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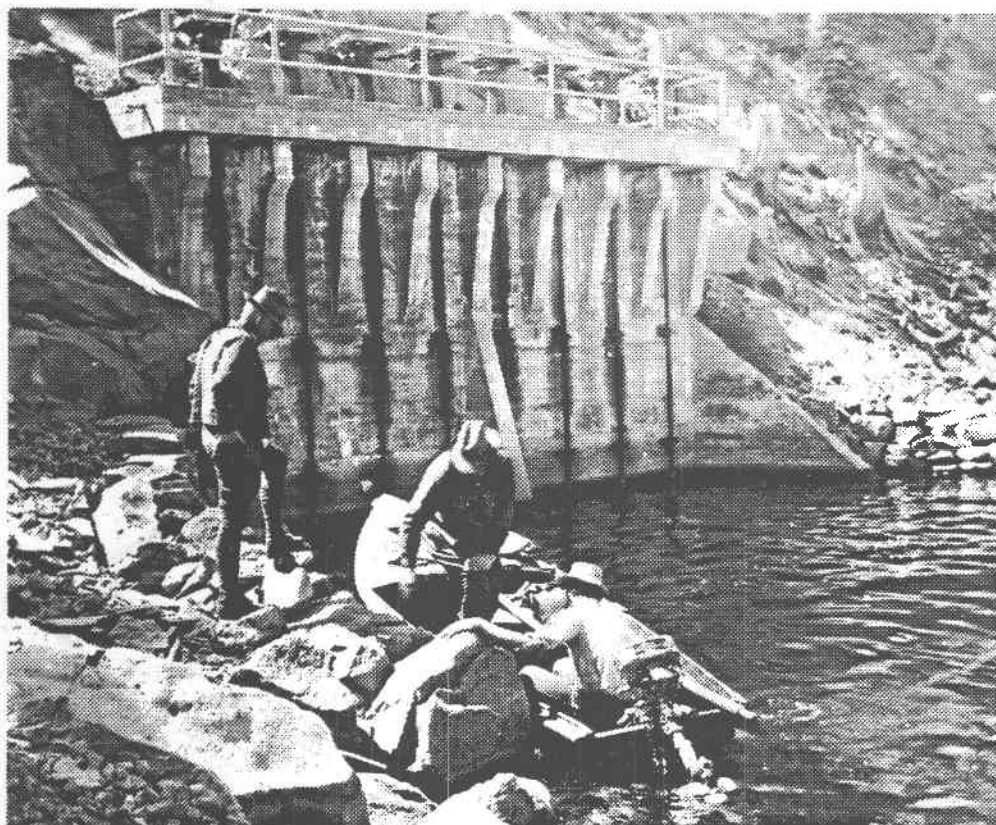
Willamette
National Forest



PRIVATE ENTERPRISE AND EARLY TWENTIETH 'CENTURY WATER RESOURCE DEVELOPMENT ON OREGON'S SECOND LARGEST LAKE

**A CULTURAL RESOURCE EVALUATION REPORT OF THE
KLOVDAHL TUNNEL AND HEADGATE STRUCTURE
WALDO LAKE, WILLAMETTE NATIONAL FOREST, OREGON**

PAUL G. CLAEYSSSENS



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WALDO LAKE, WILLAMETTE NATIONAL FOREST, OREGON

Submitted by
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Oakridge Ranger District
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Eugene, Oregon

May 1987

(January 1978)

FOREST SERVICE EVALUATION OF CULTURAL RESOURCES; Summary Sheet

Date May 13, 1987

The cultural resources whose inventory forms and detailed evaluations are attached have been evaluated against the criteria in 36 CFR 800.10, with the results on the left, below. Please indicate whether you concur with these findings for each site by marking the appropriate box on the right, below. Please return your comments to

Carl M. Davis, Willamette National Forest, PO Box 10607, Eugene, OR 97440

(person, FS unit, address)

within 10 working days of receipt of this request.

RESOURCE EVALUATION

MEETS These 36 CFR 800.10

NAME	CRITERIA				
	None	a	b	c	d
KLOVDAHL HEADGATE & TUNNEL, WALDO LAKE, OR.		XXX			

SHPO OPINION	
CONCUR	DO NOT CONCUR
XXX	

Attachments:

Site inventory forms

XXXX Site evaluation reports

Remarks: A very well prepared report. Consideration of eligibility for Criterion "B" would be possible with additional research. Uniqueness of structure as a "hydro-engineering anomaly", and fact that construction was "major engineering achievement of the time" would lend credibility to a determination of eligibility under Criterion "C" also.

by Paul C. Davis
FOREST SERVICE

May 13, 1987
(date)

by [Signature]
SHPO

MAY 19 1987

(date)

LEGAL DESCRIPTION

County	Lane
Township	21 South
Range	5 and 1/2 East
Section	36
USGS Quad.	Waldo Lake 15 Minute, 1956
UTM Zone	10

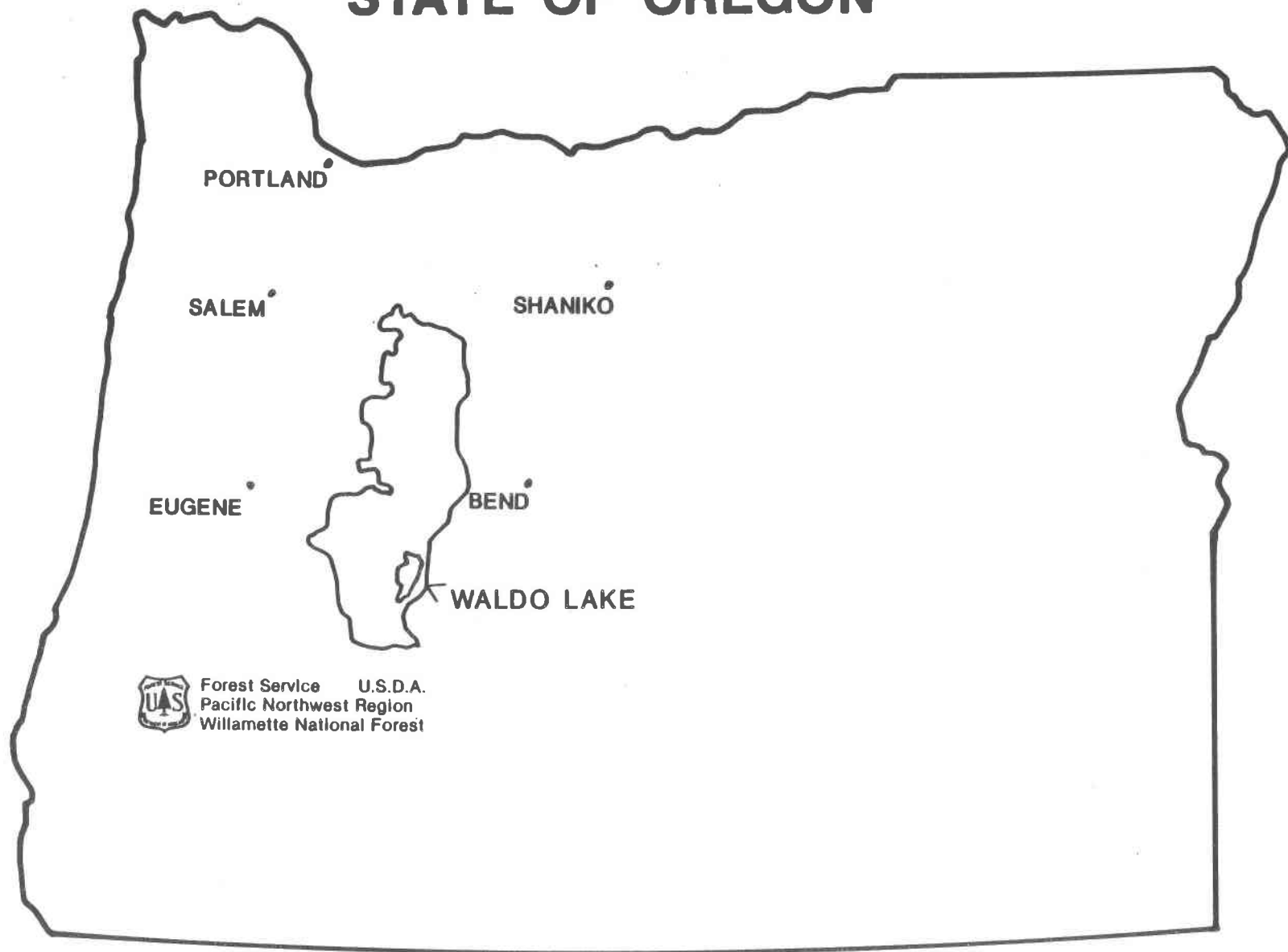
UTM Polygon Coordinates (See Figure 4)

	<u>Easting</u>	<u>Northing</u>
1.	575025	4838750
2.	574800	4838750
3.	574700	4839000
4.	574500	4839000
5.	574500	4839150
6.	574700	4839150
7.	575025	4839300

STATE OF OREGON



Figure 1.



OAKRIDGE RANGER DISTRICT

WILLAMETTE NATIONAL FOREST

111

VICINITY MAP

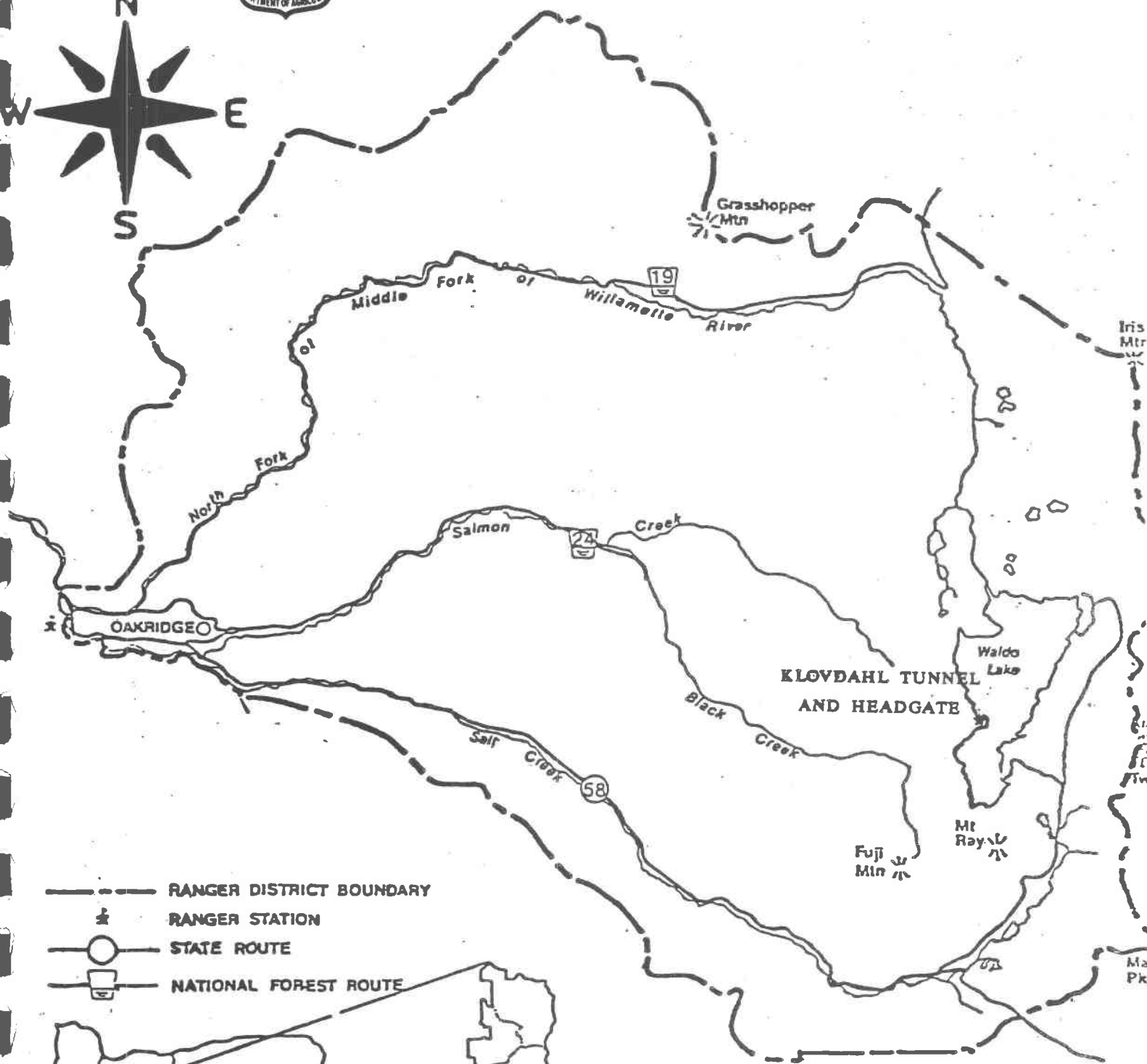


Figure 2.

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R. 6 E.

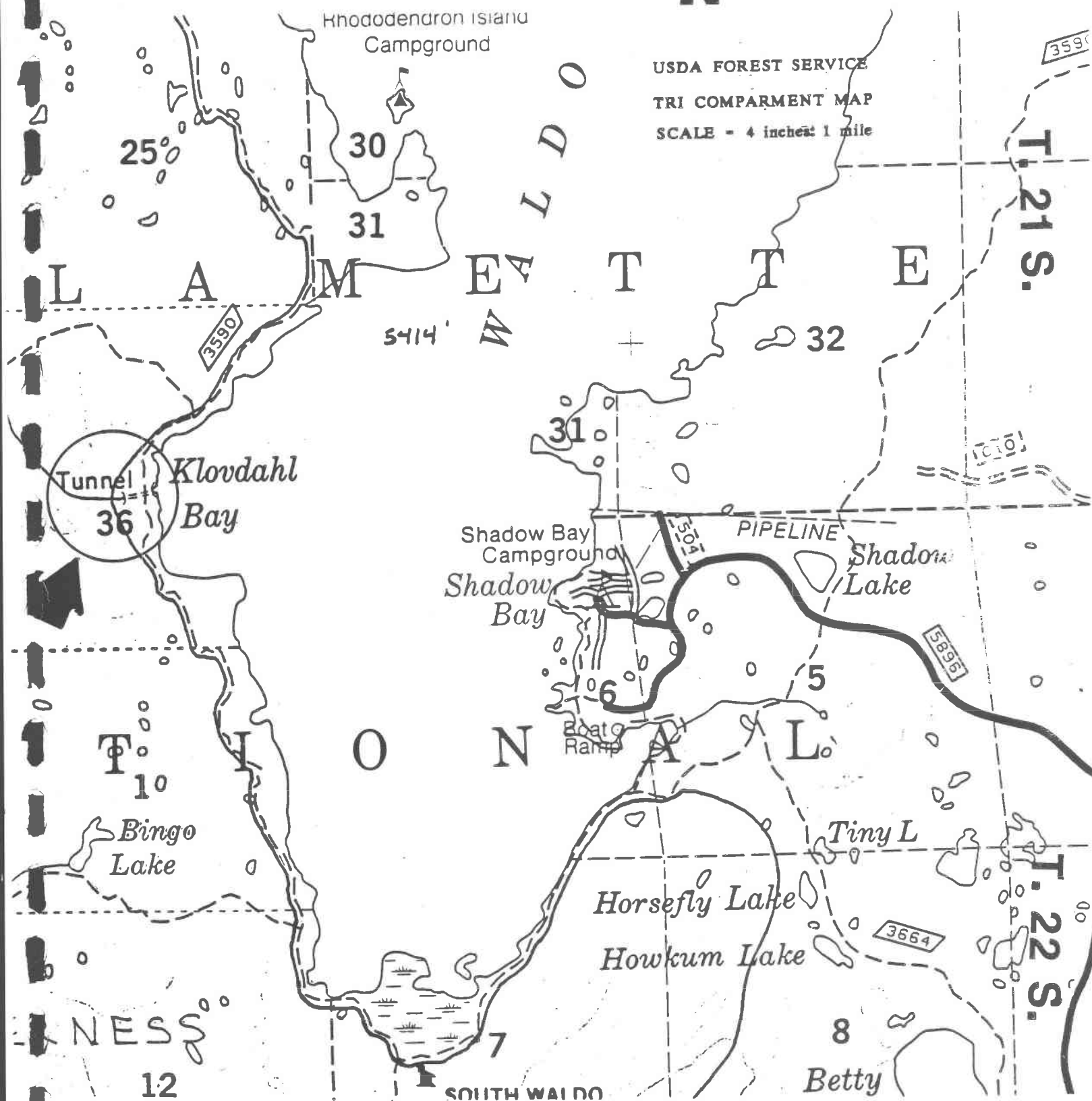


Figure 3. Waldo Lake, southern segment.

KLOVDAHL TUNNEL UTM POLYGON SITE PARAMETERS

WALDO LAKE QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)

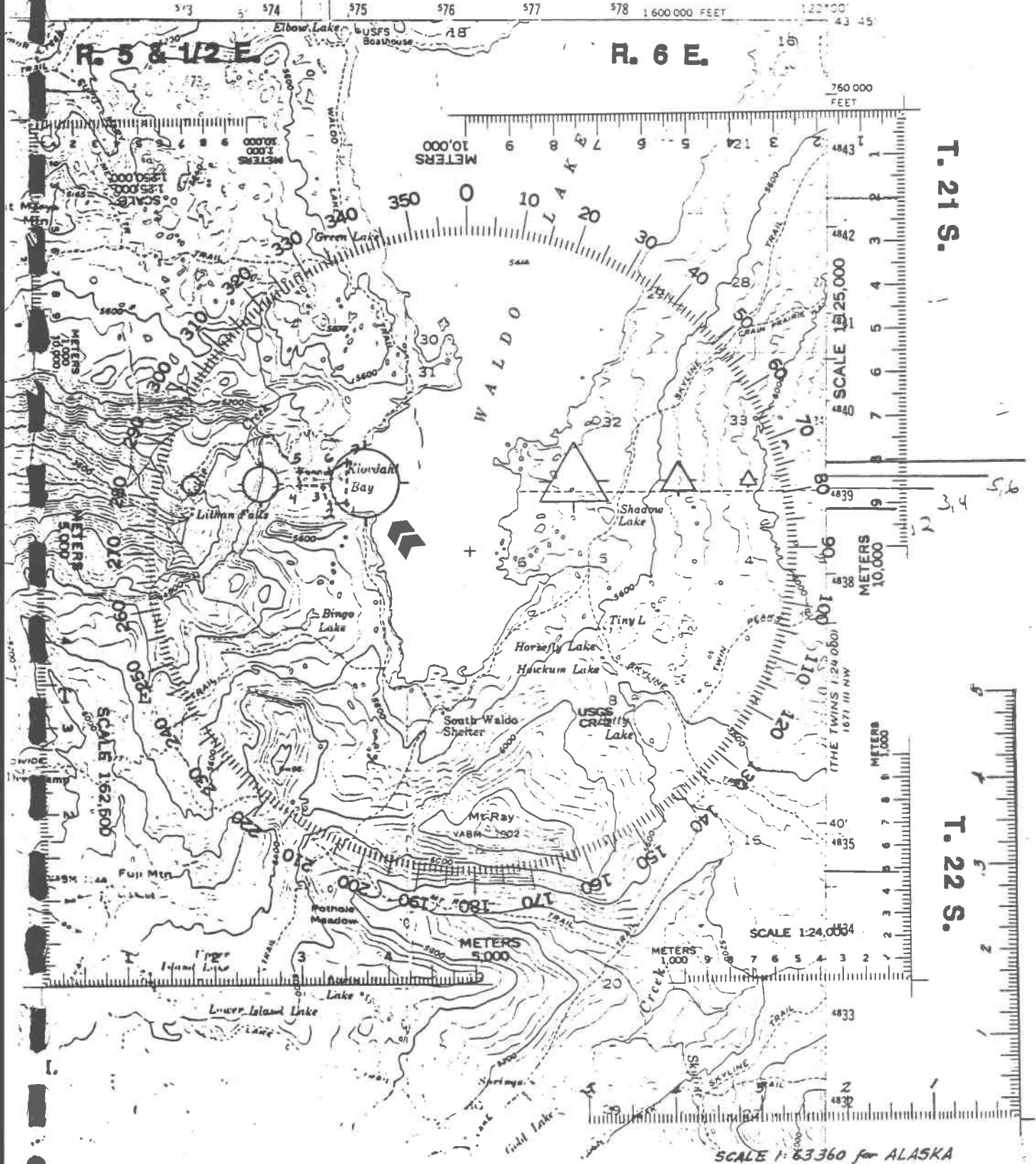


Figure 4.

MANAGEMENT SUMMARY

An historic hydro-engineering structure was built between 1909 and 1914 on the west shore of Waldo Lake (Oregon) at Klovdahl Bay. It consists of a concrete headgate structure (28.6 by 40 feet in size) fitted with 8 cogwheel-stem operated sliding phosphor-bronze gates (providing 80 sq. ft. of opening) that tap the lake at a depth of 25 feet. A 50 foot long concrete chamber structure (See Figure 12) funnels the released water into an unlined 500 foot tunnel (7 x 10 foot) that cuts through a volcanic ridge. It opens into the headwaters of the Black Creek drainage (See Figure 13), a subdrainage of Salmon Creek (a major tributary of the Middle Fork of the Willamette River). This project was originally promoted by Amos R. Black of Eugene, Oregon in 1905, he then sold it to Frederick H. Ray of Helena, Montana in 1908 for \$20,000.00. Ray then created the Waldo Lake Irrigation and Power Company, securing investors from all over the Northwest (some of whom were national figures in irrigation promotion), with hopes to create a monopoly over irrigation and electric power development in the Willamette drainage (See Figure 5). This project was theoretically capable of providing 120,000 acre feet of water and irrigating 100,000 acres of Willamette Valley cropland. Their four proposed power plants with a total head of over 4000 feet were believed to be capable of producing 47,430 theoretical horsepower for electric power generation. Up to this time no gravity irrigation systems had been developed on the Willamette due to the prior appropriation of all of the Willamette River flow during the low stage summer months by the Portland Railway Light and Power Company at Oregon City, where they harnessed Willamette Falls, producing electricity for Portland and local pulp mills.

This project evolved during the formative period of water resource development in Oregon and the Nation, just following the establishment of the U. S. Reclamation Service (later known as the Bureau of Reclamation). As such, it was a unique attempt at private enterprise in a resource development field that was rapidly being transformed and dominated by emergent state and federal control. The project never progressed beyond the construction of the headgate and tunnel, except on paper in company proposals to various federal agencies. A combination of poor judgement, financial speculation, lack of water and power markets, local opposition to irrigation bonding, and the vicissitudes of state and federal water resource policy, all culminated in the creation of an hydro-engineering anomaly located on one of the world's purest lakes in the High Cascades of Western Oregon. It is probable that some of the original promoters were speculating on the increasing value of their proposed undertaking, and had only vague intentions of carrying the project to its completion. Had this project reached fruition it could have significantly effected the local and regional economy (agriculture, transportation and industry) as well as rendered Waldo Lake a veritable reservoir, devoid of its current cherished scenic and hydrologically pristine character.

The Klovdahl Tunnel and Headgate structure is the only physical legacy of this water resource development scheme. It is named after the Swedish-American civil engineer who designed and supervised its construction (and who owned a significant share in the promoting company), Simon Klovdahl C. E. (1855-1932) of Eugene, Oregon.

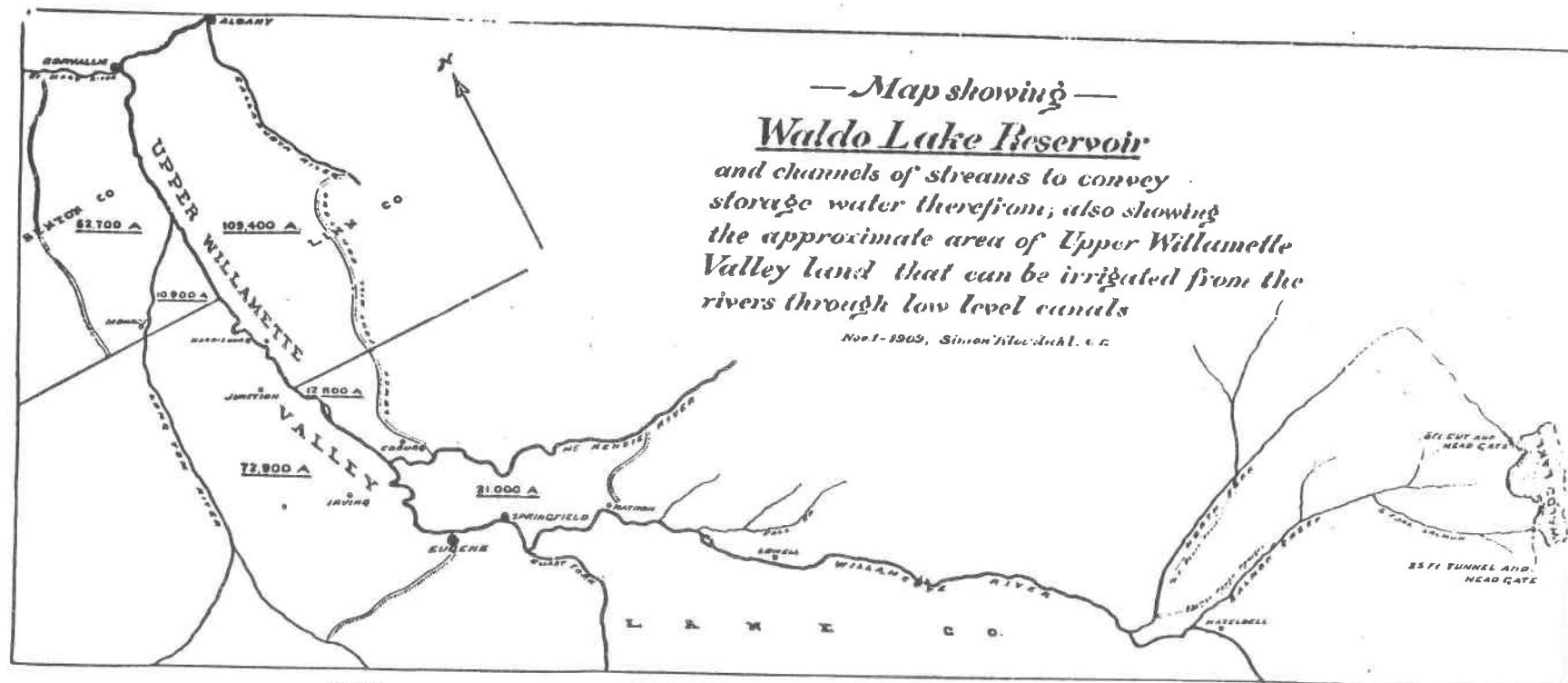
MANAGEMENT SUMMARY (continued)

This structure is herein evaluated for its eligibility to the National Register of Historic Places. Following the criteria of significance as contained in 36 CFR 60 and elaborated in How to Apply the National Register Criteria for Evaluation (National Park Service 1982 [Draft]) this document addresses the following prerequisites; integrity, historic context, level of significance and specific criteria considerations. The Klov Dahl Tunnel and Headgate, sometimes referred to as the 'Klov Dahl Dam', is determined to be eligible to the National Register of Historic Places. The rationale upon which this judgement was reached is presented in the accompanying report.

By way of summary this engineering structure is determined to be eligible to the National Register for the following reasons:

1. The Klov Dahl Tunnel and Headgate historic structure possesses integrity both in its retention of original design, materials, engineering, character and location. Despite leakage occurring around the gates and portions of the headgate structure, it is basically sound and will remain so for many years to come.
2. The historic context within which this hydro-engineering structure is evaluated, is the Reclamation Period of the Western United States. This period corresponds generally to the era after 1894 within which the state and federal governments took an active role in the promotion and development of water resource projects. Reclamation was promoted to facilitate the growth of regional agricultural economies through irrigation and to supply the power needs of nascent industrial and natural resource based economies.
3. The Klov Dahl hydro-engineering structure is an extant representative of the initial period of water resources development in the Western Cascades of Oregon. The structure and its related reclamation project was promoted by private interests during the time in which state and federal management of water resources was in its formative stage. This cultural resource is thus determined to be significant at the local level: It illustrates the contentious relationship between private interest and national policy with regard to the management of water resources and their reclamation during the early years of the twentieth century.

Figure 5. Kloydahl's 1909 "Waldo Lake Reservoir" project map.



PREFACE AND ACKNOWLEDGEMENTS

This determination of eligibility to the National Register of Historic Places for the Klovdahl Tunnel and Headgate structure was initiated to comply with 36 CFR 800 and related federal resource laws and in response to the proposed repair to the structure. The Willamette National Forest is currently planning to effect a long-term solution to a water leakage problem through the headgate. This leakage, currently estimated at 300 gallons per minute (gpm), has plagued this structure since shortly after its original construction. During the late 1920's and again during the late 1950's leakage was significantly higher than at present, reaching 5,500 gpm in 1957. Two repairs have been previously executed, both of which relied on the replacement or application of additional concrete to the headgates to seal the leaks; one performed in 1929 by the Waldo Lake Irrigation and Power Company, and the next in 1960 by the USDA Forest Service, Willamette National Forest. During the early 1980's Willamette National Forest engineers were directed to begin inspections of the structure due to public concerns over increased leakage of lake water. Some patchwork was performed with hydraulic cement in 1984, and extensive analysis and planning for an eventual permanent repair was initiated.

Currently an environmental analysis is being conducted under the leadership of David Murdough, Oakridge Ranger District watershed specialist, to select an alternative that will effect a permanent water-tight seal of the tunnel. The EA process has identified the major concerns as; the prevention of an uncontrolled release of water from the lake through leaks in the headgate structure, lowering of the lake level as much as 25 feet thus severely effecting the lacustrine ecosystem and scouring the Black Creek drainage, and protecting the historic resource values of this early twentieth century hydro-engineering structure. Dave Nordenson, Willamette National Forest Structural Engineer, is the engineering team leader and the author, Paul Claeysens, is assigned to the task of cultural resource assessment.

As in any such effort so many people and organizations contributed to the development of this document. The author wishes to extend his sincere gratitude to the following persons for providing assistance, often on short order, so many of whom showed such great enthusiasm for this site's history: Dave Nordenson, Willamette National Forest; Marty West, Lane County Historical Museum; E. Gail Throop, USDA FS Pacific Northwest Region; Elizabeth W. Potter, State Historic Preservation Office, Margaret Hollis, Willamette National Forest; Gerald Williams, Umpqua and Willamette National Forests; Stephen D. Beckham, Lewis and Clark College; Bob Cox, Lane County Historical Society; Tom McCallister, The Oregonian; Lewis L. McArthur, Oregon Geographic Name Board and the Oregon Historical Society; Carl Davis and Jim Cox, Willamette National Forest; Doug Williamson, Willamette National Forest; Staffs of the University of Oregon Library 'Oregon Collection', Montana State Historical Museum Library, Montana Secretary of State Corporations Bureau, Eastern Washington State Museum Library and to others I have unknowingly omitted. The author also wishes to thank all my co-workers and especially my family for their patience and support during this endeavor. As with the usual caveat, the author excepts full responsibility for the final product, including any potential errors found herein.

P. C.
May 1987

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INTRODUCTION

Picture back at the turn of the century a group of entrepreneurs eager to capitalize on what was then perceived as a sound investment, returning 300% profit (Klov Dahl N. D.), controlling a monopoly over the services rendered, and you will begin to have a feeling for the enthusiasm and faith these men had in transforming a great wilderness lake into a reservoir capable of irrigating 100,000 acres of Willamette Valley cropland and providing between 30,000 to 50,000 horsepower of electrical generation, "without a dam" (Ibid, emphasis original). This enterprise, first pursued in 1905 by A. R. Black of Lane County and later in 1908 by F. H. Ray and the Waldo Lake Irrigation and Power Company, became known as the Klov Dahl Tunnel (and headgate) after Simon Klov Dahl, a Eugene civil engineer involved in the project from its inception in 1905. Due to the vagaries of economics and resource policy, and the questionable viability of utilizing Waldo Lake as a reservoir, this project was never completed. The Waldo Lake Irrigation and Power Company under the supervision of Klov Dahl, was successful only to the point of tapping the lake by a 30 foot by 40 foot concrete headgate structure to the headwaters of Black Creek via a 500 foot tunnel through a narrow ridge. This was no easy task as equipment, supplies and construction materials had to be freighted by wagon road from points east of the Cascades at Shaniko, some 90 miles distant (See Figure 1), or hauled in by pack-string from Oakridge, some 26 miles west of the lake. To construct this structure under extremely isolated and remote wilderness conditions was in itself a major engineering achievement of the time.

Today, what remains is a hydro-engineering anomaly, a structural legacy of a business scheme that for many reasons never came to pass. This site is visible from most parts of Waldo Lake, and is marked by the presence of a concrete headgate structure located at the base of a volcanic ridge rising up from the lake margins (Figures 6 and 7). In such a location as Waldo Lake, known for its scenic beauty, pristine character and proximity to the Waldo Wilderness, it is a surprise to encounter such a unique waterwork.

This document has one main objective, the determination of this structure's eligibility to the National Register of Historic Places: As such, this document does not pretend to be a comprehensive site-specific historical study or an in-depth analysis of past water resource policy in the Pacific Northwest. It is hoped that a detailed historic treatment will follow this process, so that interested parties will have greater access to such regional historical data as represented by this cultural resource. The analysis involved in the present evaluation report relies upon a three-tiered process; the establishment of the structure's historic context, the examination of its specific history, and the application of the National Register criteria to the site as it exists today. Initially, however we must situate this historic cultural resource in its environmental context.

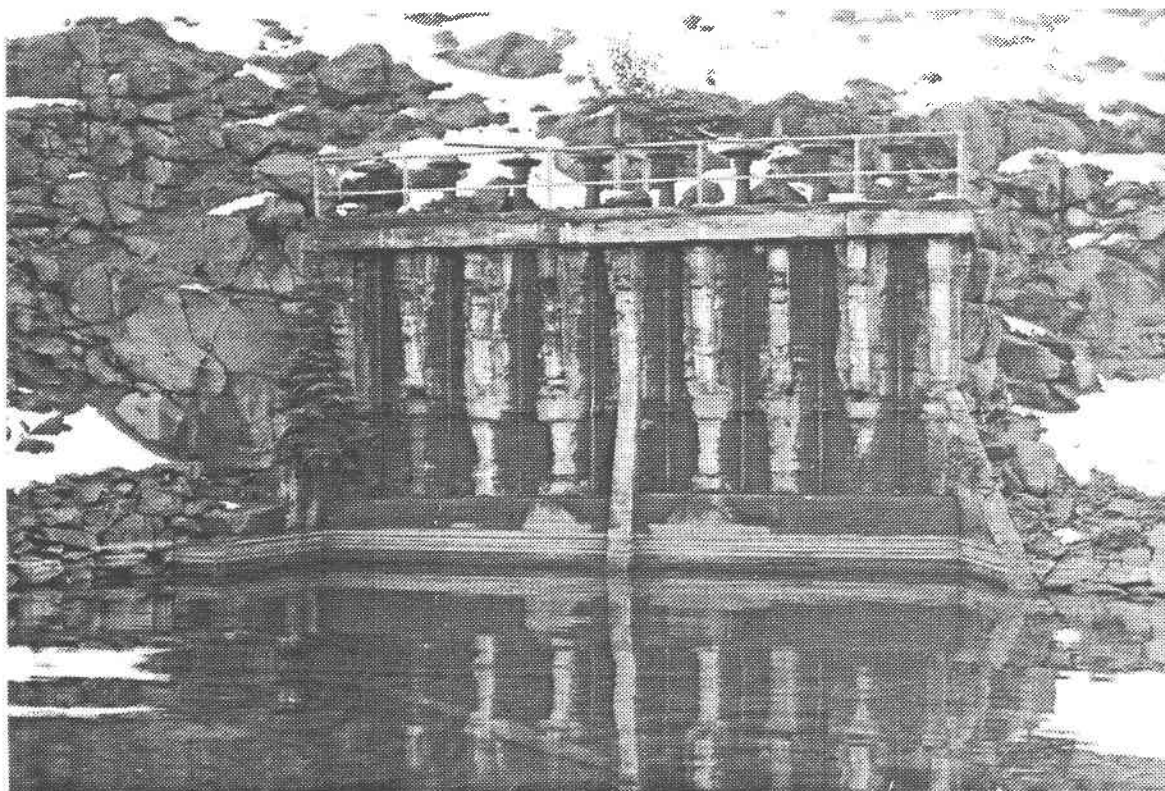


Figure 6. Current view (west) of the Klov Dahl Headgate.
Photo by Dave Nordenson, USDA FS, Willamette N. F., 1986

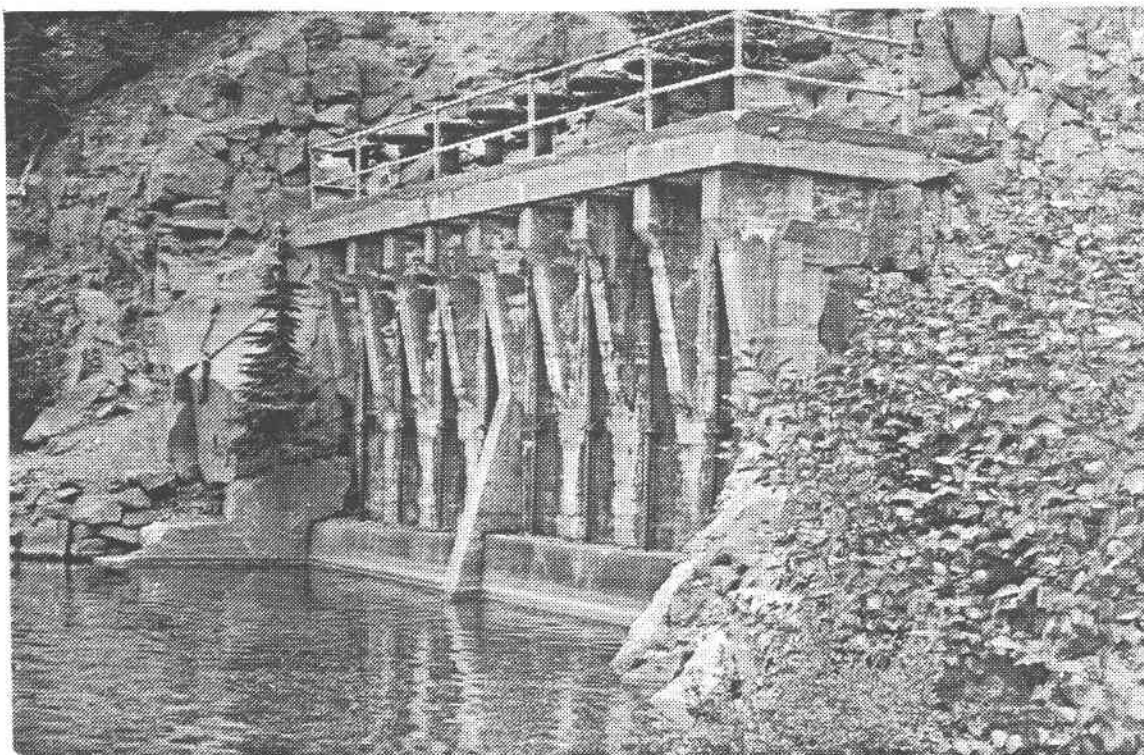


Figure 7. Current view (southwest) of the Klov Dahl Headgate.
Photo by Dave Nordenson, USDA FS, Willamette N. F., 1986

ENVIRONMENTAL SETTING

The Klov Dahl Tunnel and Headgate is located at Waldo Lake, Oregon, on the western crest of the Cascade Mountains, roughly halfway between the state's north and south borders. It is approximately 63 miles east of Eugene, 75 miles west of Bend and 165 miles from the Portland area (See Figure 8). It is located in Township 21 & 22 South, Range 5 1/2 and 6 East, Willamette Meridian, at an elevation of 5414 feet (1640 m) above sea level and encompasses a total area of 6700 acres (2680 hectares) (Figures 1 and 2). Waldo Lake is the second largest (natural) lake in the state of Oregon. It was named for Judge John Breckenridge Waldo, an early advocate for wilderness in the central Cascade range of Oregon (McArthur 1944: 629). This lake is considered one of the most oligotrophic (pure) fresh bodies of water in the world (Powers et. al 1975). Since the early 1960's many limnological studies have been conducted at Waldo Lake; according to Mauleg et. al. (1972), Waldo Lake's "ultra-oligotrophic" state has both great aesthetic value as a natural resource and significant scientific value as a baseline for worldwide limnological research.

The lake basin is the headwater for the North Fork of the Willamette River, the drainage area of the lake basin itself comprises 19,800 acres (7920 hectares). It rests in a basin whose geologic origin is not well understood. Plio-pleistocene glaciation and volcanic activity are likely both responsible for its current form. In any case, the lake is within the High Cascades physiographic province (Baldwin 1981, Franklin and Dyrness 1973). The soil mantle is less than one meter thick (Mauleg et. al. 1972) consisting of moderately weathered volcanic and glacial till, supporting a variety of mixed timber stand communities comprised of Douglas-fir, Western white pine, various Abies species, Western and Mountain hemlock, and Lodgepole pine. The many plant communities in the vicinity of the lake fall generally within the Abies amabilis (Pacific silver fir, climax) coniferous forest zone (Franklin and Dyrness 1973); forming an intermediate zone between subalpine and temperate slopes of the Western Cascades. Rainfall was recorded at 74 inches in 1914 (Frankland 1931: 16) and estimated at 72 inches per year (1969-73) by the National Ocean and Atmospheric Administration (as quoted in Powers et. al. 1975:1). There are no permanent influent streams; numerous small intermittent streams, unchanneled run-off, probable spring sources and direct precipitation provide all of the run-off of said annual rainfall.

It has long been assumed that due to the porous nature of this volcanic region that all of the theoretically available run-off of the drainage does not reach the lake itself (Cf. Culver 1964:2), Culver stated that, "It is estimated that it [the lake] would take 10 years for the lake to regain its normal level if the water were drawn down 40 feet." (Ibid.). This fact was overlooked both by the Waldo Lake Irrigation and Power Co. and initially by the federal government, in computing the number of acre feet available to draw-off on an annual basis. In a letter from J. C. Stevens, the USDA Forest Service District [Regional] Engineer, to Mr. F. H. Ray of Montana dated August 19, 1908, Stevens claimed that 120,000 acre feet per annum were available based on data provided by the USDA Irrigation Branch of Experiment Stations (Klov Dahl N. D.). The same facts were contained in a document produced by the Cascade National Forest (Seitz 1909:4). A. R. Black, who filed the original appropriation of Waldo Lake water initially claimed 100,000 acre feet with a right to store an additional 150,000 (The Oregonian May 23, 1905; Klov Dahl N. D.).

HISTORIC CONTEXT

The history of water resources development, specifically irrigation and water power development, can only be traced over the last one hundred years in the western United States. Irrigation was practiced prehistorically by Native American societies in the greater Southwest. Historically there had been limited irrigation as well as flood control efforts in the East, but it was not until the arid lands of the West were perceived as desirable for settlement, that large scale reclamation (irrigation) projects were undertaken. The federal government took an active role, through the Homestead Act of 1866, to promote such western movement of settlers. As the Western conditions became better known through various federal survey reports (such as those by Major John Wesley Powell) and congresses of irrigationists, reclamation was heralded as the saviour of the arid West, able to transform vast dry lands into profitable croplands. Despite the efforts of politicians, reclamation promoters, and settlers there emerged no national policy on irrigation. The federal government deferred to the states the control over reclamation projects by the passage of the Act of July 26, 1866 (Golze 1961:16).

As early as the 1870's there were concerns expressed over the ability of private enterprise to effectively develop and carry out reclamation projects. In 1873 George Peter Marsh stated that, "Such works will be seldom properly and securely constructed by private persons or bodies, and the management of them by individuals and corporations, will always be liable to abuse and gross corruption." (as quoted in Lampen 1930:19). The conservation movement had early focused its attention upon the management of water resources. According to Hays (1959:5), the tension between the public interest and private enterprise was perhaps best displayed in the water conservation movement of the latter part of the 19th Century. Yet, despite many attempts to develop a nationwide or Western states water policy, no such legal document was produced. It was not until 1894, with the passage of the Carey Act (Act of August 18, 1894), that the federal government became even indirectly involved in reclamation efforts. Whereas the Desert Land Act (Act of March 3, 1877) had provided 640 acres of public domain lands to those successful in reclaiming the land within three years through irrigation works, the Carey Act proceeded to grant up to one million acres of public domain to each desert-land state, including Oregon. This law gave the states control over the development of appropriate water/reclamation law and the establishment of related programs and agencies. Most Western states enacted very similar laws establishing state water boards that reviewed the reclamation plans of private persons or corporations, forwarding approval to the Department of the Interior, who then withdrew the lands from entry, and if approved permanently segregated said lands from the public domain. The state board could then enter into contract with the corporation or individuals to construct the reclamation project and once completed, the alienated lands are then sold to farmers and settlers who have entered into contractual arrangements with the reclamation company (Golze 1961:15-19).

The Carey Act was relatively ineffective in meeting the objective of implementing reclamation projects in the West. Direct federal involvement did not come until 1902 with the passage of the Reclamation Act (32 Stat 388), which among other things established the Reclamation Service, which later became the

Bureau of Reclamation (Golze 1961:23-34, Hays 1959, Lampen 1930). The increasingly high costs associated with reclamation projects under the Carey Act forced private enterprises to seriously re-evaluate their financial commitments. The Reclamation Act anticipated the fiscal limitations of state and private promoters and initiated direct federal involvement in irrigation projects (Golze 1961 op. cit.). The federal goal was still to turn over the distribution of water resources to private, community or co-operative ownership, while providing federal funds to get necessary projects underway or complete those stalled for lack of money. As with the Carey Act there were provisions to protect such projects and distribution systems from land speculators. The reader is reminded that this early reclamation period coincides somewhat with the historic theme regarding land speculation and the role of the federal government in Oregon's history (Cf. Minor et. al. 1982). The Bureau of Reclamation has been responsible for the development of much of the Nation's irrigation and hydro-electric power projects since its inception, transforming arid lands into viable agricultural regions.

Various authors have suggested three general historic periods for reclamation in the West (Golze 1961, Lampen 1930, Hays 1959, Winch 1984): Development by private enterprise, up to 1890; State control, 1890-1902; and Federal reclamation, 1902-to the present. The Klov Dahl project (1905-1934) falls generally within the state and federal periods, but was unique in that from the start, it was wholly a private endeavor on public lands. Some additional background information is necessary to explain this apparent contradiction.

In the Act of 1866 the federal government gave to the states, the prerogative for establishing state water law, as stated above. Oregon, like most other Western states, based its water law on "prior appropriation" (Cf. Hays 1959:16-17). Under Oregon Law, Section 6625 (Lord's Oregon Law 1905 c. 228:401) a person, like A. R. Black could post public notice of water appropriation, file it with the county clerk, and barring any objections, receive approval from the State Engineer for the development of the appropriated water resources so filed upon, in this case irrigation and power, free of charge.

Yet, despite the relative ease of acquiring water rights, the expense involved in developing irrigation systems was quite high. Private developers, having reached the limits of their resources by the 1880's, turned to state and federal government for help. The National Irrigation Congress, meeting in Salt Lake City in September of 1891 resolved in favor of ceding all public domain lands to states and territories (Hays 1959:31), in part to aid in the development of reclamation, through the sale and disposition of those lands. During the Carey Act years debates in and out of Congress centered around the ideas of such conservationists like Gifford Pinchot, Theodore Roosevelt and Fredrick Newell, who sought tight federal control over such reclamation efforts.

When Roosevelt took over the Presidency in 1901 he made resource conservation a national priority. He considered "[F]orests as natural reservoirs" and that "...forest conservation is therefore an essential condition of water conservation" (as quoted in Lampen 1930:40). Furthermore, he believed that the conservation of forests, and hence water, was a function of the federal government not private interests (Ibid.). Pinchot and Roosevelt had long

advocated that reclamation should be controlled by the Department of Agriculture, in fact the forestry movement had already taken up irrigation as a essential part of resource management. Other forces however were at work, particularly private interests, who saw that the newly created agency (U. S. Reclamation Service) was placed in the Department of the Interior, which was traditionally far more sympathetic to utilitarianism rather than conservationism (Hays 1959:244-260). Pinchot and Roosevelt did the next best thing; they positioned their compatriot, Fredrick H. Newell, for appointment as Chief of the Reclamation Service in 1902 (Ibid.:15, Golze:26). One point must be made clear however, Roosevelt's federal conservation policy was not against private enterprise per se, only those who would unscrupulously squander and deplete public resources for private gain. The policy of federal reclamation was to transfer the benefits of irrigation to the farms and homesteads of small landholders and thus strengthen the regional and national economies (Lampen 1930:49).

Pinchot, successful in 1905 in having the vast Forest Reserves transferred to the Department of Agriculture (where conservationism could be administered under centralized and firm government control), sought to increase his new agency's (The Forest Service) power over reclamation efforts in lands under his management. This presented tangible problems for the promoters involved in the development of Waldo Lake's reclamation potential. The Forest Service, having just established the Permit System in 1905, agreed only to the granting of temporary permits for such private developments. This was a means by which to protect the "public interest" against speculators and "looters of the public domain". In addition, this system required the charging of "conservation fees" for irrigation and power development (Hays 1959:74-75); a condition vehemently objected to by A. R. Black in his attempt to secure such as special-use permit (Seitz 1909, Klov Dahl N. D.). This drama was enacted throughout the West between potential permittees and the Forest Service (Hays op. cit.). Black and other promoters like him, felt that since the state had granted them free appropriation, the federal government should grant them free use. This situation led Black to argue back-and-forth for over 26 months with the Forest Service (1905-1908) in order to finally obtain a permit that both parties could agree to; but it required a personal visit on Black's part to the Forester's office (to Pinchot and his assistant Adams) in January of 1908 (Seitz 1909, Klov Dahl N. D., Cascade National Forest N. D.).

Two other items of historic context must be presented before treating the Waldo Lake project's specific history. It has already been noted that reclamation was a relatively recent event in the history of Western states. The development of hydro-electric power was even more so. It had to await the development of the science and application of electricity. It was not until the 1870's that Edison's work (among other's) was recognized as having vast potential as a practical energy source. The first commercial application of this process was the limited electric lighting of New York City in 1882. By 1894 an electric hydro-power generating plant was in service at Niagara Falls, and in 1896 such power was delivered to the nearby city of Buffalo, New York (Encyclopaedia Britannica 1984). Finally the development of effective reclamation projects necessitated the engineering and construction of permanent and durable dams, spillways and headgates. Modern structural concrete as used in the Klov Dahl Tunnel and Headgate, as well as most major reclamation projects in the twentieth century, required the invention of portland cement, an early 19th Century development in the manufacture of artificial cements (Ibid. V.10:1075).

HISTORIC SUMMARY

Back at the turn of the century, local and regional business interests looked towards Waldo Lake as a natural and untapped reservoir with untold potential for economic success and regional development. Speculating on potential monopolies over both irrigation and power development, A. R. Black filed notice of appropriation on 100,000 acre feet of water from the Waldo Lake drainage basin under Oregon law in 1905 (The Oregonian May 19, 1905, Seitz 1909, Klov Dahl N. D.). During that same year he applied to the Forest Service for a special-use permit to begin construction on a canal ("ditch") at the lake's natural outlet, in the northwest corner (Seitz 1909, Frankland 1931, Cascade National Forest N. D.). His stated purpose was to be able to control the lake level and impound additional water to provide irrigation to the Willamette Valley (Ibid.). The Forest Service however suspected that Black was more interested in power development than irrigation and conducted a protracted negotiation with Black that lasted about 26 months (Cf. "Kent Report in Cascade National Forest N. D.).

The actual permit was not signed until he journeyed back to Washington D.C. in January of 1908, wherein an agreement was finally reached and the permit approved and signed by the Acting Forester, James Adams. The Forest Service was aware that Black had applied to the City of Eugene and Lane County for an electric street-car franchise in 1904 and was denied; and that in 1904-05 he had filed water appropriation notices on Windy Creek near the city of Glendale, Oregon, the McKenzie River and the Willamette River for power development. Black continued to insist on the exemption from all "conservation fees" because his interests were initially purely for "beneficial use" and to serve as "...demonstration works to show that the lake waters could be drawn off with that method [ditch/flashboards]" (Frankland 1931:4). The Forest Service special-use files and related correspondence show that Black was attempting to secure virtual free use regardless of his ultimate plans (Cf. Cascade National Forest N. D.). The charge of "speculation" by the Forest Service was probably justified, especially considering that A. R. Black had secured no guaranteed markets for either irrigation or power (Ibid.).

During the years between 1905 and 1908 Black engaged the services of, Simon Klov Dahl, a professional civil engineer from Eugene. By the summer of 1908 they had made surveys, constructed a 26 mile trail from Oakridge up Salmon Creek to Waldo Lake and had initiated the construction of the "Black Cut" at the North Waldo outlet (See Figure 9). Then, in July 1908, Black sold his water rights and project to a F. N. Ray (from Helena, Montana) for the significant sum of \$20,000 (Conveyance to Ray, June 22, 1908, Klov Dahl N. D.). Black made a significant profit on the sale of his "project" and in the said conveyance. He also retained rights to 38,500 acre feet of the Waldo Lake appropriation for irrigation of his own lands in the Lowell area. Ray then sought to find investors in order to form a corporation to carry on the project (Ray to Klov Dahl, Septemeber 1, 1908, Ibid.). In his solicitation letters he claimed to secure with this project a virtual monopoly over irrigation and electric power development for the Willamette Valley (See Figure 5), expecting 300% profit once services were delivered (80,000 acre feet of water to irrigate 60,000 acres of cropland and 45-50,000 horsepower of power generation). Ray, Klov Dahl and their Montana and Eugene based associates probably had more in mind than simply providing a public service.

Waldo Lake Irrigation and Power Company was incorporated in December of 1908 under the laws of the State of Montana (Personal communication, Montana Secretary of State; Cascade National Forest N. D.). Klov Dahl and Ray recognized that the physiography of a ridge along the western shore of Waldo Lake presented a unique opportunity to re-direct their reclamation efforts. By 1909 they received a new special-use permit from Supervisor C. Seitz of the Cascade National Forest in order to "...construct[ing] a tunnel and headgate not less than 7 ft. high and 10 ft. wide on the bottom...for the purpose of partially draining Waldo Lake and storing flood waters therein...". The company again employed the services of Simon Klov Dahl to begin construction on a 500 foot tunnel from the headwaters of the Black Creek drainage through this narrow ridge of volcanic origin, connected to Waldo Lake by a concrete headgate "dam" structure. The company envisioned developing this "natural" reservoir "...without a dam" (Ibid.:1), and thus significantly reducing construction costs associated with similar reclamation efforts. Work began in 1909. The remote wilderness location presented many difficulties for the project, chief of which was access and transportation. Pack string was used to keep the work camp supplied from Oakridge, 26 miles to the West (Klov Dahl N. D.). Heavier materials had to be freighted from Shaniko in Central Oregon, the nearest accessible railhead. Shaniko at that time was considered the "Wool capital of the World" and was connected to Portland and other railroad systems by the Columbia Southern Railroad (Winch 1984:345). For Klov Dahl and his crew this necessitated the improvement and re-construction of existing primitive wagonroad systems (including the building of bridges across the Deschutes and Cultus Rivers) over some 90 miles through Bend and on across the Cascade Crest (Klov Dahl to Waldo Lake Irrigation and Power Co., April 1, 1911, Klov Dahl N. D.). The existing wagonroad system had penetrated the North Waldo area prior to the 1900's providing sheepherders access to the Western Cascades. Klov Dahl then had to construct an additional wagonroad over 5 miles to the southeastern shores of the lake, wherein using barges towed by a motorboat, the supplies were ferried over 1 1/2 miles across the lake to the tunnel and headgate project site (Ibid.).

Over great hardship, and the apparently tight financial conditions of the company, the "dam" was finally completed in 1914, with work often progressing into the harsh winter months (See Figures 10 and 11). Sand for the cement had to be acquired locally, which unfortunately was full of organic debris (despite washing); this led to leakage problems, years later. Perhaps one of the most significant feats was the transportation of the eight phosphor-bronze gates, forged in Eugene, to Bend (accessible by rail in 1912) and then over the wagonroad to Waldo Lake. Correspondence between Klov Dahl and the company indicates that frequently adequate funds were unavailable (deposited in the First National Bank of Eugene). It appears that in reality the Montana based corporation consisted of some financial speculators with no corporate office, who based all their operations out of Klov Dahl's Eugene practice. For all intents and purposes Klov Dahl's contributions between 1908/09 and 1914 produced the only tangible evidence of corporate activity, other than a minor amount of company correspondence.

The completed waterwork with its 8 bronze gates opening into a 7 x 10 foot tunnel (See Figure 12), was theoretically capable of lowering the lake by as much as 25 feet, once the cofferdam was removed (Frankland 1931). However, after completion of the headgate and tunnel in 1914 no additional project work was performed. What went wrong? How did so much human effort (the laborer's as well as the engineer's) go to such waste. To partially answer these questions we have to turn to some of the historical facts surrounding the corporation's "back office" dealings.

Ray had sought investors, not only to form the company and to raise capital, but to recoup his own money (\$5000.00 to hold the deed of conveyance in escrow) invested in the project (Ray to Klov Dahl, September 1, 1908, Klov Dahl N. D.). Thus by forming the corporation Ray was relieved of any personal indebtedness with regards to this project. His solicitation offered "equal" opportunity for the initial investors to share in 1/10th (\$25,000.00) of the necessary capitalization and presumably in an equivalent share of the profits (Ibid.). Utilizing research conducted by A. P. Stover, then on staff at the USDA Irrigation Office at Oregon Agricultural College, that extolled the need and necessity for irrigation in the Willamette Valley, Ray created an impression that the project was bound to succeed. The only factor in the way was "...the mossback character of many land owners" in the valley (Ibid.). Ray indicates in this document that he was "well acquainted with Mr. Stover" and has been for three years anonymously promoting the development of irrigation in the valley (Ibid.). On a related note, in 1910 Samuel Fortier, then Chief of Irrigations, U. S. Department of Agriculture, sends the company a very laudatory letter praising their proposed irrigation plans and stated that "...very large profits must accrue to the investor" (Fortier to W.L.I. & P. Co., May 18, 1910, Klov Dahl N. D.).

An examination of the company's shareholder records as of August 31, 1911 shows that a certain S. Fortier holds 10 preferred shares and a Mrs. L. Stover (of as yet unproven relation to A. P. Stover) holds 75 common shares (Op. cit.). The document also indicates that by this date the company had sold only 526 and 1/2 shares of preferred stock, which valued at \$100.00/share would have provided them with a working capital in the treasury of \$52,650.00. According to Ray's original solicitation, the preferred stock, which was to be use solely for acquiring A. R. Black's water rights and constructing the headgate, was barely adequate for the task (originally projected at \$125,000.00). Indeed, correspondence between Klov Dahl and the company during 1910 to 1914, indicates that the engineer's ability to secure supplies and make payroll was limited by the availability of funds in the company's account (Klov Dahl N. D.). By the summer of 1914, just prior to the completion of the headgate and tunnel system (2 years behind schedule), Klov Dahl resigned in part from going without salary for over a year, the depletion of company treasury, and the expenditure of his personal funds (Klov Dahl to Abercrombie, August 14, 1914, Ibid.).

It appears that in 1912 Milton L. Bugbee, attempted to take over the corporation. With the support of the other board members, he instigated the decapitation of Ray from the Board of Directors. Though the records are incomplete, it appears that Bugbee was successful, despite Ray's protests against such a "Blue Sky" proposition (referring to the speculative nature of Bugbee's cut-rate acquisition of W. L. I. & P. Co. shares). According to Klov Dahl's correspondence, there was a "falling out" between he and Ray during 1912-1914. Ray died a broken man in 1914, suffering from a "nervous breakdown" (Helena Independent 1914). By 1915 a new group of investors came on the scene, with a Colonel W. R. Abercrombie, a pioneer settler of Spokane and a developer of Eastern Washington mining interests (Anonymous 1912), ascending to the presidency. After 1914 the reclamation project is basically dead in its tracks (Whistler and Lewis 1916:91). An article appearing the Oregonian in 1913 creates the impression that the company was not releasing its future plans, "...[t]he company has not specified any irrigation project...neither does it indicate a place for the sale of power..." (The Oregonian 1913). Besides the internal battles with the corporate offices and tight financial conditions, two other factors were responsible for the failure of the project.

The company had originally hoped that markets for its proposed electric power generation could be found in local and interstate railway systems. The company solicited the Southern Pacific Railroad in 1911 as a potential consumer for their power, but were politely refused (Ray to Hood, June 29, 1911, Klov Dahl N. D.). The Southern Pacific was extending its line between Natron and Klamath Falls, Oregon, through the Cascade Range at this time. However there was a hiatus in construction between 1912 and 1923 and so potential locally derived sources of power were not then necessary.

The company's attempts to stir up interest in irrigation, despite the support of certain influential government officials in the Department of Agriculture, met with similar failure. There is evidence that the company had intended to attempt to buy cropland in the valley near Eugene, develop it for irrigation, and sell it back to farmers at greatly increased prices. Barring the cost prohibitive nature of that scheme, the secondary plan was to form irrigation districts that would then contract the company's services (Ray to Klov Dahl September 1, 1908, Klov Dahl N. D.). It appears that Ray and then after 1914, Bugbee continued such efforts until 1918, when a well organized group of democrats and citizens formed the "Anti-Bonding Irrigation and Drainage League" in the Eugene area to oppose such efforts (The Oregonian 1918; Bugbee Affidavit August 19, 1927, Cascade National Forest N. D.). From existing documentary records there appears to have been almost no activity after 1918, until the late 1920's. According to a letter from the State of Oregon Corporation Department to the Forest Service, the company failed to pay license fees after 1920 (Cascade National Forest N. D., letter dated October 12, 1926). An examination of the special-uses file (Ibid.) indicates that the Forest Service and U. S. Senator George E. Chamberlain (Oregon) were conducting an investigation of the intents of the company to determine whether or not the permit should be revoked for non-use. A "Memorandum for the Files" dated December 15, 1917 states that though the company has not been successful in finding a market for their services due to the "absence of a market", and since they have invested \$93,000.00 thus far, their permit should remain intact given the fact that it may be revoked if necessary at a later date (Ibid.).

Prior to 1918, as a result of reclamation investigations conducted under cooperative agreement between the State Engineer and the Bureau of Reclamation in 1916, the Waldo Lake project area was officially withdrawn by the State to protect future reclamation development from entry (e.g. homestead, mining, etc.) (Frankland 1931:9). The company was then forced to apply to the State Engineer and later the Federal Power Commission (after 1920) for the right and license to operate its planned irrigation and hydro-power facilities. Part of the requirements for receiving such rights was to prove that the company could provide for "beneficial use" and could also financially see the project to its final completion. The company made an exerted effort in 1927 to make good on their claims by petitioning the Forest Service to extend their special-use permit (Cascade National Forest N. D.). The Forest Service had been concerned since 1915 that the company would never be able to but their project to "beneficial use".

The Forest Service made an extension on their permit conditional upon the repair of the headgate structure which was by that time leaking badly. In 1927 the company again hired the services of Simon Klov Dahl to effect the repair (Ibid.). The company performed its obligation satisfactorily and was granted an extension. However, because of the Federal Power Act of 1920, which created the Federal Power Commission, they were now faced with the need to pass over another bureaucratic hurdle. The company applied for a preliminary permit in 1927 to the FPC. An application for preliminary permit was also filed by a competing business interest from Los Angeles, California. The Waldo Lake Irrigation and Power Company made a concerted effort to develop plans for four power plant sites along Salmon Creek and the North Fork. They proposed miles of diversion canals to channel waters from both drainages in order to harness the 4000 feet of head of water power. Their design called for the main power plant to be located above Westfir near the Southern Pacific Railroad tracks and the Western Lumber Company mill site. They apparently had plans to ultimately develop a paper and pulp mill in the Westfir area utilizing their own power (Willamette National Forest N. D.).

By 1933 the Federal Power Commission denied the Waldo Lake Irrigation and Power Company's application for a preliminary permit. In 1934 the Forest Service terminated their special-use permit and the area reverted to Forest Service jurisdiction. The company soon withered away and failed to file annual financial reports with the State of Montana after 1938 (Montana Secretary of State 1987). The Army Corps of Engineers still had plans of incorporating the Waldo project into the Willamette Basin plans up to the mid-1950's, when the public and the Forest Service was beginning to seek political and administrative ways to protect the lake's natural beauty and recreational potential (Willamette National Forest 1926-64). However it was not until October 26, 1959 that the Secretary of the Interior, John H. Gutzler, vacated the existing power withdrawals (No.'s 1039 and 1046) under Section 24 of the Federal Water Power Act (Willamette National Forest 1971). This local chapter of the history of reclamation in Western Oregon ended with barely a recollection of the Waldo Lake Irrigation and Power Company.

The bulk of the history of the Klov Dahl Tunnel and Headgate since 1914 can be found only in the form of primary and secondary historical documents. The structure thus represents a tangible artifact of this project up to 1914, and from thereafter as a symbol for the plans and aspirations of future commercial reclamationists. Today the the headgate and tunnel remains a tribute to the engineer and workers who struggled so hard to make the dreams of a few water-power speculators come true, and it is a tangible reminder that the beautiful Waldo Lake area as we know it today could have been rendered a highly modified ecosystem if the unfolding of history had taken a slightly different course.



Figure 8. Aerial view of Waldo Lake from the south. Photo by Sam Frear, USDA FS, Willamette N. F., 1971



Figure 9. View of "Black Cut" at North Waldo outlet in 1913. Photo, courtesy of the State of Oregon.

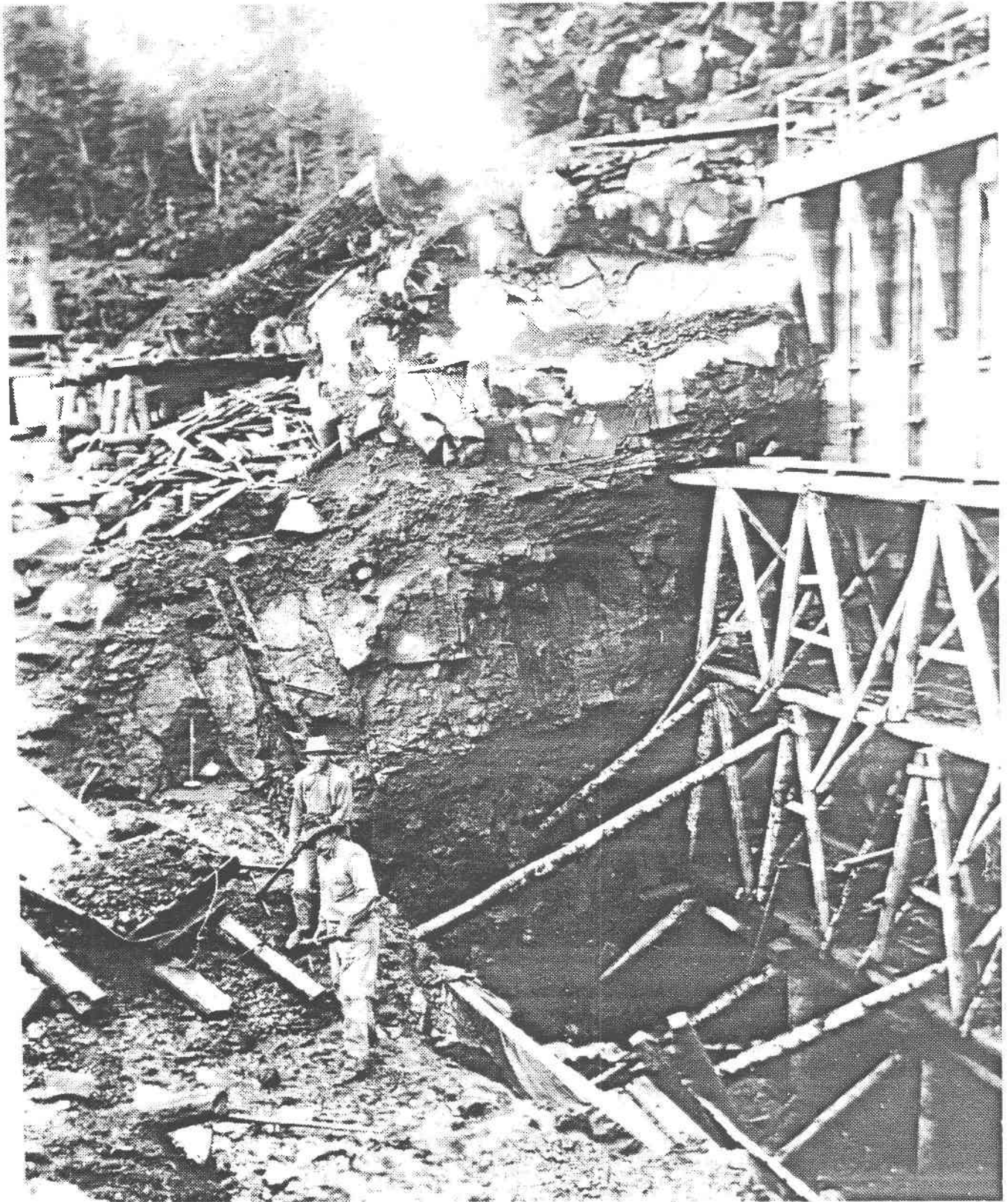


Figure 10. Klov Dahl Headgate and construction workers in 1913.
Photo, courtesy of the State of Oregon.

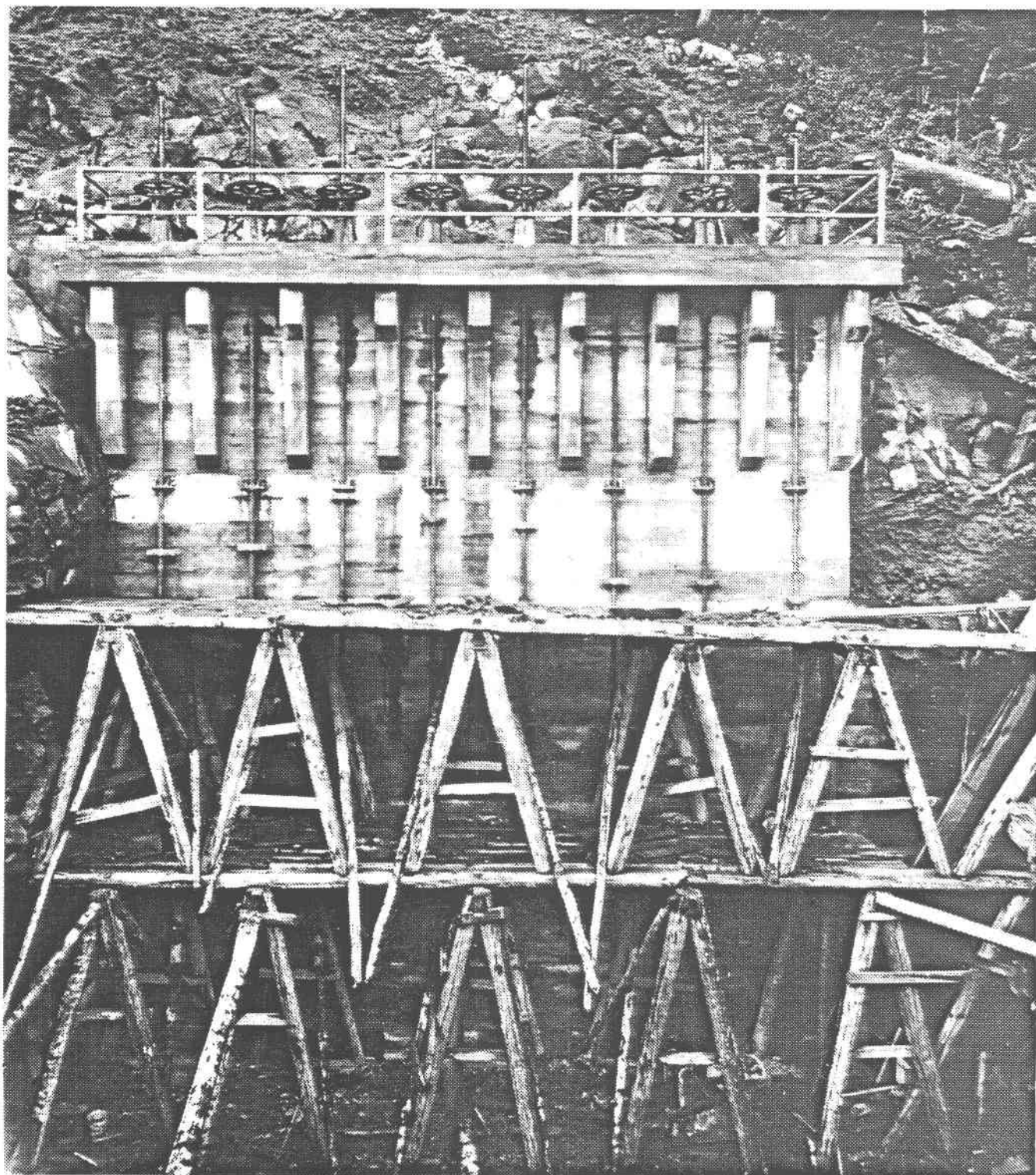
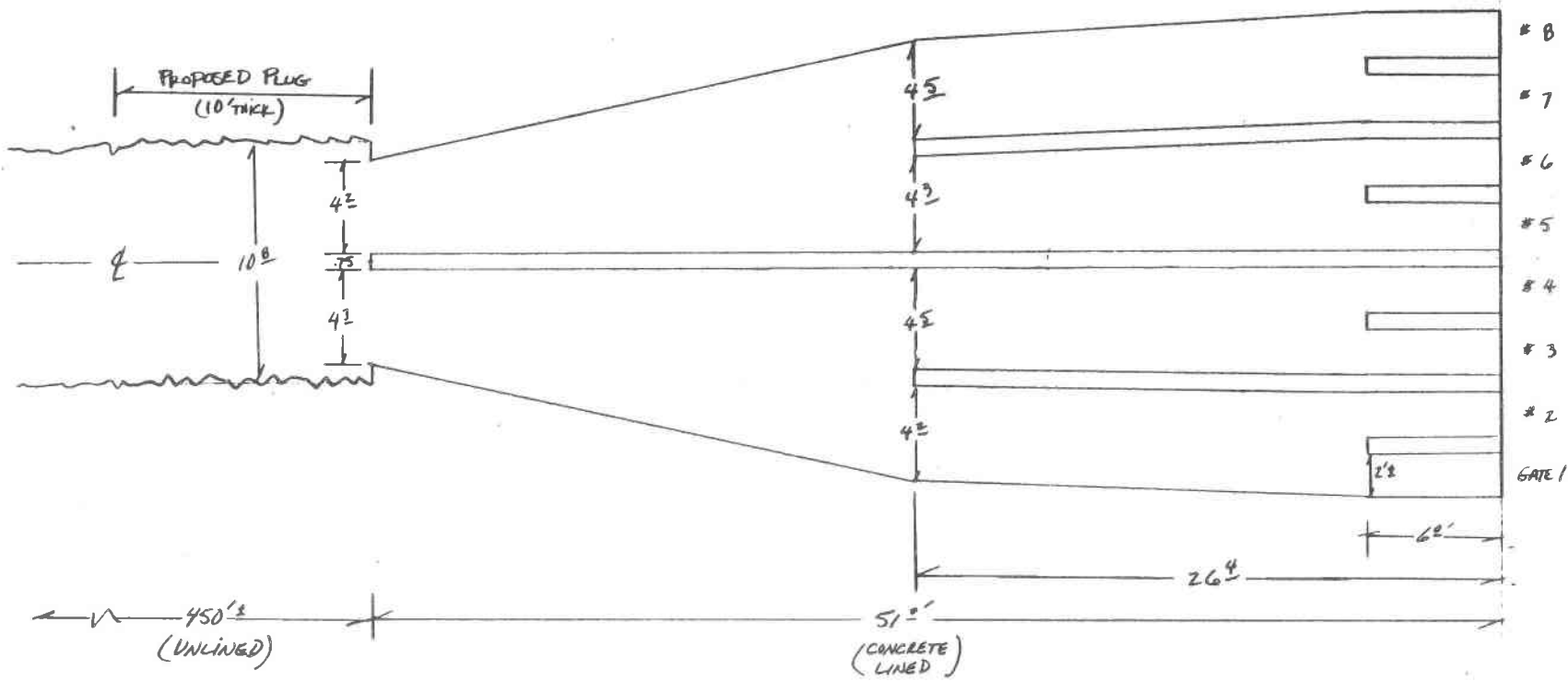


Figure 11. Klovdahl Headgate under construction in 1913, view from the cofferdam (west). Photo courtesy of the State of Oregon.

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WALDO LAKE



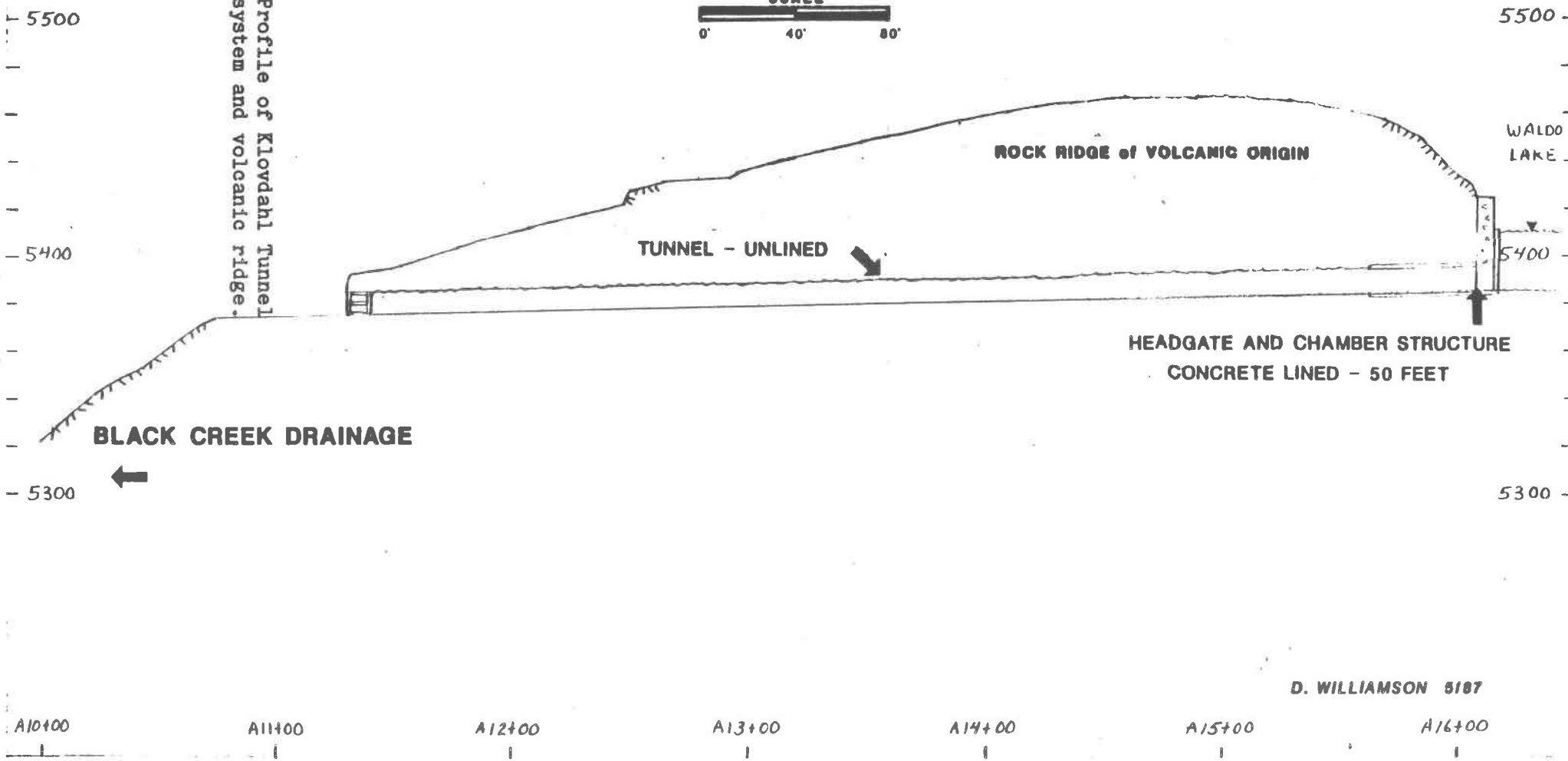
KLOVDAHL TUNNEL
 PLAN VIEW
 1" = 5'-0"

Figure 12. Plan view of Headgate Chamber and Tunnel.

Figure 13.

Profile of Klovdahl Tunnel system and volcanic ridge.

KLOVDAHL TUNNEL and HEADGATE PROFILE



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ANALYSIS OF SIGNIFICANCE

Below, the Klov Dahl Tunnel and Headgate Structure is evaluated for its eligibility to the National Register of Historic Places. This document has thus far treated the structure's description and history for the purpose of addressing the specific criteria of significance as contained in 36 CFR 60 and elaborated in How to Apply the National Register Criteria for Evaluation (National Park Service 1982 [Draft]). The following criteria elements are discussed below; integrity, thematic representation, association with significant persons, and level of significance. The Klov Dahl structure is determined to be eligible to the National Register by possessing integrity and meeting Criteria A ("...associated with events that have made a significant contribution to the broad patterns of our history..."), in its illustration of the Reclamation Period in the history of the Western states. In assessing the structure's eligibility, the level of significance assigned to this cultural resource was local.

The Klov Dahl Tunnel and Headgate structure was determined to have integrity in its retention of original design, materials, engineering, character and location. Despite the leakage located around the gates and portions of the headgate structure, both historically and in the present, it is judged to be basically sound and will likely remain so for many years to come. Currently the Forest Service plans to effect a repair of the leakage as documented in the environmental analysis (Willamette National Forest 1987, forthcoming). The objective is to protect the original structure for ensuring the engineering success of the repair as well to provide for the future enhancement of the structure as a cultural resource. Past repairs to the leakage problems in 1929, 1960 and 1984 involved the application of cement repairs to the headgate walls. Most of this past repair has taken place below water level and has not significantly modified the structure in any visible way. It appears much like it did upon completion in 1914, save for weathering of the concrete face, and headgate controls (Cf. Figure 6 and 14). The tunnel is basically sound, though a collapse of the unlined outlet had occurred during the 1930's, preliminary engineering work in 1986 repaired the outlet and made the interior of the tunnel and chamber-system accessible. The chamber-system (Figure 15) that channels the water taken in by the gates into the tunnel appears on visual examination to be in very good condition (Nordenson, Personal communication).

The structure is an extant representative of the Private enterprise period of the reclamation of Western lands. Of further importance is the fact that this project was developed and promoted well into the early twentieth century when the role of private interests were being usurped by state and federal governments, specifically the State Water Board, Bureau of Reclamation and Army Corps of Engineers. There were concurrent reclamation efforts in Central and Western Oregon but none in such a remote wilderness setting requiring such a monumental effort to both access and construct. There were two power plants in operation on the nearby McKenzie River by 1916, one at Walterville supplying hydro-electric power to the City of Eugene and a small plant on the mouth of Blue River that supplied the mining district in that area. Promoters had filed on Clear Lake to effect a similar scheme to the Waldo Lake project but it never was implemented on the ground (Whistler and Lewis 1916:89-90).

The Tumalo Irrigation District surpassed the Klov Dahl site in becoming an established reclamation project existing to the present day, despite its own historic "booms and busts" (Winch 1984, 1985, 1986). Had it not been for the failure of Willamette Valley farmers to wholeheartedly take up gravity fed irrigation (eventually relying instead on irrigation through pumping of ground water), the untimely lack of guaranteed power markets, or the financial and management problems of the Waldo Lake Irrigation and Power Company, this project could have become one of the most ambitious private reclamation efforts in the state. The Klov Dahl Tunnel and Headgate structure remains as an example of the attempt of private enterprise to acquire virtual free use of public natural resources for reclamation purposes and the search for high profits, as well as an indirect testimony to the role of government (particularly the various federal agencies) in managing such public resources and reclamation efforts.

This historic structure is also associated with persons, both private entrepreneurs as well as agents of the federal and state governments, who though not infamous or well known by scholars, were nevertheless representative of the early development of natural resources in the Western Cascades during the early 20th Century. However in addressing Criteria B of the National Register, this analysis came to the conclusion that no individuals involved with this project could be identified as having reached significant standing in the history of reclamation on account of the Waldo Lake project. It is possible that this project was Simon Klov Dahl's most important engineering achievement, however more biographical and related research would be needed to defend such a claim. The following data on the individuals involved is provided as biographical background and information for future research.

Simon Klov Dahl was a professional civil engineer from Eugene (1855-1932), for whom this headgate and tunnel was later named. An extensive document file, including many personal effects, is housed at the Lane County Historical Museum Library (Klov Dahl N. D.). To date no biographies could be located on him, however the historical community has an interest in him and his association with the Waldo Lake area (Bob Cox, Tom McCallister, and Lewis A. McArthur, Personal communication). Fredrick H. Ray of Helena, Montana (the major stockholder and secretary/treasurer of the company) was well known in his home state. He was involved in various reclamation projects in Montana, created the office of "State Engineer" and the "Carey Land Act Board". By the time he became involved in the Waldo Lake Irrigation and Power Co. he was Montana's Registrar of Lands (Sanders 1913:1403). Another member of the company's first board of directors was H. W. Thompson, County Judge in the jurisdiction of Lane County, Oregon (History of the Bench and Bar 1910). After the "rebirth" of the company in 1914, the board shifted to Spokane, Washington. Colonel William R. Abercrombie (1857-1943) assumed the presidency in 1915, he was a well known pioneer military man and settler of the nascent Spokane community in the late 1800's. He was involved in both the military history of that area as well as responsible for the development of the Metalline Falls mining district in the Pend Orielle River country. As of 1943 he was the only living man to have a mountain named after him, a 7200 foot peak in the vicinity of Locke, Montana. During World War I he served as Chief of Staff in the Panama Canal Zone (Eastern Washington State Historical Society Biography files; History of the City of Spokane and Spokane Country, Washington V. II 1912:100-105). The minor involvement of both Forest Service officials as well as such "irrigationists" in the Department of Agriculture have already been noted.

There is also limited biographical information available on some of the other company officers, though none appear significant in either the history of this structure or the region as a whole. The author regrets that information was not thoroughly traced for Milton L. Bugbee, whose financial involvement and participation as an "engineer" from 1912 to 1934, no doubt would add a colorful footnote to this structure's history. Most of the biographical material available on the other participants never once mentioned the Waldo Lake project. Of these people only Simon Klov Dahl had most of his hopes and dreams wrapped up in this project. In the future, students of Lane County history may want to expand this biographical treatment of Klov Dahl, as he spent a good part of his professional life on this project and has been made a well-known legacy through the structure and bay that bear his placename at Waldo Lake, Oregon.

CONCLUSION

Based on the National Register eligibility criteria (Criteria A) the Klov Dahl Tunnel and Headgate at Waldo Lake is determined to be eligible. After a thematic historic analysis of the history of reclamation in the Western States, and a consideration of the history of this cultural resource as it relates to that theme, this hydro-engineering structure is found to possess: Integrity, to be a locally significant representative of private enterprise in the history of the reclamation of water resources in the central Western Cascades of Oregon; and to illustrate the historic processes significant in the development of agriculture, industry and the regional economies of the Western states.

Unlike many historic sites this structure is as important for what it never became. The Klov Dahl Tunnel and Headgate was only to be an initial phase (albeit essential) in the development of an entire reclamation system along the Upper Willamette River Basin. This system would have employed miles of penstock and diversion canals, four hydro-power generating plants and untold transportation and related facilities. There is no doubt that if history had unfolded more favorably for these private developers of publicly owned natural resources, the Waldo Lake vicinity and indeed much of the Upper Willamette country would have been permanently effected. This would have had ramifications in the area's economy, demography, social life and especially the natural resources and beauty of the area that is so much in demand as an amenity value today. The Klov Dahl Tunnel and Headgate as a cultural resource site thus serves as a reminder of an earlier era, where the dreams and schemes of entrepreneurs focused to make their fortunes in the mountains amongst the multitude of natural resources once thought by some to be purely commodities "for the taking". Today this cultural resource offers a unique opportunity to provide a non-commodity value to the public, through historic interpretation, repair and enhancement of the Klov Dahl Tunnel and Headgate structure as proposed currently by the Willamette National Forest.

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