	Warehouse	29,000
2618	Mechanics Shop	9,000
2619	Open Storage	9,000
2504	Gas and Oil House	5,000
	Water System	140,000
	Sewage Disposal System	180,000
	Station Roads	20,000
	Landscaping	15,000
	Tree Storage Building (Move only)	2,000
	Trailer Sites (6)	6,000
	New Construction (for years 72-76)	
	Residences (3)	75,000
	Land Purchases	20,000
	Administrative Site Plan	7,000
		$1,014,000

A Forest Service scaling ramp located on the present State Highway 227 right-of-way in S1/2SE1/4 Section 30, T. 30 S., R. 2 W., W. M., will be inundated. The ramp will have to be relocated at a suitable site along the relocated road. Estimated cost for installing a scaling ramp similar to the existing ramp is $3,500.

A new scaling ramp, large enough to scale four loads of logs at one time, with additional parking space for six trucks should be constructed. Estimated cost for the improved scaling ramp and land is $7,000. The Forest Service would be responsible for financing the additional $3,500 cost.

If the Tiller Administrative Site is not moved, and if the sewer and/or water system are rendered inoperable because of the reservoir, the Corps of Engineers should fund replacement of these facilities.

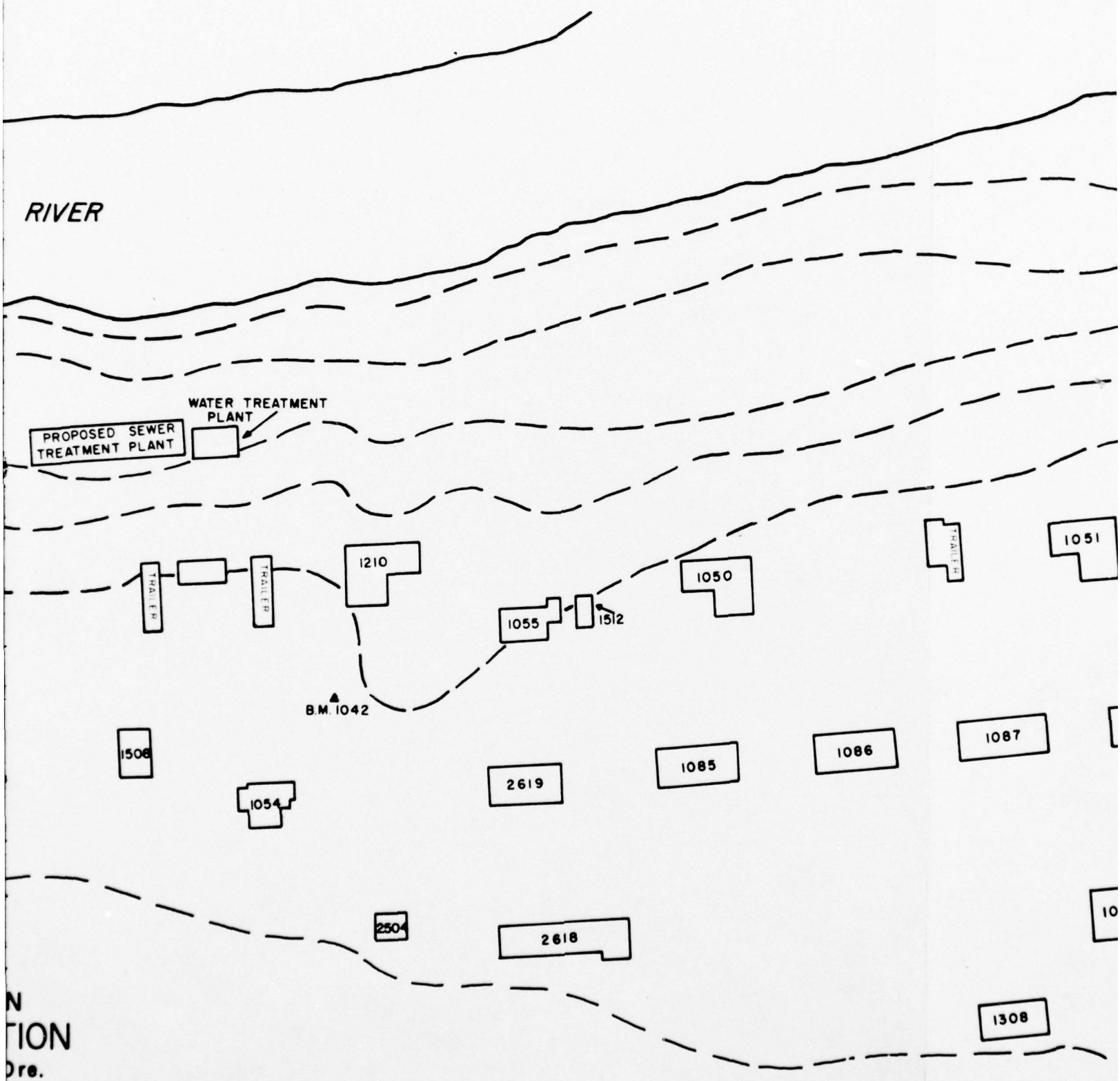


CONTOUR MAP & SITE PLAN
TILLER RANGER STATION

Sec. 33, T. 30 S., R. 2 W., W.M., Ore.

SCALE: 1" = 32'

WMD 6-25-71


RIVER
WATER TREATMENT PLANT
PROPOSED SEWER TREATMENT PLANT
TRAILER
TRAILER
1210
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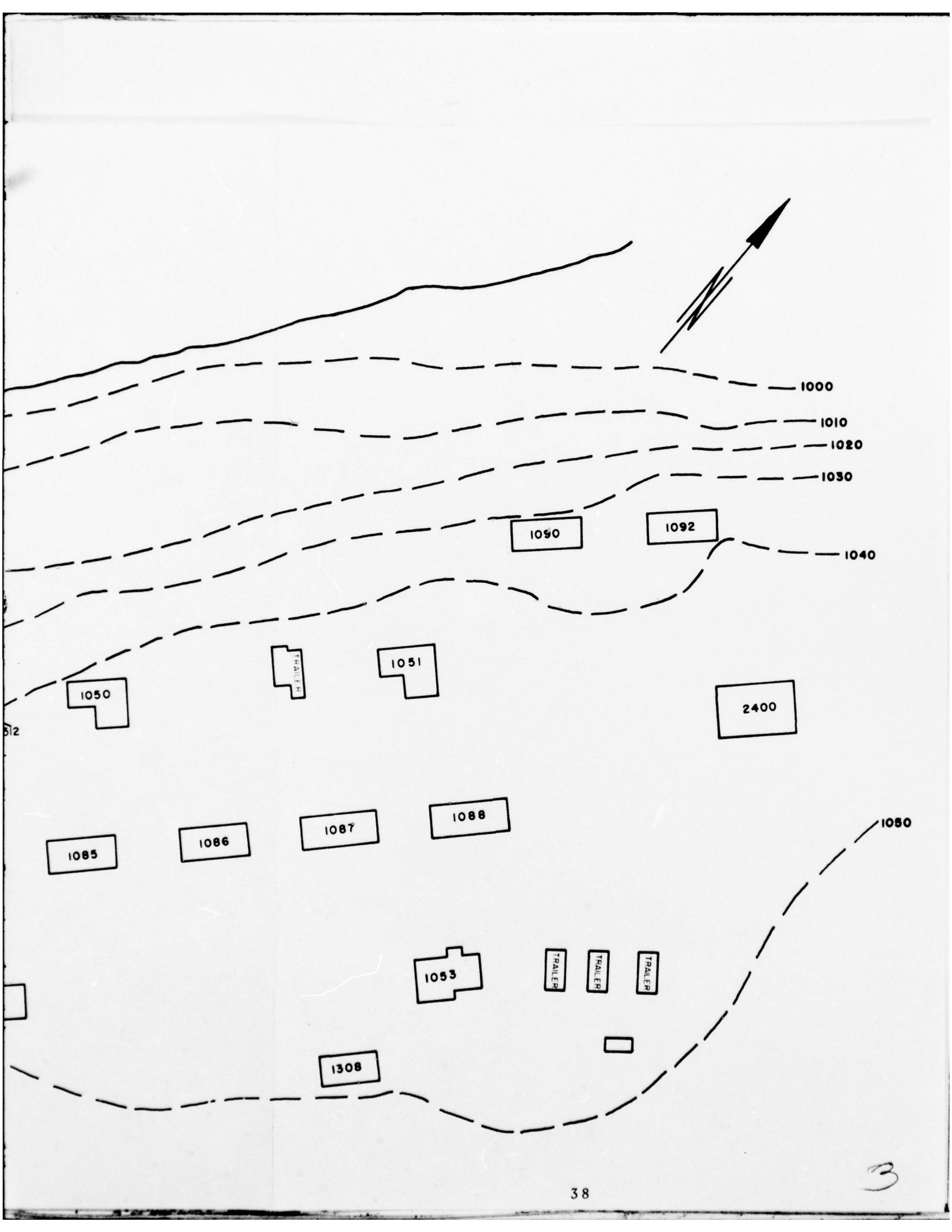
1000
1010
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1092
1051
TRAILER
1050
2400
1085
1086
1087
1088
1050
1053
TRAILER
TRAILER
TRAILER
1308

Photo No. 2

A modern, new office building was annexed to the existing Tiller Ranger Station office during Fiscal Year 1971.

D. Fire Prevention, Presuppression and Suppression. As a result of the impoundment, an increased number of visitors and users will impact the reservoir area and adjacent National Forest land. This use will introduce fire risk on the area. Primary responsibility for fire protection of the proposed project rests with the Douglas Forest Protective Association. All clearing and slash disposal work will be regulated by State and Federal laws.

That portion of the project lying east of Hatchet Creek on the south side of the river, and east of Coffee Creek and Granite Creek on the north side of the river is included in the Forest Service protective areas. By cooperative agreement, initial action on any fire near the protective boundary is carried out by either the Douglas Forest Protective Association or the Forest Service. Upon determination of the fire location, the agency under whose jurisdiction the land lies takes over with the assistance of the other.

Responsibility for protection of the entire project area should lie with one agency. This should be undertaken by the Douglas Forest Protective Association.

Fuel types along the highway consist mostly of grass and light brush, with scattered stands of Douglas-fir and pine on the steep slopes above. Occasional oak-madrone stands prevail. These fuels, coupled with the steep southwest slopes and warm summer climate, represent high fire hazards and extreme rates of spread. Access to the roads in Tiller, as well as the Brown Ranch, Coffee Creek, and Salt Creek, must remain open during the fire season (April 1 through October 31).

The south slope of the South Umpqua River, from Coffee Creek to the end of the project has a history of several fires. Most of the fires were man-caused.

To minimize the danger of fire outside of the reservoir areas, all materials to be burned should be piled in existing fields and openings for burning. Normally, disposal work is carried out during the fall and winter months in this area, but with additional protection and favorable weather conditions, burning may be done during the summer.

E. Withdrawals, Land Adjustment, Right-Of-Way Procurement. A permanent mineral withdrawal should be made around the perimeter of the reservoir to protect the aesthetics. No right-of-way will be required, except for the relocation of the County and State highways. Access shall be provided to Forest Service administered lands.

An administrative site may have to be purchased for relocation of the Tiller Ranger Station. The area needed will be determined by final selection of site location. It is estimated that the complete Ranger Station complex will require 30 acres of suitable ground.

Additional land will have to be purchased for a recreation site development and relocation of the existing Coffee Creek scale ramp.

Property corners for lands administered by the National Forest should be protected, and lines reestablished. Eleven corners will be inundated or destroyed. They will have to be referenced and monumented. Estimated cost for this work is $3,500.

F. General Administration. The National Forest lands in the project area are administered by the Tiller Ranger District of the Umpqua National Forest. Fire protection is primarily the responsibility of the Douglas Forest Protective Association, except that portion of the project area east of Coffee Creek on the north side of the river and east of Hatchet Creek on the south side of the river. This area is presently the responsibility of the Forest Service. The Forest Service recommends that the Douglas Forest Protective Association take complete responsibility for all lands within the finally selected project boundary.

VII. DIVERSITY OF OPINION

To date, all political pressure groups and politicians concerned with the Days Creek Dam are in favor of project construction. (See Exhibit 1, appendix.)

However, there are some points at issue. The primary issue is possible turbidity in the reservoir and downstream from the project. Three Government agencies recently advised the Myrtle Creek Chamber of Commerce that they are concerned about the possible turbidity. The Corps of Engineers has publicly announced that if its study of this problem indicates that the reservoir might be turbid, the dam will not be built. (See Exhibit 2, appendix.) This conclusion had already been reached in an interagency meeting on July 10, 1970. (See Exhibit 1, appendix.)

Other points of issue against dam construction are concern about the inundation of valuable bottomlands and doubts that the project would enhance the fishery resource.

VIII RECOMMENDATIONS CONCERNING COORDINATION, MEMORANDUM OF UNDERSTANDING, AND LIAISON

A general memorandum of agreement was entered into August 13, 1964, between the Secretaries of Agriculture and the Army relative to management of land and water resources at water development projects of the Corps of Engineers located within or partly within the National Forest system.

Data necessary to prepare the supplemental memorandum of understanding is included in this impact survey. This will become necessary after construction funds have been allocated.

One Forest Service employee should be assigned as liaison officer after construction funds are allocated to coordinate construction on Forest Service administered land; relocation, design and construction of a new Ranger Station complex; and design and construction of recreation developments. Total cost for the liaison officer is estimated to be $56,000.

IX. STATE AND PRIVATE FORESTRY CONSIDERATIONS.

An estimate by the Corps of Engineers of land use in the proposed project area (Plans I, II, and III) is given in Table 5.

For the most part, private lands have been cutover within the last 20 years, and much of this area would not grow trees for many years due to high soil temperatures and low soil moisture. Nevertheless, over one million board feet per year in allowable cut will likely be lost from these lands, although there would be little logging for the next forty years or so.

Most commercial timber in the project area is on BLM lands. The BLM estimates that, for plan II, 14.5 million board feet will need to be removed from the reservoir area, and another 12 million board feet will be subject to reduced cutting, as it would be in a landscape-management area. Reductions in allowable cut are estimated to be:

Plan I	200 thousand board feet
Plan II	342 thousand board feet
Plan III	400 thousand board feet.

The reservoir would create little effect on the local forest industry.

X. CONCLUSIONS AND RECOMMENDATIONS

1. The Days Creek Dam be constructed only if the Corps of Engineering studies show that turbidity will not be a serious problem. (Section VB)

2. Corps of Engineer Plan II or III should be selected. (Section VB)

3. The Corps of Engineers should make an engineering feasibility study for stabilizing the Tiller Administrative Site if Plan II is selected. The possibility of using gabions should be evaluated. Based on this study, the Forest Service should decide whether to relocate. (Section VIC)

4. If the Tiller Administrative complex need not be moved, it should either be excluded from the project area, or the Corps of Engineers should approve occupancy inside the project boundary. (Section VIC)

5. If the Tiller Administrative complex is not moved, and if the sewer and/or treatment system are rendered inoperable because of the reservoir, the Corps of Engineers should fund replacement of these facilities. (Section VIC)

6. If the Tiller Administrative complex is not moved, some provision should be made by the Corps of Engineers to permit continued operation of business and services in Tiller where buildings and facilities would not be physically affected by the reservoir. (Section IIIC).

7. If the Tiller Administrative complex is abandoned, the Corps of Engineers should restore the site to an aesthetically-desirable condition. (Section VIC)

8. If the selected full pool elevation renders the existing Tiller Ranger Site unusable, the Corps of Engineers acquire land in the Tiller area suitable for relocation of the complex, and fund construction of a new station and facilities at an estimated cost of $1,014,000. (Section VIC)

9. The Corps of Engineers purchase land in a location agreeable to the Forest Service and relocate the service scaling ramp, now located in S1/2 SE1/4, Section 30, T. 30 S., R. 2 W., W.M., on said land. Estimated cost is $7,000. The Forest Service would be responsible for costs needed in excess of that needed to replace the existing ramp ($3,500). (Section VIC)

10. A permanent mineral withdrawal be established around the perimeter of the reservoir to protect the recreation values. (Section VIE)

11. The Museum of Natural History at the University of Oregon be informed by the Corps of Engineers of the impending project at least two years in advance of construction in order to permit them to conduct salvage archeological operations. (Section IVB3)

12. By commercial timber sale, Forest Service dispose of National Forest timber in the project area prior to project clearing contracts. (Section VC)

13. The Forest Service should build two new campgrounds and reconstruct and enlarge another after project construction funds have been allocated. Funding should be WRDRA Category II, except that land for a new campground along Elk Creek should be acquired by the Corps of Engineers and transferred to the Forest Service. (Section VA)

14. The Forest Service continue and intensify erosion-control practices in logging and road construction to minimize movement of sediments into the reservoir. (Section VID)

15. The Forest Service conduct an intensive survey of watershed restoration needs with WRDRA Category I funds to determine treatments which can enhance the value of the proposed reservoir after construction funds have been allocated. Treatment should be accomplished with WRDRA Category III funds. (Section VID)

16. Fish passage facilities to be constructed as part of the project to provide an anadromous fish resource in the National Forest waters above the dam. (Section VIE)

17. Sufficient clear cold water be released to reduce water temperatures in the South Umpqua River enough to significantly enhance the fishery resource. (Section VIE)

18. Project area lands be managed to mitigate wildlife habitat losses to the extent feasible. (Section VIE)

19. New special use permits be issued to Pacific Power and Light Company and California Pacific Utilities Company for relocation of their power and telephone lines. (Section VG)

20. Access roads to lands within the Forest Service protective boundary be kept open and access through the project area should be suitable for hauling forest products at all times during the construction period. (Section VC)

21. Douglas Forest Protection Association have fire protection responsibilities for the project area. (Section VID)

22. The Forest Service and Corps of Engineers negotiate a Memorandum of Understanding following allocation of construction funds. (Section VIII.)

23. A Forest Service employee be assigned as project liaison officer to coordinate with the District Office of The Corps of Engineers following allocation of construction funds. (Section VIII.)

24. The Corps of Engineers should burn clearing debris only during favorable weather conditions to avoid smoke pollution. (Section VF)

25. Roads adjacent to the reservoir should be designed and constructed so as to avoid any soil displacement into the reservoir and all bare soil in the project area should be revegetated the fall following soil disturbance. (Section VD)

XI. SUMMARY

The Days Creek Dam and Reservoir project would be compatible with management of Forest Service lands. The only significant direct effect on the Forest Service is the possible need for relocation of the Tiller Administrative Site. Plan I would eliminate the need for relocation of the Tiller Administrative site. Plan II would require study to make a determination, and Plan III would definitely require relocation of the administrative site.

Corps of Engineers Plans II and III would involve 13 and 58 acres, respectively, of Forest Service lands. Plan I would involve no Forest Service land.

Flood control would be the largest project benefit. Additional benefits are recreation, irrigation, water supply, water quality control, and fishery resource enhancement.

At a meeting in the Corps of Engineers office on July 10, 1970, an interagency group came to the conclusion that if construction of a Days Creek project were recommended, the recommendation would include a stipulation that construction not be started prior to completion of detailed studies

of the turbidity problem. Those studies would have to confirm the lack of potential for significant turbidity or show that appropriate preventative measures could be taken or it would not be appropriate to expect the realization of fishery benefits as now anticipated. Without those benefits, economic justification would be lacking. Also, the project would lack environmental justification in the opinion of the Forest Service.

Wildlife habitat would be reduced by project construction. There would also be losses in agricultural and timber production in the area to be inundated but these losses would have only minor significance to the local economies.

If the project is constructed, the most valuable bottom lands will be flooded regardless of whether Plan I, II, or III is chosen. From a resource standpoint it is the opinion of the Forest Service that, based on preliminary information furnished by the Corps of Engineers, Plan II is the smallest project which should be selected. The overall environmental effect of constructing a dam under Plan II or III would be favorable if turbidity is not a serious problem. Plan III benefits appear greatest of all alternatives and would appear to be most desirable from a resource enhancement standpoint. Plan II has the highest cost-benefit ratio based on preliminary information, however.

If the dam is constructed it is imperative to the Forest Service that provisions are made for passage of anadromous fish to and from the streams on Forest Service lands upstream from the impoundment.

Local reaction to the proposed Days Creek project has been highly favorable. All organized political groups and politicians taking a position on the project are in favor of it. The project has received heavy publicity in the Roseburg News Review.

The Farmer's Home Administration, Soil Conservation Service, and the Agricultural Stabilization and Conservation Service are USDA agencies having programs which should be applicable in enhancing the rural socio-economic environment which would be affected by the Days Creek project.

Exhibit 1

18 May 1971

Project Data Sheets
Days Creek Multiple-Purpose Project
South Umpqua River, Oregon

1. Background

The Corps of Engineers' current study of Umpqua River Basin, authorized by Congress in the late 1930's and delayed for many years during and after World War II, now is nearing completion. With the cooperation of other Federal and State agencies, it has been aimed at evaluating needs and basin resources and formulating a plan for use of resources to meet present and projected needs. The needs considered have been in the eight functional fields recognized by the Congress as appropriate for Federal water resource projects, plus those for preservation of desirable natural environment. It has been determined that, so far as water is concerned, the principal problems are those of too much water, in the form of major floods, during the winter and too little water during the summer months. This is particularly true of South Umpqua River where flows in the order of 50 to 70 cubic feet per second during the summer months contrast with recorded flood peaks of up to 105,000 cubic feet per second during the winter flood season. North Umpqua River, with natural headwater storage in the forms of extensive lava and pumice deposits, has low-water flows in the order of 500 to 700 cubic feet per second.

Federal and State agencies which have participated in various aspects of the study include: the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Bureau of Land Management, Forest Service, Environmental Protection Agency, Bureau of Outdoor Recreation, Fish Commission of Oregon, Oregon State Game Commission, Oregon State Water Resources Board, the Department of Environmental Quality, and the State Engineer's office.

In the early phase of the current study, an evaluation was made of headwater sites for storage projects, with the view to avoiding, if possible, inundation of anadromous fish spawning areas. It was found,

however, that none of those sites alone or in combination could be developed, within the limits of economic feasibility, to levels beyond those appropriate for watershed projects by Soil Conservation Service under Public Law 566. Further, no combination of such headwater projects would be capable of providing a reasonable degree of service to total present needs for flood control and water conservation in the basin as a whole. Based on those findings, and considering needs and possibilities for provision of increased flows for improved water quality in South Umpqua River during the summer months, attention then was concentrated on potential major storage projects.

Those potential projects, which would be compatible with and needed in addition to projects under Soil Conservation Service and Bureau of Reclamation programs, were:

a. Tiller, on upper South Umpqua River
b. Galesville, on upper Cow Creek
c. Winkle, on Calapooya Creek

As the study progressed, it became apparent that the potential Winkle project was almost completely lacking in economic justification. Subsequently it was found that the economics of a project at the Galesville site would be marginal. Thus, the study was concentrated on the potential Tiller project on South Umpqua River.

A project at the Tiller site would control runoff from about 450 square miles, or about 25 percent of the South Umpqua drainage area. It would have a capability, other things being equal, to provide a relatively high degree of flood control and a relatively high degree of flow augmentation along all of South Umpqua River from Tiller downstream to the confluence with North Umpqua River. The Tiller damsite would be highly satisfactory for the construction of a project of any size compatible with basin needs and the available water resources. The reservoir, however, would be in an area of extremely unstable soils characterized by the recent major slide on Dompier Creek in 1962 and many older landslides which have been detected

by geologic reconnaissance. Under those conditions, reservoir operation for flood control could have been expected to have aggravated the slide problem to the detriment of relocated major timber access roads and efficient management and harvest of the timber resources of the upper basin. Also, these unstable soils posed a potential for considerable reservoir turbidity, based on possible wave erosion along the shoreline as well as the possible occurrence or recurrence of major slides in the reservoir area.

For that reason, in 1967 further consideration of the potential Tiller project was abandoned. Since that time all work has been concentrated on an alternative downstream site in the vicinity of Days Creek. Those continuing studies, by the Corps and the participating agencies, have indicated a probability of economic justification for a project as subsequently described. Also indicated, however, is a possibility that a reservoir at the Days Creek site might experience turbidity problems. Thus, in a meeting in the Corps of Engineers' office on 10 July 1970, the interagency group came to the conclusion that if construction of a Days Creek project were recommended, the recommendation would include a stipulation that construction not be started prior to completion of detailed studies of the turbidity problem. Those studies would have to confirm the lack of potential for significant turbidity or show that appropriate preventive measures could be taken or it would not be appropriate to expect the realization of fishery benefits as now anticipated. Without those benefits, economic justification would be lacking. The interagency group also concluded that, as soon as the Corps of Engineers' study had progressed sufficiently, project data would be furnished to the concerned agencies as a basis for preparation of appropriate impact reports. These sheets constitute the agreed-upon project information data.

2. Schedule for Completion of Studies

There is continuing support and pressure, in Umpqua River Basin and through the office of Congressman John Dellenback, for early completion

of the Umpqua study and submission of a report thereon. Those pressing for early completion and apparently favoring construction of a project at the Days Creek site include the Douglas County Court, the Umpqua Watershed Resources Development Association, and a newly formed and highly vociferous local group known as "Women for Dams." In view of the strong local desire, as expressed directly by those organizations and by them through Congressman Dellenback, the report has been scheduled for completion and submission in December 1971. That date is the latest on which a report can be submitted with expectation of congressional action in 1972. Later submission would entail a 2-year delay awaiting such action in 1974.

3. Days Creek Project

Days Creek Dam, as shown on the attached map, would be located just upstream from the town of Days Creek on South Umpqua River in Section 21, Township 30 South, Range 4 West, Willamette Meridian. The project, as now planned, would be constructed and operated for control of floods on South Umpqua River and to store water for use during the summer months for the purposes of fish and wildlife enhancement, recreation, water supply, water quality control, and irrigation. Power generation apparently would not be economically justifiable, and the project would have no navigation benefits. In order to determine the most appropriate scale of development, three reservoir sizes have been investigated. Those sizes, and the accompanying project operations and effects, are referred to in these data sheets as Plans I, II, and III. Plan I would provide a reservoir with a total capacity of 365,000 acre-feet and a water surface area of 3,700 acres at maximum conservation pool. Plan II would provide a total capacity of 480,000 acre-feet with a surface area of 4,270 acres at maximum conservation pool. Plan III would provide 605,000 acre-feet with a surface area of 4,850 acres at maximum conservation pool. The ensuing attachments show (1) most-probable pool elevations when the project is

operated for flood control and to provide benefits from downstream uses of stored water during the summer months; (2) data on storage and reservoir areas vs. pool elevations; (3) flow regimen and temperatures for improvement of fish habitat downstream from the dam; (4) releases which, with return flows, would be available for irrigation; and (5) economic data, based on information now available.

a. Plan I. - Plan I, with 365,000 acre-feet of storage space, could be operated to control a 25-year flood at site. Water stored in space required for that degree of flood control, and available for multiple-purpose use, would amount to 200,000 acre-feet. An additional total of 90,000 acre-feet could be used to meet requirements for temperature control and/or to supplement the capability of the 200,000 acre-feet of flood control and multiple-purpose storage to meet downstream needs for water in years of low runoff. The amount of storage available to provide dependable increased low-water flows, and the capability of the project to provide those flows at low temperatures at the damsite, would be substantially less than under Plans II or III. Assuming, as in the case of the authorized Rogue Basin storage projects, that available water supply would be shared among all uses in the same proportions as for a full supply, use of Plan I would entail shortages in 9 years out of the 40-year period studied. Maximum shortage would be 67 percent, with shortages of 40 percent in 2 years and 56 percent in one other year. The shortages could be reduced to 7 out of the 40 years with a maximum shortage of 40 percent by withdrawing water which normally would be reserved for temperature control. Under those conditions, releases to the river might have temperatures slightly in excess of 58° F., during July, August, and September in low-water years. With releases, for the period June through September, of 600 to 800 c.f.s., release temperatures as high as 58° F., and some lack of dependability in providing fishery flows, fishery enhancement capability apparently would not be great.

b. Plan II. - Plan II, with 480,000 acre-feet of storage space, would be operated to provide at-site control of a 100-year flood. Water stored in space required for that degree of flood control, and available for multiple-purpose use, would amount to 275,000 acre-feet. An additional total of 130,000 acre-feet could be used to meet requirements for temperature control and/or to supplement the capability of the 275,000 acre-feet of flood control and multiple-purpose storage to meet downstream needs for water in years of low runoff. The amount of storage available to provide dependable increased low-water flows, and the capability of the project to provide those flows at low temperatures at the damsite, would be substantially greater than for Plan I but less than for Plan III. Assuming, as in the case of the authorized Rogue Basin storage projects, that available water supply would be shared among all uses in the same proportions as for a full supply, use of Plan II would entail shortages in 7 years out of the 40 years studied. Maximum shortage would be 69 percent, with shortages of 30, 40, and 44 percent in three other years. The shortages could be reduced to 6 out of 40 years with a maximum shortage of 48 percent by withdrawing water which normally would be reserved for temperature control. Under those conditions, releases to the river would have maximum temperatures of about 54° and 56° in average and low-water years, respectively. With dependable releases for the period June through September of 750 to 950 c.f.s., and with release temperatures in the order of 54° to 56° maximum at site more dependably assured by increased temperature control storage, the project apparently would be capable of making substantial improvements in fish habitat downstream to the confluence with North Umpqua River and the fishery enhancement effect of the project would be more dependable, and apparently significantly greater, than for Plan I.

c. Plan III. - Plan III, with 605,000 acre-feet of storage space, could be operated to control a 400-year flood at the site. Water stored in space required for that degree of flood control, and available for multiple-purpose use, would amount to 365,000 acre-feet. A total of 165,000 acre-feet could be used to meet requirements for temperature

control and/or to supplement the capability of the 365,000 acre-feet of multiple-purpose storage to meet downstream needs for water in years of low run-off. The amount of storage available to provide dependable low-water flows, and the capability of the project to provide those flows at low temperatures at the damsite, would be greater than for either Plan I or Plan II. However, the cost of providing that increased amount of storage would be substantially greater than apparently could be justified by the available increment of benefits. Thus, unless fishery, flood control, and other benefit data considerably different from those now available would be a possibility, the cost of adding a 125,000 acre-foot increment of capacity to the Plan II level of development would not be justified.

Assuming, as in the case of the authorized Rogue Basin storage projects, that available water supply would be shared among all uses in the same proportions as for a full supply, the adoption of Plan III would entail shortages in 6 years out of the 40 years studied. The maximum shortage would be 54 percent, with shortages of 39, 35, and 32 percent in three other years. Use of the modified operational schedule mentioned for Plan I and Plan II would not reduce the number of years in which shortages would be experienced, but would reduce the maximum shortage to 31 percent. For Plan III releases to the river in the period June through September would be from 900 to 1,100 c.f.s. and temperatures would be approximately 52° regardless of which operating schedule would be used.

d. Proposed Plan. - Our studies, based on preliminary fishery and other need and benefit data developed by the Corps and furnished by other agencies for comparative analyses, indicate that the Plan II reservoir, with a total capacity of 480,000 acre-feet, would have the capability to control a 100-year flood; capability to provide increased flows up to 950 c.f.s. during the low-water season as well as serving municipal, industrial, and irrigation needs; and capability to develop substantially the optimum recreation potential of project lands and waters. Also, it would provide a significantly greater excess of benefits over costs than for

larger or smaller projects. Subject to final analyses by other agencies of its nature and operating characteristics, it appears best suited overall for recommendation as a means of serving the water-associated needs of South Umpqua River and Umpqua River Basin at this time. Confirmation of that tentative conclusion will depend on finally available data, particularly on the increments of benefits available for fishery and recreation functions, between Plans I and II.

Turbidity Clouds Days Creek Dam's Future

By BON AUCUTT
Of The News-Review

Turbidity raises its dirty head as "impact" reports on the proposed Days Creek Dam for the South Umpqua River near completion.

Surfacing with the problem are disclosures that three public agencies fear the dam's reservoir may be turbid and that the sponsoring U.S. Army Corps of Engineers definitely plans to make an extended soil study if the Days Creek project is approved by Congress.

Early August is now set as the target date for assembling a series of 11 "impact" reports requested from state and federal agencies by the Corps on its Days Creek project.

The important date approaches. But as the South Umpqua begins to experience its low summer flow, three letters received by the Myrtle Creek Chamber of Commerce cloud the river's future.

The Myrtle Creek organization wrote to all 11 agencies now preparing "impact" reports.

Three Replies

Three replies have confused Myrtle Creek chamber members and other Douglas County residents who have been extremely optimistic about the project which would impound 480,000-acre-feet of water just upstream from the town of Days Creek.

The state Department of Environmental Quality, the state Game Commission and the Environmental Protection Agency's water quality office all warned by letter that the 4,300-acre reservoir might have a serious turbidity problem.

Kenneth Spies, director of the Department of Environmental Quality (DEQ), recommended further studies to determine what possible turbidity might result from construction of the 170-foot high dam and its reservoir.

John W. McKean, Game Commission director, cited concern that upstream clay deposits might destroy clarity.

The water quality office for the Environmental Protection Agency (EPA), the federal environmental bureau, also recommended additional studies.

Thursday, Joe Heidel, Corps' Umpqua basin planning chief, acknowledged that "some agencies have expressed the fear of the possibility of turbidity."

Corps' Study

Heidel said the Corps will study this murky possibility.

The study will be made after Congress authorizes and appropriates fund for the entire project. Heidel said such a study may take two years then added that turbidity studies are based normally on two full water cycles.

Since the Corps is committed to submitting a finished report by December of this year, the 11 agencies have agreed to complete their reports if the study is done later.

In effect, this means that if Congress approves the project in 1972, then appropriates an estimated the $100 million during the 1973 session, the Corps will use a small portion of this money for the two-year study. Depending on when Congress appropriates funds, actual construction may be delayed until 1975 at the earliest.

But the reason for this projected delay is important. The soil study will determine

(Continued On Page 2)

Government Agencies Eye Damsite Turbidity Factor

(Continued From Page 1)

whether or not an approved multiple-use dam can be built.

If built, the dam would control floods and store water for use during summer months for water supply, water quality control, irrigation, recreation and fish and wildlife enhancement.

Two Affected

Unclear, murky water affects the latter two of the multiple uses.

Turbid water is bad for recreation. It limits swimming and cuts into fishing success. And, as far as fish and wildlife enhancement is concerned, turbid water affects the base of the "food chain" for fish.

Ralph Grenfell said dark, unclear water prevents light from reaching underwater aquatic plants. Insects feed on aquatic plants. Small fish eat the insects. Large fish eat the smaller fish. And these larger fish include the ocean-going salmon and steelhead trout. Cool and constant flowing water from the Days Creek reservoir is supposed to improve the anadromous fishery in the South Umpqua.

Even if the water from the reservoir lost its turbidity after it left the giant pond, the salmon and trout would still have to pass through the 13-mile reservoir.

Grenfell, assistant supervisor for the Game Commission's Southwest Regional Office in Roseburg, cited problems with the Corps' Hills Creek Reservoir on the Willamette River.

Heidel also cited turbidity in the Hills Creek Reservoir, one of 13 impounded by Corps-built dams in the Willamette Valley. The Corps is now sponsoring an Oregon State University study to find out what the exact implications of murky water are and how the condition can be predicted.

Officials Comment

Thursday, officials for two of the objecting agencies explained the reasons for concern about the Days Creek project.

Jack Weathersbee, DEQ deputy director, said the state environmental agency recognizes the need for augmenting the South Umpqua's flow, but questions the stability of soils in the reservoir area.

Weathersbee said the DEQ did not raise a new "question." Rather, said the official, the agency acknowledged the issue in the Myrtle Creek letter. He said turbidity interferes with recreation and sport fishing.

According to Weathersbee, the DEQ doesn't intend to be an obstacle. "We fully expect the matter will be resolved," he said.

"It appears that if this turbidity does appear at the level of its potential, it could be a problem," commented a less optimistic Harold Gerren, acting director of river basin planning for the EPA.

Gerren said a November 1970 report to the Corps identified the possible turbidity problem. This report was based on an earlier study that revealed landslide potential in the Tiller area and later reports from the U.S. Geological Survey which indicated unstable soil in the projected reservoir area.

After this report was submitted, several agencies met with the Corps to discuss the matter. An agreement was made, said Gerren, to complete "impact" reports with the stipulation that soil studies be made before construction started.

Specific Problems

Commenting on specific problems, Gerren mentioned wind action along the reservoir shoreline and the possibility that reservoir turbidity would result from flood waters. He also mentioned erosion caused by logging operations in the area, but said this could be controlled.

Gerren said the EPA's comment in the Myrtle C[illegible] letter was based on "[illegible] preliminary type studies." He also said, "The re[illegible] could be filled with highly [illegible] water."

"We're not opposed to the project, but we feel this definitely should be looked at some more," remarked Gerren.

Sutherlin's George Stubbert, chairman of the Umpqua Watershed Resources Development Association, noted that these comments did not come from the agency (Corps of Engineers) designing the project. "In their position of being environmentalists, this will happen on all reservoirs."

Stubbert said the local association, which actively supports the Days Creek project, will discuss the turbidity issue with Corps representatives at its Aug. 3 meeting.

For Douglas County residents who have been subject to South Umpqua floods for many years (including one last January), the matter of poor recreation and fish and wildlife enhancement benefits from the project may seem secondary.

But Heidel said a large portion of the "benefit" side of the all-important "cost-benefit" ratio depends on these two factors.

Heidel concluded that if the soil study reveals a definite possibility of turbidity, the Days Creek project could "wash it" out as an economic possibility. The project would lose its economic justification.

Heidel said the Corps would definitely not construct a dam if the backed-up water in the reservoir might be turbid.

Tiller In 1968

In 1968, the Corps quit a proposed dam site near Tiller because studies showed the soil to be unstable. Stubbert said, "The Tiller site evidently showed possibilities of turbidity," then added that the Days Creek site is better.

Heidel concurred with this opinion. He said Days Creek is in a different geological zone, and the soil is firmer and more stable.

In September 1[illegible], Charles Collins, then county water resources coordinator, noted the existence of similar soil conditions in the Umpqua basin and the Hills Creek Reservoir area. One year later, the Tiller site was abandoned in favor of the Days Creek area.

The Myrtle Creek letters have revived an old problem.

APPENDIX

TABLE I

ESTIMATED COSTS OF REPLACING EXISTING FACILITIES AND SERVICE, MITIGATION MEASURES, AND ADMINISTRATIVE AND PROTECTIVE SERVICES

A. Facilities and Mitigation Required:

	Units	Cost
1. Buildings		
Residence	17	$393,000
Office	1	140,000
Barracks	2	39,000
Warehouse	1	29,000
Mechanics Shop	1	9,000
Open Storage	1	9,000
Gas and Oil House	1	5,000
Tree Storage Building (Moving only)	1	2,000
2. Roads and Trails		
Station roads		$20,000
3. Water and Sanitary Facilities		
Water Systems		$140,000
Sewage Disposal System		180,000
4. Communication Facilities		
Relocation of base radio, antenna, and needed relay	1	$3,500
5. Other Facilities		
a. Landscaping on Station Complex		$15,000
b. Trailerhouse Sites	6	6,000
c. Scaling Station Ramp	1	2,000
6. Land Acquisition		
Ranger Station Site	30 acres	$20,000
Land for Scaling Station	7 acres	1,500

		Unit	Cost
7.	Corner and Land		
	Line Referencing and Relocation		$3,500
8.	Site Plan for New Administrative Site		$7,000
9.	Contingency allowance - 10%		$102,000
		Sub Total	$1,126,500

APPENDIX

TABLE 2

ESTIMATED COSTS OF PROVIDING FACILITIES AND SERVICES TO MEET PROJECT RELATED USES

A. New facilities to provide normal expected basis protection and services of public health, safety and property, as applicable.

1. Public use, access, and management facilities.

a. Campgrounds, picnic sites and [illegible] facilities.

(1) Threehorn Campground Reconstruction and 9 additional units		$46,000
(2) Proposed CCC Site 20 units		60,000
(3) Additional proposed site on Highway 227 20 units		60,000

2. Soil stabilization, cover improvement, and debris abatement.

a. Soil stabilization Water Division	50 miles	$ 12,000
b. Tree and shrub planting, grass seeding	100 acres	158,000
c. Debris abatement	2[illegible]	20,000
3. Contingency allowance		$35,000
Sub Total		$ 391,000

B. Administrative Services

1. Advance planning (including recreation site planning and administrative site planning)	9 man-months	$ 11,000
2. Liaison and additional administrative services during construction	48 mon-months	$ 56,000
3. Contingency fund		$ 7,000
Sub Total		$ 74,000
Grand Total		$ 465,000

Exhibit 3

FOREST SERVICE

CCOMPLISHMENT AND PLANNING SUMMARY
TER RESOURCE DEVELOPMENT PROJECTS

(Ref: FSM 2572.1)

REGION(S)	FOREST(S)	STATE(S)	COUNTY(IES)
6	Umpqua	Oregon	Douglas

PROJECT NAME	PROJECT COSTS	PROPONENT
Days Creek Dam and Reservoir	$100 Million Est	Corps of Engineers

VOIR (NORMAL POOL) Est.
ity 480,000 (Acre Feet) Surface 3,300 (Acres)

TRIBUTARY WATERSHED
Name(s) South Umpqua R. Jackson CR. Elk Cr.
Number(s) 63615-007, 008,009
Total Area 367,000 (Acres) N.F. Area 319,000 (Acres)

PREPARED BY (NAME)	TITLE	DATE	APPROVED (SIGNATURE)	TITLE	DATE	RESERVOIR (DAM) NO.
Las Hughes	Hydrologist	7-21-71				06-25-04

B	C	D	E	F	G	H	I	J	K	L	M	N
									WRDRA FUND			
	Unit of Measure	Total Planned		Accomp. FY 19 71	Plan. FY 1972	Left To Accomp.	Target Date to Complete	Date Job Completed	FY 19 73		FY 19	
		No. Units	Needs (M$)	No. Units	No. Units	No. Units			Needs (M$)	No. Units	Needs (M$)	No. Units
IMPACT SURVEY & CONST. LIAISON												
1. Impact Survey & Report	%	100	16.3	10	15	0	8/71					
2. Watershed Treat. Analysis Appen. *	M Acres	283	34	*	*	*	6/76		-			
3. Area Recreation Plan Appen. Mgt. Composit No. (_____)	%	100	1									
4. Construction Liaison	%	100	56									
5. Memorandum of Understanding	No.		1									
6. WRDRA Subtotal (1-5)									-		-	
LAND ADJUSTMENTS												
7. Interchange, Transfer, etc.	M Acres											
8. Acquisition (To NF Status): a. L&WCF	M Acres											
b. Weeks Law	M Acres											
c. Exchange	M Acres	0.04										
PUBLIC USE AND ACCESS FACILITIES FOREST SERVICE												
9. Site Planning and Design **	Sites	2	7									
	M PAOT	160										
10. Installation	Sites	3	156									
	M PAOT	236										
CONCESSIONAIRE												
11. Prospectus	%	100										
12. Installation	Sites											
	M PAOT											
ADMINISTRATIVE & MGT. FACILITIES												
13. Design	Sites	1	7									
14. Installation	Sites											
15. WRDRA Subtotal (9-14)												
F.S. TRANSPORTATION FACILITIES												
16. Road Construction	Miles											
17. Trail Construction	Miles											
18. Total (FR&T Funds)												
TRIBUTARY LAND TREATMENT *												
19. Watershed Treatment Prescription	M Acres											
20. Gully Stabilization	Miles											
21. Sheet Erosion Control	Acres											
22. Streambank Stabilization	Miles											
23. Reservoir Shore Stabilization	Miles											
24. Stream Channel Clearing	Miles											
25. Rehab. of Abandon Roads & Trails	Miles											
26. Mine Restoration	M Acres											
27. Sediment Basin Construction	M Acre Feet											
28. Lake Shore Clearing	M Acres											
29. Water Yield Improvement	M Acres Miles											
RESERVOIR OPERATION												
30. Sweeping	M Acres											
31. Aquatic and Noxious Week Control	M Acres											
32. Vector Control	M Acres											
33. Other (Identify):												
34. WRDRA Subtotal												
35. WRDRA Total (Line 6+15+34)									-		-	
36. Grand Total (Line 7+8a+8b+8c+18+35)									-		-	

REMARKS: * A reconnaisance level hydrologic survey will be written in F.Y. '72 covering the entire area. This inclu a low intensity sample of restoration needs. An intensive restoration survey is planned following alloca construction funds.

** The Threehorn Campground expansion and reconstruction already has a site plan, but it is probable that WR will be needed for construction.

Exhibit 3

REGION(S)	FOREST(S)	STATE(S)	COUNTY(IES)	CONG. DISTRICT(S)	CENSUS REGION	File: 257(
6	Umpqua	Oregon	Douglas	4	1	

PROJECT NAME	PROJECT COSTS	PROPONENT	MANAGING AGENCY	PERTINENT DOCUMENTS
Days Creek Dam and Reservoir	$100 Million Est	Corps of Engineers	COE, Douglas Co.	---

TRIBUTARY WATERSHED Name(s)	Number(s)	Total Area	N.F. Area	DATE:
South Umpqua R. Jackson CR. Elk Cr.	63615-007, 008,009	387,000 (Acres)	310,000 (Acres)	Planning Authorized 1963; Construction To Begin 19__; Construction Authorized 19__; Reservoir To Fill 19__

DATE	APPROVED (SIGNATURE)	TITLE	DATE	RESERVOIR (DAM) NO.
7-21-71				06-15-04

D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Total Planned		Accomp. FY 1971	Plan. FY 1972	Left To Accomp.	Target Date to Complete	Date Job Completed	WRDRA FUNDING REQUESTS AND PLANNED ACCOMPLISHMENTS											
							FY 1973		FY 1974		FY 1975		FY 1976		FY 1977		FY 1978	
No. Units	Needs (M$)	No. Units	No. Units	No. Units			Needs (M$)	No. Units	Needs (M$)	No. Units	Needs (M$)	No. Units	Needs (M$)	No. Units	Needs (M$)	No. Units	Needs (M$)	No. Units
100	16.3	10	15	0	8/71													
283	34	*	*	*	6/76						8	183	5.5	100				
100	1										1	100						
100	56										14	25	14	25	14	25	14	25
	1																	
							-		-		23		19.5		14		14	
0.04												0.04						
2	7										1.5	1	1.5	1				
160												80		80				
3	156										46	1	60	1	60	1		
236												76		80		80		
100																		
1	7										7	1						
											54.5		64.5		60			
							-		-		77.5		81		74		14	
							-		-		77.5		81		74		14	

ic survey will be written in F.Y. '72 covering the entire area. This includes only
oration needs. An intensive restoration survey is planned following allocation of

sion and reconstruction already has a site plan, but it is probable that WRDRA funds
n.

REVIEW REPORT
ON
UMPQUA RIVER AND TRIBUTARIES, OREGON
INTERIM REPORT, SOUTH UMPQUA RIVER

APPENDIX J

REPORT OF THE NATIONAL PARK SERVICE

A REPORT ON THE ARCHEOLOGICAL POTENTIAL OF THREE PROPOSED RESERVOIRS IN THE SOUTH UMPQUA RIVER DRAINAGE, OREGON

SUBMITTED TO THE
NATIONAL PARK SERVICE
WESTERN REGION
U.S.D.I.

by

THOMAS M. NEWMAN
DANIEL J. SCHEANS

PORTLAND STATE COLLEGE
PORTLAND, OREGON

February 4, 1966

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PLATES

MAPS

I: INTRODUCTION

This report will detail the results of a survey of the archeological potential of three proposed dam projects in the South Umpqua River area done for the National Park Service at the request of the U. S. Army Corps of Engineers. The three proposed projects are the Tiller and Days Creek Projects, both on the South Umpqua River, and the Galesville Project on Cow Creek, a tributary of that river. The three dams planned for the projects will impound water in three reservoirs which will, in turn, cover much of the land along and adjacent to the present rivers. Additionally, the projects will also initiate an extensive road building program around the reservoirs that could, along with the reservoir waters, destroy much of the archeological potential of the area. For these reasons the survey covered all accessible areas that would be damaged by the projects.

The survey of the proposed reservoirs was undertaken from December 27 through December 31, 1965, by Thomas M. Newman and Daniel J. Scheans of the Department of Anthropology, Portland State College. It was hampered, unfortunately, by heavy snow and rainfall during much of the time involved. The Tiller reservoir area was covered by varying amounts of snow during the entire tenure of the survey, a circumstance which local residents assured us was quite unusual for this time of the year. The Days Creek reservoir area, downstream from the Tiller Reservoir, had little snow cover; instead most of its flat areas were covered with standing water or were excessively marshy. December 31, the day reserved for survey of the smallest reservoir, the Galesville project on Cow Creek, found the main highway at Canyonville blocked by snow and accidents, forcing cancellation of this survey. Local informants were questioned about the Cow Creek area but were unable to suggest any known site locations in the immediate vicinity of the proposed reservoir. Consequently, it is felt that the Galesville Reservoir is of little archeological significance, however, an effort will be made to confirm this suspicion in the future.

The survey was conducted in a traditional manner which involved (1) investigating on foot potential and suggested site locations, and (2) talking with local informants about artifacts recovered locally and about known collecting localities. Because of weather conditions the extensive use of informants was required -- and, quite candidly, it was because of their knowledge that a successful conclusion of the survey was possible. This is particularly true of Mr. Robert D. Clauson and Mr. H. M. Lilligren at the Tiller Ranger Station. Indeed, these two men have located and identified more sites in the Tiller area than would have been discovered during any short survey. Mr. Clauson accompanied us during one day of the survey, pointing out a number of sites, and offered invaluable advice on other occasions. Mr. Lilligren in addition to his extensive private collection, has carefully kept intact another impressive collection of artifacts from the Jackson Creek region in the Tiller Area. Other residents of the area who

provided advice and assistance include Mrs. Nellie Crispen, Mr. Wayne Grimes, Mr. and Mrs. Bill Lewis, Mr. Mike Martin, and Mr. Ira Pool.

II. THE AREA AND ITS SETTING

The total environmental picture of the Tiller and Days Creek Reservoir areas, in Douglas County, Oregon, is roughly similar except for a few differences which will be noted. The Tiller Reservoir is at a higher elevation and was largely snow covered during the time of the survey, while the Days Creek area had little snow on the ground, and this only in the morning. The Tiller Reservoir area is also characterized by narrower valleys, steeper hillsides, smaller, discontinuous terraces and benches along the river, and by a heavier tree cover. In all probability, however, the absence of trees in large parts of the Days Creek Reservoir may simply be a function of a larger population, more intensive land-use, and heavier cutting of timber outside the National Forest.

Ecologically both reservoirs are in a transitional zone since the Douglas Fir biome and Sugar Pine biome are represented in each area. Also represented are at least twenty species of conifers, sixteen species of hardwoods, grasses and various low-growing cover plants. The fauna includes bear, deer, bobcat, porcupine, and a number of smaller species. Trout, salmon, and steelhead are to be found in the river.

A majority of the sites in the Tiller and Days Creek Reservoir area are located within a short distance of either the South Umpqua River or it's tributary streams. The single exception to this pattern is a large site in the Jackson Creek area which is away from the main creek on a small spring-fed stream. Our observations correspond with those of both Mr. Lilligren and Mr. Clauson who feel that, at least for the Tiller Reservoir area, small "flats" (open patches of ground) on the first and second terraces above the river contain virtually all of the main sites in the Reservoir.

III. THE SITES

A: The Tiller Reservoir

Site 1. Location: NW. ¼ of NE. ¼, Sec. 4, T. 30 S., R. 1 W.
The site is located on a small knoll immediately south of the present road up the South Umpqua river. The bulk of the site occupies an area of approximately 100 x 40 feet between the road and the river. Forest Service maps show that it is on private property and the owner's attitude towards excavation could not be determined since the title is vested in a land-holding company. The site is undisturbed and its contents known only from surface collections. The materials recovered consist solely of flaking debris and miscellaneous chips of obsidian, red jasper and green jasper.

Site 2. Location: SW. ¼ of SE. ¼. Sec. 33, T. 29 S. R. 1 W.
This site, about 500 yards northeast of Site 1, is in a logged over area characterized by numerous tree stumps and some ground cover. Cultural materials have been recovered from an area approximately 150 x 450 feet. The site is easy of access and there is a small spring at its south end. We were told that when there is no snow an old cabin site is observable near the site. Local collectors have recovered projectile points, scrapers and knives from the site. Most of these were made from red jasper. As in the case of Site 1 no excavation has taken place although logging did disturb the area. In the disturbed areas the soil appears to be quite deep for a site of this type so near to the river. This might indicate that a "deep" site is in the offing and that extensive excavation is called for.

Site 3. Location: Center of SW. ¼ of Sec. 33, T. 29 S., R. 1 W.
Site 3 is on a small (one acre) flat overlooking the South Umpqua River. The site proper covers an area of approximately 60 x 30 feet. It is best identified by its relationship to a large rock in the river immediately to the east and a marked bend in the road immediately to the west. At present a heavy, but spotty, blackberry bush cover is found on the site. Local collectors have done some testing on it and these showed that the site soil is fairly deep. From those tests and from the surface they have recovered projectile points, scrapers, and a mortar and pestle. In addition to these promising indications the site is near the Acker Divide and a reported aboriginal trail that connected the Tiller area to regions farther south. For these reasons the site, while not a large one from surface indications, appears to be potentially of some importance.

Site 4. Location: NE. ¼ of NE. ¼ Sec. 33, T. 29 S., R. 1 W.
Access to this site is by way of BLM road 284 D which parallels Radford Creek. The site is east of the road on a ridge that slopes southeast from the high ground above the river to the South Umpqua River road. Flakes of obsidian, red jasper, green jasper, and quartzite

have been recovered from an area on the ridge that measured approximately 700 x 150 feet. The soil on the ridge is both thin and rocky and the wide scatter of materials would indicate that the site was probably a chipping station or temporary camp. A similar situation exists immediately to the east of the ridge in Sec. 34 at another small site, that was not numbered.

Site 5. Location: SE. ¼ of NW. ¼, Sec. 27, T. 29 S., R. 1 W.
Site 5 is located about 600 feet up the Straight Creek road from its junction with the South Umpqua River Highway. It occupies an area of about 1/10 of an acre on the north side of the road. This small flat was used in the past as a logging platform and the area is somewhat disturbed. It has, however, produced numerous flakes of obsidian and jasper and it is likely that the main site area was not covered by the survey.

Site 6. Location: SW. ¼ of SE. ¼, Sec. 22, T. 29 S., R. 1 W.
This site is conveniently located on the Dumont Creek Campground. Construction of the campground showed that the soils on the site were fairly deep. It is reported that after every rain obsidian and jasper chips may be observed throughout the campground in an area approximately 300 x 100 feet. Finished artifacts from the site include the usual projectile points and scrapers.

Site 7. Location: NE. ¼ of SW. ¼, Sec. 13, T. 29 S., R. 1 W.
This is another site located on a campground -- Boulder Creek Campground. It lies just outside of the pool limits but will be disturbed during the course of construction, road building etc. It is well worthy of excavation since it has yielded small projectile points that are characteristic of areas to the north -- The Columbia River and the Plateau.

Site 8. Location: SE. ¼ of NE. ¼, Sec. 23, T. 29 S., R. 1 W.
A small site, on National Forest Land, at the confluence of Zinc Creek and the South Umpqua River. It has produced a number of obsidian chips and an occasional artifact.

Site 9. Location: SW. ¼ of SE. ¼, Sec. 7, T. 30 S., R. 1 W.
The site is located on the "Hunter Place" and has produced artifacts from a strawberry patch just east of the house on the property. Several projectile points were dug up there by a local collector, Mr. Dell Godby. The river just below the house forms one of the best known salmon pools in the Tiller area and it is possible that this might account for the presence of the site. A site similar to this one, but not visited, was reported by Mr. Godby on his place at the confluence of the River and Jackson Creek. He has recovered from it a number of projectile points. Its location is SW. ¼ of NW. ¼, Sec. 18, T. 30 S., R. 1 W.

Site 10. Location: NE. $\frac{1}{4}$ of SW. $\frac{1}{4}$, Sec. 22, T. 30 S., R. 1 W.

This site is located across Jackson Creek at its confluence with Beaver Creek. Since there is no road on that side of the river Jackson Creek would have to be crossed to reach the site. The area has been extensively logged in the past so that it is relatively clear at present and would not present any serious excavation problems. Those who have been on the site say that it was occupied in historic times. Since few of the collections from it show much in the way of trade goods it is equally probable that the site might also show a prehistoric occupation as well. Represented in the collections from it are an obsidian blade, several projectile points and numerous scrapers. The site is on private land and its owners could not be contacted during the survey.

Site 11. Location: W. $\frac{1}{4}$ of NW. $\frac{1}{4}$, Sec. 22, T. 30 S., R. 1 W.

This site is the largest encountered during the survey and measures at least one quarter of a mile north and south. Unfortunately, its width could not be determined because of snow on the ground. Its northern portion lies on the Forks of the River Ranch while its southern portion is on land owned by a landholding company, Cheney Forest products. Very little of the site is in the actual pool area, but a large segment of its southern part would be affected by wave action and by road building around the Jackson Creek arm of the reservoir.

While we have listed this locale for the purposes of the survey as a single site it seems quite likely that a more extensive examination of the area after it is free of snow would show that what we are dealing with is a series of campsites scattered up the hill away from the Creek. Cultural features of note in the site area are possible housepits represented by circular depressions approximately ten feet in diameter, areas of broken and burned deer bone, and a large number of artifacts indicative of a broad tool assemblage. Among these were several clay effigies which seem to represent cultural practices not normally found in this part of Oregon.

B: The Days Creek Reservoir

Site 1. Location: NW. $\frac{1}{4}$ of NE. $\frac{1}{4}$, Sec. 28, T. 30 S., R. 4 W.

The site is approximately 0.8 of a mile above the confluence of Beal Creek and the South Umpqua River. It is marked by a buried soil horizon that appears as a broad band of carbonaceous material in the bank of the creek. No artifacts were recovered from this location and for this reason it is best regarded as a tentative site. Such soil and/or occupation horizons are not unknown in many of the Early Man sites in the Northwest and for this reason the area should definitely be tested to determine if extensive excavation would be warranted. The site, however, like most in the Days Creek Reservoir is on private property and excavation probably could not take place until the Days Creek Project was fairly well under way.

Site 2. Location: Center of SW. ¼, Sec. 26, T. 30 S., R. 3 W.

Site 2 is under the present Milo Academy, a Seventh Day Adventist Boarding School in the Days Creek Reservoir area. This site was reported by a number of informants who had knowledge of it before the school was constructed, and it is said to have produced projectile points in the past. Mrs. Nellie Crispen reported that the site was last used in the late 1800's as a camp site of Umpqua Indians. It is believed that this site, located as it is on the second terrace above the river, may be one of the more important sites in this reservoir, but extensive work would have to wait until the land changed hands. Members of the Academy, while polite, did not express enthusiasm for a survey of the property, and the site area is now sodded or in pasture. One portion of the site appears to lie on a discernable first terrace and could be tested without disrupting the school. The majority of it could not.

Site 3. Location: NW. ¼ of SW. ¼, Sec. 25, T. 30 S., R. 3 W.

This site is at the old Milo Academy Youth Camp on a terrace about 40 feet above the present river. Mr. Grimes of Milo Academy reported that several artifacts or flakes had been found in this area in the past, and a single flake was noted directly across from the Youth Camp on the north side of the river. Permission to test or excavate here could probably be obtained without difficulty.

Site 4. Location: SW. ¼, Sec. 30, T. 30 S. R. 3 W.

This might be better called a "site area" rather than a site, since extensive cultural materials are to have been found in the vicinity of the confluence of Pool Creek and the South Umpqua River. The site area is on the south side of the river, and has been widely used as a source of artifacts in the past. Much of it has been plowed, resulting in the recovery of mortars, pestles, and bowls in addition to the inventory of chipped stone artifacts. Sweat houses are reported by Mr. Ira Pool, former District Ranger, but the presence of these could not be confirmed.

Site 5. Location: NE. ¼ of NW. ¼, Sec. 34, T. 30 S., R. 3 W.

This site is across the South Umpqua River from Milo, at the confluence of Stouts Creek and the South Umpqua River. A former Indian village is said to have been located at this site, but whether historic or prehistoric is unclear. Small artifacts, projectile points and scrapers, are known from this site, but are not abundant. Large ground stone materials including pestles and bowls are in the hands of private collectors in the area.

Site 6. Location: NE. ¼ of NW. ¼, Sec. 25, T. 30 S., R. 3 W.

This site is located in the pasture east of Mrs. Nellie Crispen's place on a large bend north of the South Umpqua River. Mrs. Crispen reported that several projectile points had been recovered there in the past, but they are now in a private collection in Canyon City. Heavy brush cover precluded our making a surface collection from the site.

Site 7. Location: N. $\frac{1}{2}$, Sec. 33, T. 30., R. 2 W.

In and immediately around the community of Tiller there are a number of sites. These sites are all on private property or on the land now occupied by the Tiller Ranger Station. Whether these sites will be inundated by the Days Creek Reservoir depends on the final decision about its pool elevation, but some of them will undoubtedly be damaged. A variety of artifacts from these sites are in the hands of private collectors, and those examined appear to represent one or more hunting and gathering cultures characterized by large projectile points, and related chipped stone artifacts.

IV. THE ARTIFACTS

It is beyond the scope of this survey to undertake any substantial analysis of the artifacts from the potential reservoir areas, but some note must be made of their possible importance. The variety of artifacts examined by us and the varied techniques used in their production are impressive. It has been suggested by Davis (1963) that a core and blade industry may be present in the South Umpqua Drainage, and we observed at least one flake which could well be a blade in the European sense of the term. Minimally, an effort should be made to determine whether such an industry is present, perhaps by examining a number of sites for evidence of prepared cores. There is also the possibility that a crude core chopper industry of some antiquity is present in the area. Whether it is related to other more sophisticated cultural materials or constitutes a separate industry should be determined. Recent suggestions in the anthropological literature of a "Pre-projectile Point Stage" render investigation of the circumstances surrounding such crude percussion flaked implements extremely important.

Projectile points in the collections examined are the most numerous artifacts, followed by scrapers and knives. These highly variable projectile points include types thought characteristic of many portions of the Northwest including the southern coastal region of Oregon, the Klamath Basin, the Cascades, the Plateau, the Columbia River, and the Great Basin. Their presence in the area surveyed is highly suggestive of wide connections in the Northwest for the South Umpqua Drainage and clearly has implications for the study of migration patterns in Southwestern Oregon and adjacent areas.

V. RECOMMENDATIONS

In our estimation a goodly portion of the archeological materials from the Tiller and Days Creek reservoirs could be salvaged during three field seasons: each lasting eight weeks during the summer of any given calendar year. Our specific recommendations in the order of their priority are as follows:

The Tiller Reservoir: This reservoir, according to the results of our survey, should prove to be the most productive archeologically. Consequently, it is recommended that two field seasons, of the three proposed, be expended there. The initial season would be devoted to the preliminary excavation and testing of a selected number of sites in order to determine the temporal and cultural range of the materials involved. Sites of particular importance are those numbered 2, 3, 9, 10, and 11. Of these Site 11 would seem to warrant particular attention, and if it is at all endangered by the project waters or construction work, testing in it should be given the earliest possible priority. The data gathered during this season, after its analysis during the winter months, would then be used as a guideline for the second seasons work. During that season, work would be concentrated upon those sites from which more in-depth detail is desired in order to present as complete a picture of the archeology of the reservoir as possible.

The Days Creek Reservoir: On the basis of our limited knowledge it seems likely that this reservoir contains fewer sites than does the Tiller Reservoir. Accordingly, we propose that one field season be devoted to the testing and limited excavation of a selected sample of sites in the Days Creek area. Since sites 1, 2, 4, and 5, presently appear to be the most promising --- they should be examined first. Demonstrated village sites would then receive the remainder of our attention.

In summary let us state that we are in essential agreement with the position taken by W. A. Davis in 1963 when he (with particular reference to what in this report is the Tiller Reservoir area) stated that:

> "The South Umpqua Ranger District, with its rich density of sites, technological specializations, and suggestions of antiquity, is an archaeological province with no know parallels to date in southwestern Oregon. The Umpqua National Forest has an unique opportunity to broaden the scope of its service to the public...(Wilbur A. Davis, Evaluation of the Archaeological Resources of the South Umpqua Ranger District, Umpqua National Forest, November, 1963)

I. Salaries:

A.	Director - 27% of annual salary ($9,200)	$2,564.00
B.	Foreman - $2.00 per hour, 40 hour week for 8 weeks	640.00
C.	Crew Members - six at $1.50 per hour, 40 hour week for 8 weeks	2,880.00
D.	Student Laboratory Assistants - two at $1.50 per hour, 10 hour week for 12 weeks (Winter)	360.00
	Subtotal (A,B,C,D)	$6,444.00
E.	Payroll costs - 8.2% of $6444.00	528.40
	Salary (I) Subtotal	$6,972.40

II. Field Expenses:

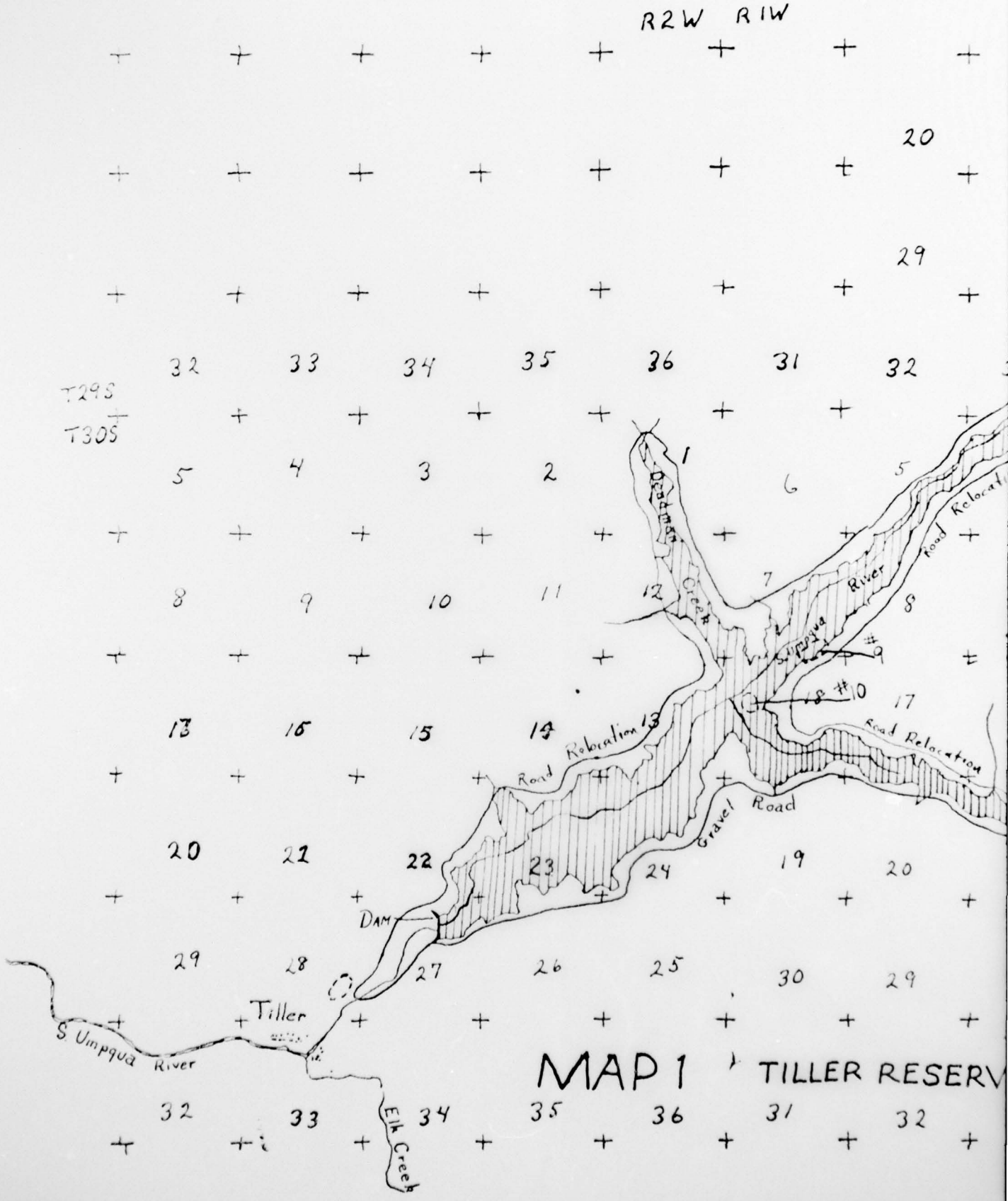
A.	Travel - 1500 miles at .05 cents a mile	$ 75.00
B.	Field support for staff - $1.50 per day for 56 days x 8	692.00
C.	Equipment maintenance and replacement	75.00
	Field Expenses (II) Subtotal	$ 842.00

III. Supplies:

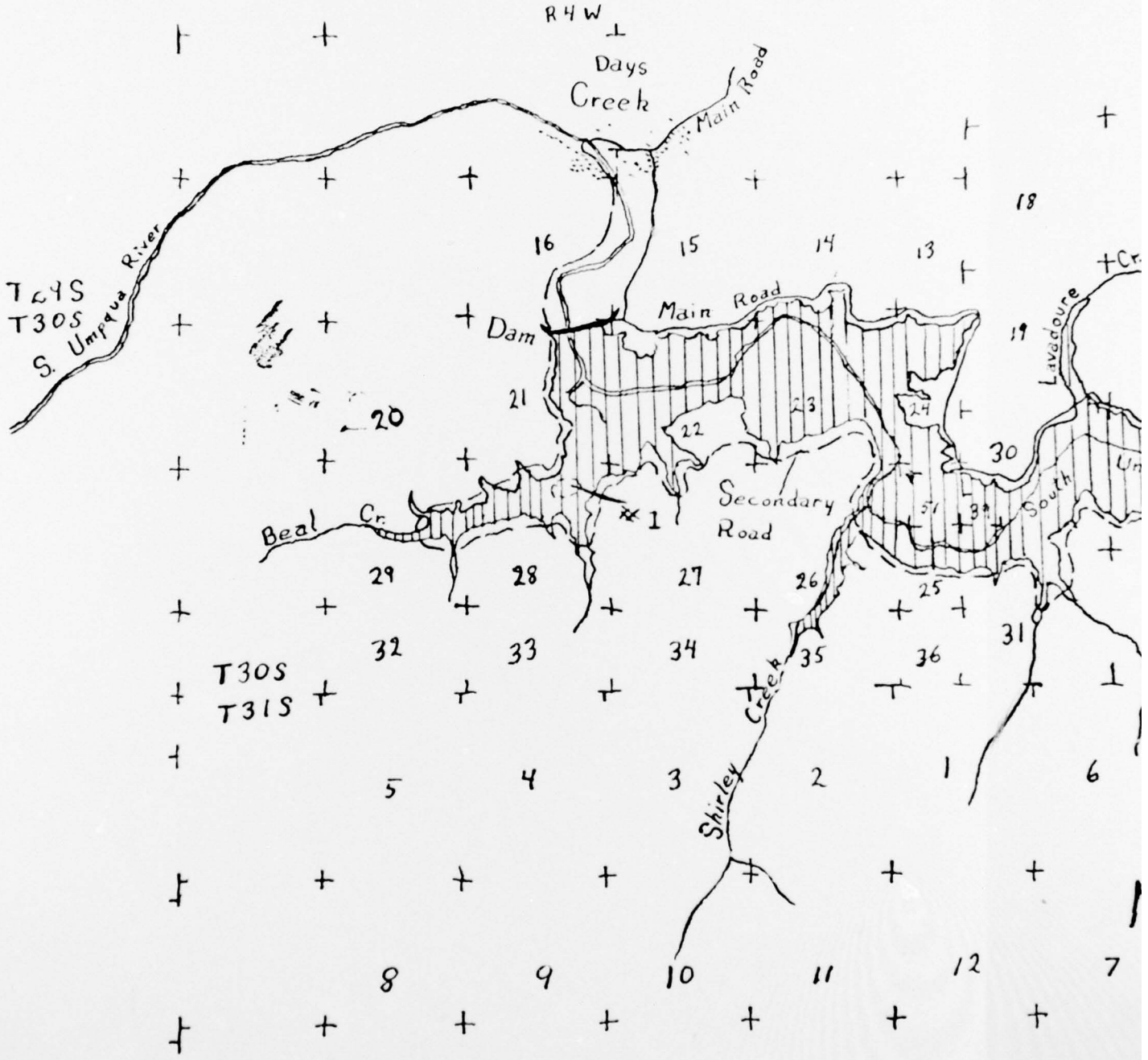
A.	Film	$ 40.00
B.	Photo Finishing	50.00
C.	Drafting Materials	25.00
D.	Maps and Aerial Photos	20.00
E.	Miscellaneous - Forms, Preservative and Storage Materials, etc.	15.00
	Supplies (III) Subtotal	$ 150.00

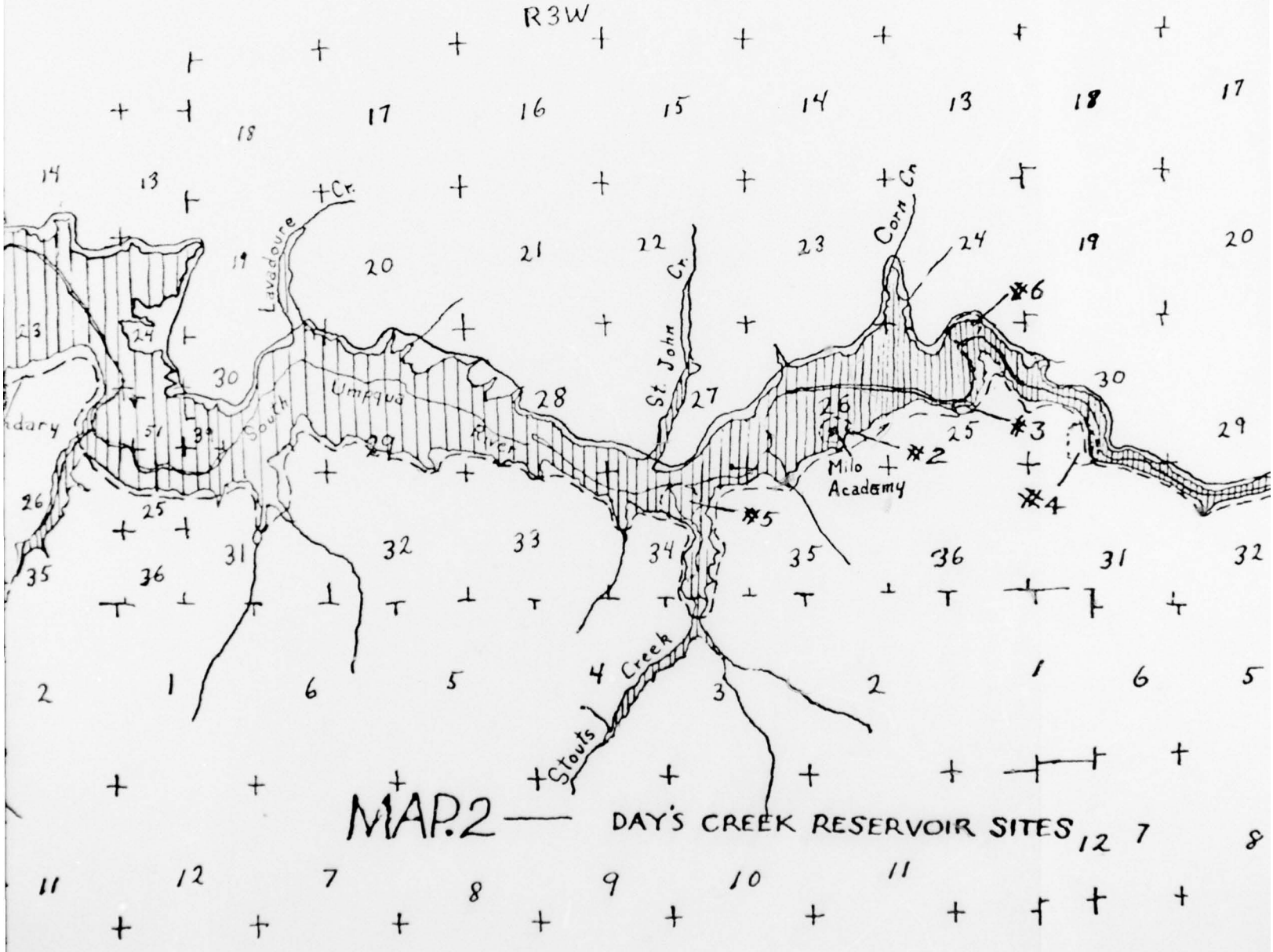
IV.	Printing of Reports	$ 100.00
V.	C14 Dates - two at $150.00	300.00
	Subtotal for I, II, III, IV, V	$ 8,364.40
VI.	Overhead costs - 25% of $8,364.40	2,271.10
	Total Budget	$10,455.50

Note: If the program of excavation recommended in this report is carried out (2 seasons in the Tiller Reservoir and one season in the Days Creek Reservoir) the total estimated budget for the three years involved would be $31,366.50.

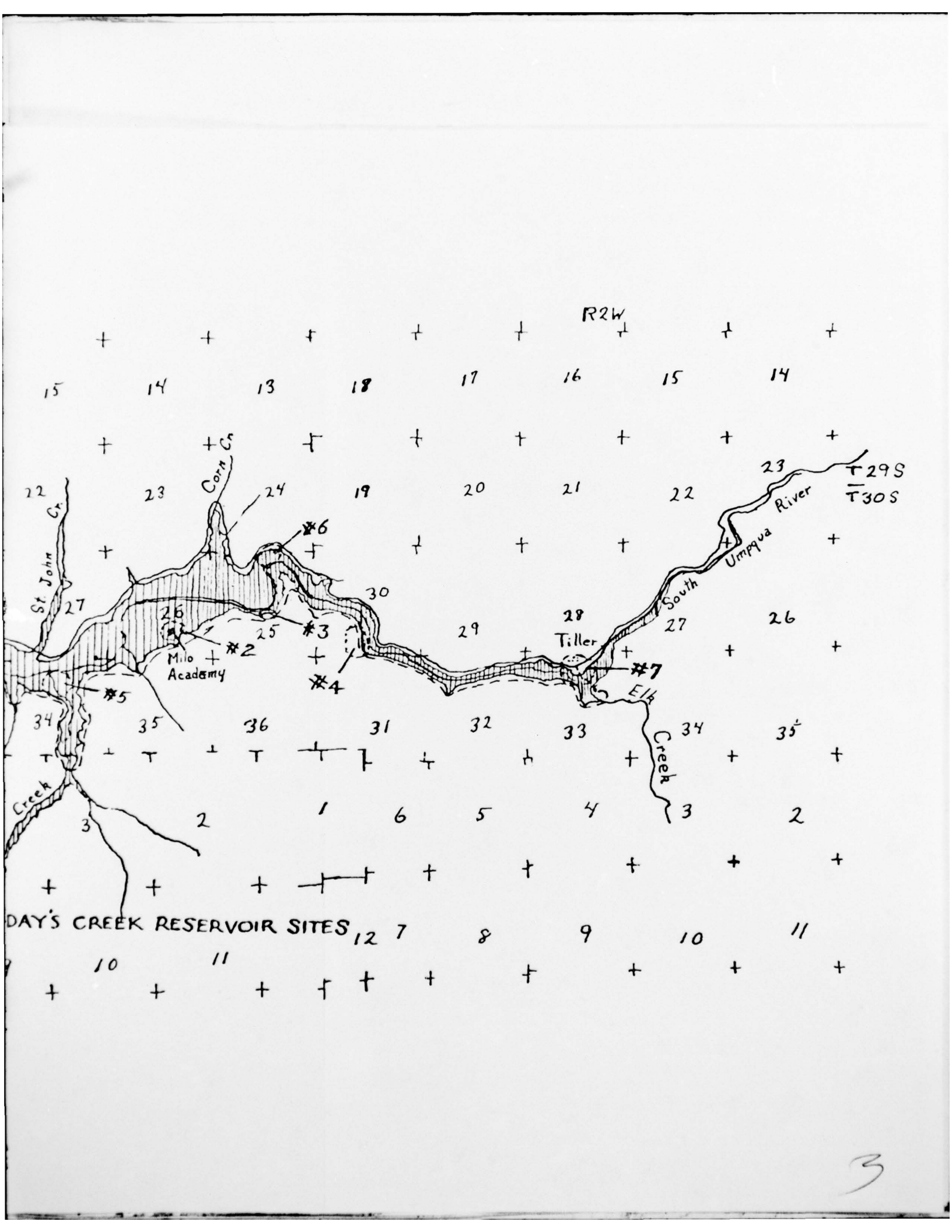

R2W R1W
T29S
T30S
Tiller
S. Umpqua River
Elk Creek
DAM
Road Relocation
Gravel Road
Road Relocation
Road Relocation
Creek
River
MAP 1
TILLER RESERV

MAP 1 TILLER RESERVOIR SITES


R4W
Days
Creek
Main Road
T24S
T30S
S. Umpqua River
Dam
Main Road
Lavadoure
Beal Cr.
Secondary
Road
South
T30S
T31S
Shirley
Creek

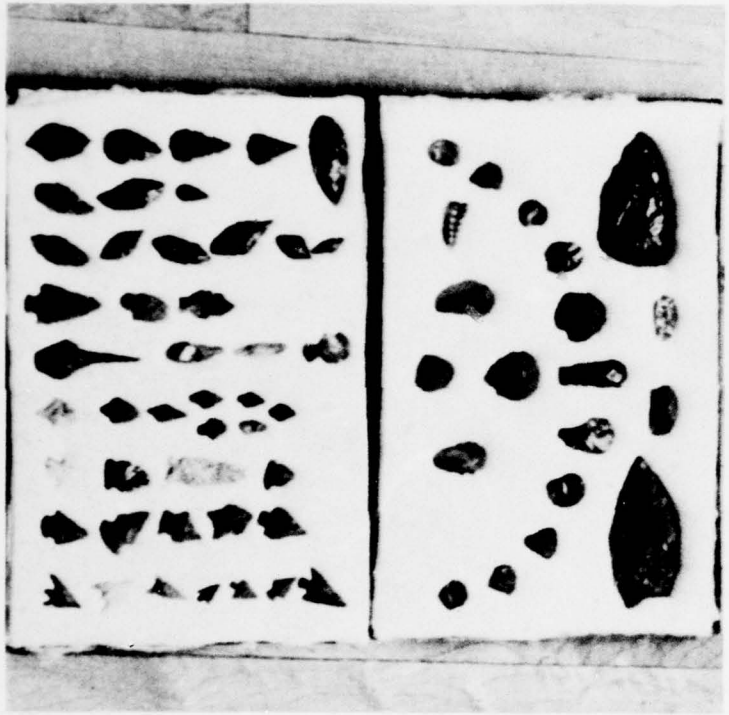


MAP 2 — DAY'S CREEK RESERVOIR SITES

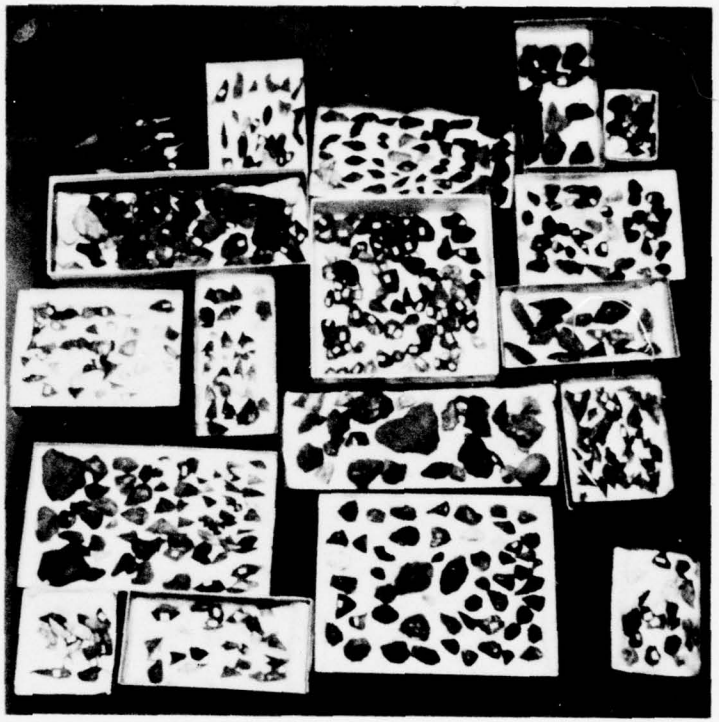


DAY'S CREEK RESERVOIR SITES

Plate 1



Clauson Artifact Collection from Tiller Tiller Ranger Station and Tiller Reservoir Area



Artifacts from Site 11, near Jackson Creek, Tiller Reservoir

Plate 2

Site 3, Tiller Reservoir

Site 2, Tiller Reservoir

Site 2, Tiller Reservoir

Site 11, Tiller Reservoir

Plate 3

Plate 4

Site 6, Tiller Reservoir

Site 11, Tiller Reservoir

Site 11, Tiller Reservoir,
Area containing house pits

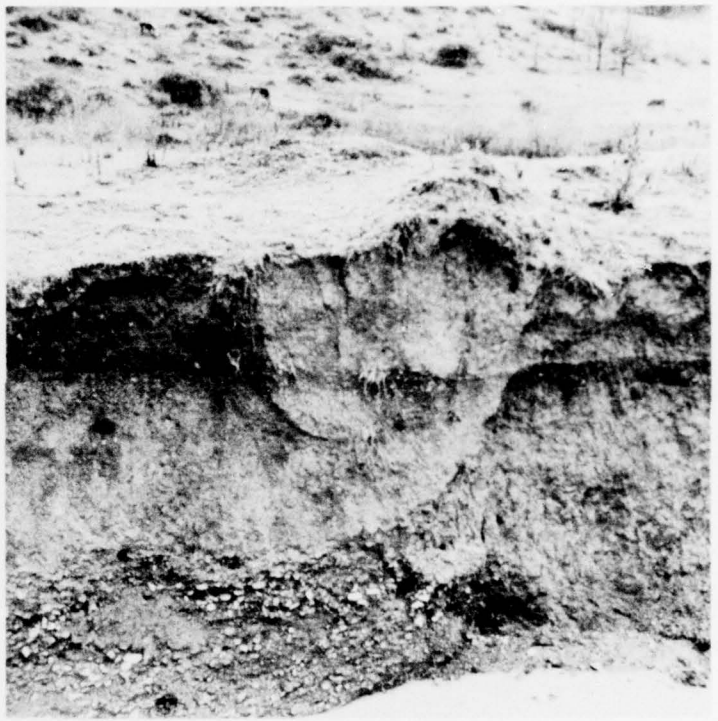
Plate 6

Milo Academy on Second Terrace and
Site 2, Days Creek Reservoir

Youth Camp on Site 3,
Days Creek Reservoir

Plate 7

Beal Creek Valley,
Days Creek Reservoir



Buried Soil Horizon, Site 1,
Days Creek Reservoir