STATE OF WASHINGTON

THIRD BIENNIAL REPORT

OF THE

Department of Conservation and Development

From April 1, 1925, to September 30, 1926

ERLE J. BARNES, Director

OLYMPIA
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1927

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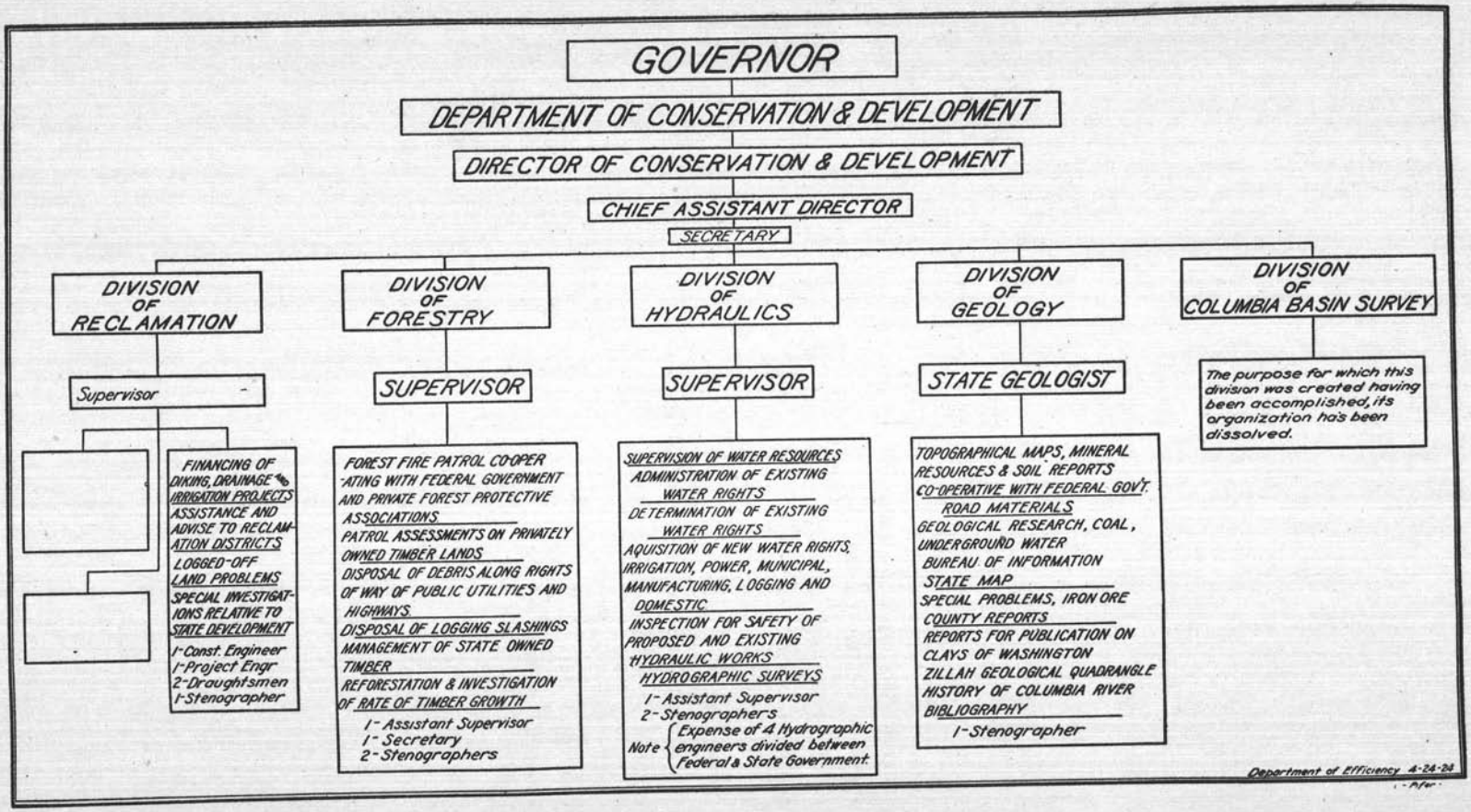

GOVERNOR
DEPARTMENT OF CONSERVATION & DEVELOPMENT
DIRECTOR OF CONSERVATION & DEVELOPMENT
CHIEF ASSISTANT DIRECTOR
SECRETARY
DIVISION OF RECLAMATION
Supervisor
FINANCING OF DIKING, DRAINAGE & IRRIGATION PROJECTS
ASSISTANCE AND ADVISE TO RECLAMATION DISTRICTS
LOGGED-OFF LAND PROBLEMS
SPECIAL INVESTIGATIONS RELATIVE TO STATE DEVELOPMENT
1-Const. Engineer
1-Project Engr
2-Draughtsmen
1-Stenographer
DIVISION OF FORESTRY
SUPERVISOR
FOREST FIRE PATROL CO-OPERATING WITH FEDERAL GOVERNMENT AND PRIVATE FOREST PROTECTIVE ASSOCIATIONS
PATROL ASSESSMENTS ON PRIVATELY OWNED TIMBER LANDS
DISPOSAL OF DEBRIS ALONG RIGHTS OF WAY OF PUBLIC UTILITIES AND HIGHWAYS
DISPOSAL OF LOGGING SLASHINGS
MANAGEMENT OF STATE OWNED TIMBER
REFORESTATION & INVESTIGATION OF RATE OF TIMBER GROWTH
1-Assistant Supervisor
1-Secretary
2-Stenographers
DIVISION OF HYDRAULICS
SUPERVISOR
SUPERVISION OF WATER RESOURCES
ADMINISTRATION OF EXISTING WATER RIGHTS
DETERMINATION OF EXISTING WATER RIGHTS
AQUISITION OF NEW WATER RIGHTS, IRRIGATION, POWER, MUNICIPAL, MANUFACTURING, LOGGING AND DOMESTIC
INSPECTION FOR SAFETY OF PROPOSED AND EXISTING HYDRAULIC WORKS
HYDROGRAPHIC SURVEYS
1-Assistant Supervisor
2-Stenographers
Note: Expense of 4 Hydrographic engineers divided between Federal & State Government.
DIVISION OF GEOLOGY
STATE GEOLOGIST
TOPOGRAPHICAL MAPS, MINERAL RESOURCES & SOIL REPORTS
CO-OPERATIVE WITH FEDERAL GOV'T.
ROAD MATERIALS
GEOLOGICAL RESEARCH, COAL, UNDERGROUND WATER
BUREAU OF INFORMATION
STATE MAP
SPECIAL PROBLEMS, IRON ORE
COUNTY REPORTS
REPORTS FOR PUBLICATION ON CLAYS OF WASHINGTON
ZILLAH GEOLOGICAL QUADRANGLE
HISTORY OF COLUMBIA RIVER
BIBLIOGRAPHY
1-Stenographer
DIVISION OF COLUMBIA BASIN SURVEY
The purpose for which this division was created having been accomplished, its organization has been dissolved.
Department of Efficiency 4-24-28
-Pfer-

PERSONNEL OF DEPARTMENT.

Erle J. Barnes	Director	Olympia
C. W. Karney	Chief Assistant Director	Olympia
DIVISION OF RECLAMATION—		
C. W. Karney	Supervisor	Olympia
R. K. Tiffany	Chief Engineer	Olympia
DIVISION OF FORESTRY—		
Geo. C. Joy	Supervisor	Olympia
T. S. Goodyear	Asst. Supervisor	Olympia
DIVISION OF WATER RESOURCES—		
R. K. Tiffany	Supervisor	Olympia
Chas. J. Bartholet	Asst. Supervisor	Olympia
DIVISION OF GEOLOGY—		
Dr. Harold E. Culver	Supervisor	Pullman
DIVISION OF COLUMBIA BASIN SURVEY—		
R. K. Tiffany	Chief Engineer	Olympia

LETTER OF TRANSMITTAL.

STATE OF WASHINGTON.

DEPARTMENT OF CONSERVATION AND DEVELOPMENT.

October 15, 1926.

To His Excellency, Roland H. Hartley, Governor.

Sir: I have the honor to submit herewith, in accordance with law, the Third Biennial Report of the Department of Conservation and Development, covering the period April 1, 1925, to September 30, 1926.

Respectfully,

ERLE J. BARNES,

Director Department of Conservation and Development.

THIRD BIENNIAL REPORT OF THE DEPARTMENT OF CONSERVATION AND DEVELOPMENT

Introductory.

This Department of the State Government unites two functions—Conservation and Development—with respect to our wonderful resources in timber, minerals and public waters.

As to timber, the most important function at the present time is that of conservation—protection of young and mature growth from fire and elimination of wasteful uses and methods.

As regards minerals, comparatively little is yet known as to the extent and value of the many useful materials stored away in our hills and mountains. A definite and business-like program for investigation of the location and the practical uses of our mineral resources should be adopted and carried along systematically over a long period of years. This is a type of expenditure that effects real economy by developing new sources of production and new channels of employment for the people of the State.

As to our water resources, there is need for both development and conservation. We may encourage development thru adding to our store of information in regard to stream flow, available fall, storage sites, etc., on our power streams; quality and quantity of available water supply for municipal and manufacturing purposes; available supply, storage sites, etc., for irrigation projects; and similar information with regard to the streams which cause serious flood damage, looking towards future regulation and control. This rich resource, while apparently inexhaustible, should be conserved so that the people of the State to whom it belongs may receive the greatest benefit.

Water Power.

Estimates of undeveloped water power in the United States range from 40,000,000 to 50,000,000 horsepower. Of this total more than 7,000,000 horsepower, perhaps as much as 10,000,000 horsepower when all projects are developed to this maximum potential lies within or on the borders of the State of Washington.

This is by far the most valuable single natural resource of our State. Our timber is fast disappearing; our mines will one day be worked out; but our rivers will rush ever onward to the sea and when harnessed will furnish energy equivalent to the labor of millions of men.

With her vast agricultural, mineral and timber resources, with access thru ocean shipping to the world's store houses of raw material, with the world's markets at her door by rail and sea, with a climate most favorable to efficient and economical production and with her wealth of hydro power cheap and inexhaustible, Washington is destined to become one of the leading industrial states of the Union.

Reclamation.

The State Legislature of 1919 enacted the State Reclamation Act and the operations under this act were, by the Administrative Code of 1921,

placed in charge of this Department. The Director is authorized by the law, among other things "to formulate and adopt a sound policy for the reclamation and development of the agricultural resources of the State * * *".

The Reclamation Board under the original act and this Department under the previous administration, undertook the development of many reclamation projects, but the results of these undertakings are such as to leave only one conclusion, namely, that the original reclamation act did not constitute "a sound reclamation policy" for the State; nor have we been able to formulate such a policy based upon the expenditure of State funds for reclamation purposes.

Results of the State's various ventures in reclamation will be found elsewhere in this report and in the special report submitted to special session of the Legislature in 1925. The Legislature, acting presumably upon this report authorized a special joint committee of the House and Senate to investigate State reclamation and to file a report of the results of its investigation on or before October 1, 1926.

We had hoped that this report would be at hand and would be helpful toward formulating a sound reclamation policy. It has not been submitted and in its absence we shall attempt only to set out some of what we consider to be fundamental and governing principles in future consideration of the State's reclamation policy.

Reclamation of land including arid, swamp or overflow and cut-over lands will be the most important factor in the agricultural growth of the State.

As to the cut-over lands, no satisfactory substitute has been found for individual or corporate effort. For irrigation, drainage and diking some sort of a district or community organization is essential. Constant study should be given to the problems of these districts and the statutes amended and improved from time to time in order that they may function most economically for the benefit of the landowners and settlers.

The larger irrigation projects in this State can be built only by the Federal Government. The State should support a rational program of Federal reclamation, the projects to be developed solely upon merit and as there is shown to be an economic need, present or potential, for their products.

The State should continue to secure essential information in regard to reclamation projects including stream flow, storage sites, etc.

As the water supply available for irrigation is not sufficient to serve all of the land under proposed reclamation projects and the use for irrigation is generally more valuable than any other use, legislation should be enacted authorizing the withdrawal of streams needed for irrigation from appropriation for any other purpose except municipal and domestic supply.

Most certainly we are not prepared to recommend a State reclamation policy involving the investment of State funds raised by taxation of all property for the reclamation of new lands when every new project heretofore undertaken by the State is in financial difficulty due to lack of farmers to cultivate the land and when farmers on the older projects and elsewhere thruout the State are finding it difficult to make a living.

Just now the State appears to be in need of a larger industrial and commercial development which would improve the market for its farm crops rather than any immediate increase in its agricultural area.

The Kittitas Project.

The first Federal appropriation of $375,000 for beginning construction on the Kittitas Division of the Yakima project was conditioned upon the State's undertaking to finance and become responsible for the settlement of the project. State land settlement had been urged before Congress as a proper policy for all Federal reclamation development. It was opposed by most of the western Senators and Representatives and failed to secure the approval of Congress, but this requirement with respect to the Kittitas Division was attached to the appropriation bill in committee and until a contract acceptable to the Secretary of the Interior could be agreed upon, work on the project could not be started.

We were first asked to execute a contract binding the State to the expenditure of an undefined amount of money, which it was estimated from the terms and conditions of the contract might amount to as much as $2,000,000 or $3,000,000 for the purpose of subdividing, clearing, leveling, improving the buildings and locating of settlers upon privately owned lands within the Kittitas Reclamation District. We refused to execute the contract on the grounds—

First, that the amount of money required was indefinite and was likely to be very far above any expenditure that the State should make even for experimental land settlement.

Second, that the proposed land settlement was for the benefit of private landowners within the Kittitas Reclamation District only, and that this cost should be borne by them.

Third, that the execution of this contract by the State would probably establish a precedent which, if urged on future Federal reclamation projects, would seriously limit, and in many cases absolutely prevent, Federal development.

The land settlement plan as proposed for the Kittitas project was thereafter revised so that the expenditure was limited to $300,000. The total amount of the State's obligation is underwritten and guaranteed by the Reclamation District, and it was definitely agreed that this contract should not be considered a precedent in connection with future projects. The idea that the Federal Government should require State-financed land settlement as a condition precedent to adoption of new Federal reclamation projects has been definitely abandoned. (See Appendices for contracts as first proposed and as finally executed.)

Research and Development Work.

This is a relatively new department of the State government. It has to do largely with physical properties of the State and of its citizens, and its name implies a service that will bring about the best use of these natural resources for the common good.

Under the existing laws the Divisions of Forestry, Geology, Hydraulics and Reclamation have made and will continue to make investigations as to the location, character and extent of the many and varying natural resources possessed by the State. It is well known that development along some lines has proceeded rapidly. The lumber industry, for example, has grown at such a rapid rate that those now engaged in it are not finding it any too profitable. As a result our forests are being depleted and there are unquestionably large and preventable wastes.

There is opportunity for conservation thru the development of by-products in this and other industries and there are many natural resources which are not yet used even to the extent necessary to supply the home market. It is suggested that in the future the Divisions above referred to might properly undertake to make more detailed investigations of our natural resources and of their present and potential utilization including production, markets, shipping facilities and rates, etc., and to collect, tabulate and analyze statistical data relating to the agriculture, industry and commerce of the State, to the end that a well-balanced development of the resources of the State may be promoted and encouraged.

This would enable the Department to furnish to prospective settlers and investors the best available information on points of interest to them.

ERLE J. BARNES,
Director.

DIVISION OF FORESTRY.

Hon. Erle J. Barnes, Director,
Department of Conservation and Development,
Olympia, Washington.

Dear Sir:

Herewith is submitted the Twenty-first and Twenty-second annual reports of the Division of Forestry, covering the period from December 1st, 1924, to September 30th, 1926.

Very truly yours,
GEO. C. JOY,
State Supervisor of Forestry.

INTRODUCTORY.

The chief function of the Division of Forestry has been to protect the state's timber resources from fire.

The work was inaugurated in 1905 by an appropriation of $7,500.00 to cover the cost of protection for a two year period.

The increase in the value of timber, together with a greatly increased fire hazard and the need for extending protection to our cut-over lands to aid in their reforestation, have added to the volume of work, so that in 1924 there was expended for protection, outside of the National Forests, by state and private protective agencies the sum of $393,032.54.

The expenditures of private owners exceed the expenditures made by the state for this work.

As the work has grown it has been organized and carried on so there is no duplication of effort. A cooperative agreement is had with the private agencies and the U. S. Forest Service providing for an allocation of duties and responsibilities, so that equal protection is given to all forest lands regardless of ownership.

The private agencies levy an assessment of so much per acre upon the lands of their members to carry on their work. Approximately three and one-half million acres are thus provided for. All other privately owned forest lands, not listed with private agencies, are assessed by this department for the cost of protection.

The funds for our work are provided by state appropriation and federal allotment under the Clarke-McNary Act. Assistance is also given by the Department of the Interior in the protection of its lands. These constitute the sources from which revenue for forest protection outside of National Forests is derived.

Agreement is made with five private organizations and the U. S. Forest Service for the protection of privately owned lands, assessed by the state, and the monies so raised are paid to these agencies which carry on the work. In counties where no private agencies operate, protection is extended to these privately owned lands by this department. The assessments are collected and disbursed by us.

The forest fire problem is growing apace with the increase in the amount of logged-off land and with the development of roads and trails through the forested districts. This calls for the exercise of more care and a greater effort to prevent fires.

Constant improvement in the organization and conduct of the work is required. Publicity through the press and civic organizations will greatly aid to control the situation and keep down costs. By doing these things and keeping up a high standard of service, we can hope to conserve our timber resources and to aid and encourage the production of new forests for the future.

The following tables will show the number of fires which have occurred; the area burned over; loss to timber, logs and other property, and the receipts and expenditures of the Division.

Table No. 1 shows number of fires in each county for two year period and their cause.

Tables No. 2 and No. 3 show the area burned over and loss and damage to timber and other property.

Table No. 4 shows receipts from state appropriations and expenditures made therefrom.

Table No. 5 shows receipts and expenditures from federal allotments under the Weeks Law and Clarke-McNary Act.

Table No. 6 shows receipts and disbursements from assessment of privately owned forest lands.

Table No. 7 shows amounts recovered in settlement of costs and expense incurred for fire fighting.

Summary shows expenditures made from all funds for the period December 1, 1924, to September 30, 1926.

All items of expenditure in the foregoing financial tables are segregated to accommodate the budget requirements of the United States Forest Service under the Clarke-McNary Act, and are made up as follows:

Administration: Salaries and traveling expense of officers and clerks, and office supplies.

Field Personnel: Salaries and traveling expense of wardens and patrolmen.

Improvements and Equipment: Trail work, construction and maintenance of lookout stations, tools and field equipment.

Fire Suppression: Wages and expense of fire fighters.

All Other Expense: Telephone, telegraph, postage, printing and miscellaneous expense.

Table No. 8 shows amounts expended out of the several funds for fire prevention and suppression in each county, and the amounts due the state from the several counties as reimbursement for one-third of expenditures made from state appropriations.

Table No. 9 shows number of acres of forest land assessed for protection costs by the state. This assessment is levied on all privately owned forest lands for which the owner does not voluntarily provide protection.

Tables Nos. 10, 11 and 12 show collections, cancellations and credits from forest land assessments for the period December 1, 1924, to September 30, 1926.

Table No. 13: Burning permits granted, and classification and acreage of land burned over under such permits.

FOREST FIRE SEASON 1925.

The season was normal, so far as weather affected the fire hazard, until about the middle of May. From that time onward and until August 10th, there was a deficit of rainfall sufficient to cause a cumulative increase in the hazard to above normal, and this reached its height during the first ten days of August, after which general rains fell and the critical period came to an end. In the latter part of July and early August the fire hazard was acute and it was during this period that most of the bad fires occurred.

During the latter part of September and well along into October another bad spell of weather ensued and while no bad fires developed at that time, the situation became critical, and in some of the northwestern counties of the state the woods dried out so fires burned in the duff on the

forest floor and were hard to control. The game season opened October 1st and a number of fires were started by hunters. One of these fires in Whatcom county burned over a large area of cut-over lands and ran into green timber. A number of men were required to control it.

The most disastrous fire of the season occurred on August 8th, in eastern Jefferson county, in the Olympic National Forest. It was started in July by a spark from an oil burning logging locomotive. It was controlled by the logging crew until August 8th when northeasterly winds fanned it out of control and it became a crown fire, covering 15,000 acres of ground in an afternoon and killing approximately 100,000,000 feet of timber. The fire spread outside the National Forest boundaries and burned a considerable amount of privately owned timber. Approximately 600 acres of state timber was burned; this was inside of the National Forest. It is doubtful if this state timber will be salvaged as it lies on a steep mountain side which is not easy of access, and it would not pay to log the timber under present market conditions.

The forest service officials made an investigation into the origin of this fire in an endeavor to fix responsibility for the large loss, but they could not find sufficient evidence on which to base an action for damage. The fire was undoubtedly caused by the logging operation in which it originated. The operator should pay for the losses sustained. This may seem harsh treatment for the operator, but it is not right that the government, state and private owner suffer all the loss. There is one pretty sure way of stopping such fires as this, and that is to hold the operator to strict accountability for what happens in his operations.

Another bad fire occurred July 22nd on the upper Skagit river in Skagit county. This was caused by lightning striking in a blowdown of trees. It burned over 1,440 acres in green timber but only a part of this was killed.

Another fire in King county, caused persumably from a cigarette dropped by a berry picker, burned over a large area, destroyed a logging camp and did considerable other damage.

In eastern Washington, one very bad fire in Pend Oreille county, burned some camp equipment and a considerable amount of logs. This fire was of incendiary origin. It cost $25,000.00 to control. Another fire in Spokane county burned over a large area in a sparsely timbered district and destroyed fences, some buildings and ruined a considerable amount of pasturage.

The areas burned over and losses to standing timber, logs, logging equipment and other property were considerably less than last season. There were 1,241 fires this year, as compared with 1,532 last year. The area burned over was 142,355 acres as against 322,691 acres for last season. All losses were in about the same proportions. On another page of this report, a table is given showing in detail the area and class of land burned over and loss to timber and other property.

In the white pine and cedar districts of Stevens and Pend Oreille counties an abnormally high fire hazard exists. This is due to the large amount of logged land on which only a part of the timber has been removed and the slashings not disposed of. When a fire does get started in this material it is very hard to control. It is a serious situation and one

fraught with evil consequences. During any extremely dry season the liability of large destructive fires is imminent.

The white pine and cedar timber is taken off leaving the debris scattered in amongst the tamarack and fir which is still standing. It is impossible to broadcast burn these slashings on account of the fire danger, and at present lumber market conditions it is economically impossible to dispose of them by piling and burning, or in any other manner. If not burned, these slashings remain for 20 or 25 years and are a menace to the timber left standing, to young growth, and to all other surrounding property. It is a problem difficult of solution. Intensive protection against fire is the only practicable remedy available at the present time. This condition does not exist in the yellow pine districts.

Cooperation: The United States Forest Service officers and men gave us the very best of cooperation in our work bordering the National Forests. We entered into a cooperative agreement with them which greatly facilitated the handling of fires in a common zone one mile on each side of the boundary line. Although the most disastrous fire of the season originated inside the Olympic National Forest and spread into our territory, the Forest Service did all that was humanly possible to control it. Occasionally a condition develops, in fire protection work, through a combination of fire and weather, when any number of men are powerless to control the situation.

Under the Clarke-McNary Act, which supersedes the Weeks Law Act, this state received a larger allotment of federal funds for protection work than ever before, the total amount being $33,220.00. This is used to give protection to state and privately owned lands outside of the national forests.

The U. S. Department of the Interior also furnished more funds for the protection of government lands lying outside of national forests than formerly. This is a contribution gratefully acknowledged, as a considerable amount of this land intermingles with other forest lands which we must protect, consequently this assistance is very acceptable. It is a recognition of the department's responsibility for the protection of its own lands.

The Washington Forest Fire Association, the largest private timber protective association in the state, expended $187,418.46 in protection work during the year. It operates in western Washington only.

We have the closest cooperation with this organization, there being supervising field wardens acting jointly for this department and the association, bringing the entire field force of wardens under one head. This prevents duplication of effort and makes for more effective work in the field.

The Eastern Washington Timber Protective Association is a private organization operating in Pend Oreille county only.

The Ferry County Timber Protective Association takes care of protection matters in that county.

The Stevens County Timber Protective Association is another private agency, operating in Stevens county. There are other small private protective agencies giving protection to small districts in a number of counties. These render the very best of cooperation. The private agencies operating in the state furnish 66 per cent of all funds expended for protection.

In Okanogan, Chelan, Kittitas, Yakima, Spokane and western Klickitat counties, the funds derived from the assessment of privately owned forest

lands are administered by this department, there being no private protective organizations in these counties.

Logging operators and railroad companies gave good cooperation, and the public generally rendered splendid service in the prevention of fires.

Newspaper publicity was good and we owe the press of the state a debt of gratitude for the interest manifested, the timely warnings given, for editorials and news of our work which appeared in their columns throughout the season from time to time.

Weather Forecasts: The forecasting of fire weather is now looked upon as a most important service in forest protection. The weather bureau is continuing its study of fire weather causes and effects, and six times during the season sent out warnings when such weather was impending. This is of great service to all protection agencies as extra precautions can be taken to prevent fires, logging operations closed down, etc. If more attention was paid to these warnings there would be fewer fires, as our fire reports show that a large majority of fires are started, spread and do damage during these spells of weather.

More and more attention is being given each year to the protection of cut-over and otherwise denuded lands. Private owners realize that unless fires are kept off these potential forest lands, they will not reforest.

No matter who owns our logged-off lands, or how they are administered, if fires be prevented from running over them, most of them will reforest naturally and the whole state be benefitted thereby.

FIRE SEASON 1926.

There were a less number of fires this year than last; a small increase in the loss to standing timber and second growth, but a large decrease in the loss of logs, logging equipment and other classes of property, while the area burned over was greater and the cost to all protection agencies, state, federal and private, was a great deal more than in any other year.

Almost one-half of the area burned over is in Stevens and Pend Oreille counties in the northeastern part of the state. A "dry lightning" storm swept over that section of the state on July 12th. This started an unprecedented number of fires in remote forested districts. Very hot, dry weather, with dessicating winds ensued. Most of the fires were controlled immediately, but so many occurred that the protective agencies were almost overwhelmed and were unable to give all of them attention soon enough, with the result that some of them spread to large proportions.

The loss to merchantable timber in these two counties although heavy was not as great as was feared at first. The greater loss will be in young growth, not yet merchantable, a considerable amount of which stood on cut-over lands.

One fire in Stevens county covered approximately 30,000 acres. A good deal of the area burned over was sparsely timbered or bald rocky lands.

One of the most dangerous fires was what is known as the Sheep Creek fire in northwestern Stevens county. The Forest Service did some good work on this fire and helped greatly in its control.

The conditions as pointed out in my report of last year regarding the non-disposal of slashings in those counties, was largely responsible for the

rapid and uncontrollable spread of these fires. The same fire conditions prevailed over northern Idaho, western Montana and southeastern British Columbia. The forest protective agencies were hard hit financially.

The U. S. Forest Service expended over one million dollars fighting fire in northern Idaho and western Montana.

The two private associations in Stevens and Pend Oreille counties, in cooperation with this department, put forth every effort to control the situation. The work done saved both state and privately owned timber. More money could have been expended fighting fire but it is doubtful if it would have secured any better results.

In Okanogan county a bad fire occurred from lightning on lands which were recently exchanged by the Forest Service to the state. This fire covered between five and six thousand acres, and cost the state approximately $7,000.00 to control. Fortunately the loss was not very great.

In western Washington the season was bad but there were less fires, less loss to timber, logs, logging equipment and other property, and less ground burned over than in previous years.

The worst fire in the Douglas fir region was near Eatonville in eastern Pierce county. It started on the 12th of July from some unknown cause, but is thought to have been purposely set or was caused by a cigarette. This fire covered 7,600 acres of land, mostly logged-off, killed some 18,000,000 feet of timber and destroyed some logging equipment. It was eleven miles long, extending in a northwest, southeasterly direction. In three different sections, in the vicinity of the fire, state-owned timber was exposed where it had been logged up to. Some of this timber, along the edge, was killed but no considerable amount was destroyed.

The feature of this fire was the large cost of fire fighting. Over $90,000.00 was thus expended. This was borne chiefly by the Washington Forest Fire Association, and four logging concerns whose operations were threatened. More than 40 miles of fire trail was constructed and hundreds of snags felled in the course of the fight. At one time the town of Ashford was threatened, but a shift in the wind enabled the men fighting the fire to gain control at this point.

Another bad fire was in the operations of the Yeomans Lumber Company in western Lewis county. This started from sparks from a hot tail block. It destroyed a considerable amount of logging equipment and logs.

Another fire starting from friction of a line around a snag covered a thousand acres of ground in the operations of the Saginaw Timber Company in Grays Harbor county.

Another fire in Skagit and Snohomish counties, starting from a spark from a logging locomotive, covered 1,400 acres of land and burned some timber, a little of this owned by the state.

A bad fire in Skagit county, started by a berry picker, covered two sections of logged-off land and cost $12,000.00 to control.

On another page of this report is a table showing in detail the area burned over and losses to all classes of property.

As regards weather, the season was good until the middle of June. Although several periods of fire weather occurred previously, they were of short duration and no bad fires occurred. Beginning the latter part of

June, a prolonged hot, dry period set in which continued until August 10th, when rains fell in the western part of the state and a little later in eastern Washington, after which little trouble with fire was experienced.

The most critical situation developed in July when hundreds of fires were started by lightning in the eastern part of the state, and very bad weather occurred in western Washington.

Although fire fighting costs were greater than in any other year, the total loss was not as great, which is some compensation for the large amount of work done.

One feature of the year's work which had something to do with the lower losses, was the closing down of a good many logging camps during the critical weather period. An active logging operation is one of the worst hazards there is and the liability of a fire being started during bad weather is great, as is evidenced from the reports of fires sent in by our wardens this year. If all logging camps were closed during periods of critical weather it would help greatly to reduce the number of destructive fires, which have in the past caused large losses. The loss in logs this year was 10,242 M feet; last year 20,645 M feet. The loss to logging equipment was $98,470.00 this year as against $271,317.00 last season.

Another feature of the year's work was the favorable weather conditions which prevailed this fall for slash burning. After the heavy rains in August, slashings dried out sufficiently to allow of a good burn. This was taken advantage of by many logging operators and others, and more slashings were disposed of than is usually the case.

Burning slashings is a difficult problem to handle properly as so much depends upon the state of the weather, both before and after burning. When the slashings are dry enough to be burned there is danger of getting too much fire and when they are wet they do not burn. Disposal of slashings in this manner is a necessary evil. If they are not burned, the hazard is increased and becomes perilous. Some operators make preparations in advance for burning and this is the best way to insure a safe, clean burn.

Organization: The field force was composed of the same number of district and county wardens as last year, but we had on a larger force of patrolmen, this being due to the exegencies of the season requiring more men to handle the fires.

Three special law enforcement officers were added to our force. These men devoting all of their time to the detection and prosecution of law violators. This worked out so well that we plan to add another patrolman to the force next year. We feel that a campaign for strict law enforcement will create a greater respect for the fire laws and will serve to reduce the number of fires.

Cooperation: Cooperation was had with the several private protective associations and agencies; the U. S. Forest Service; the U. S. Department of the Interior; railroad companies; logging operators and citizens. The spirit of cooperation amongst our citizenry is most encouraging. There is a deep sympathetic interest manifested in matters pertaining to Forestry and our work in general, and I find a willingness on the part of most people to not only cooperate with us when asked to do so, but many voluntarily offer their services and assistance. The Boy Scout organizations took an active part in fire prevention work and rendered the very best of service.

We commissioned 107 scouts as rangers upon recommendation of the Scout Masters. Civic organizations, Commercial Clubs, Chambers of Commerce and churches helped spread the gospel of fire prevention.

Two hundred forty-one private citizens were given commissions as rangers; 183 men were commissioned for the U. S. Forest Service, 35 for Indian Agencies; 142 for private protective associations and railroad companies, and 150 men were commissioned to serve as logging camp fire wardens.

The total combined force of all protective agencies operating in the state, men engaged and paid to prevent and control fires only, was 653 men.

Weather Forecasts: Once again the Weather Bureau played an important role in our work. Through an appropriation by Congress for this especial purpose, an expert meterologist was assigned to permanent duty at Seattle. Fortunately for the state, Mr. Geo. W. Alexander, who was here last year, was returned, and continued his investigations and research work in this phase of protection work. He will remain on duty throughout the entire year.

To install this year round study, the chief of the weather bureau, Mr. Chas. F. Marvin, from Washington, D. C., made a trip through the state and visited some of our forested districts to get first hand information of our protection problems. Later at a meeting of representatives of all protection agencies at Portland, Oregon, Professor Marvin made plans to give this service to all five Pacific Coast states.

Throughout the season fire warning forecasts were sent out whenever bad weather seemed imminent. These forecasts were very helpful, especially in the selection of the most opportune time to burn slashings.

There has been considerable agitation during the past three or four years regarding the so called "smoke nuisance." During the fire season, whenever weather conditions are favorable, the smoke from forest fires, brush fires, grass fires, from industrial and domestic operations, settles over the country obscuring the view and causing an unpleasing condition of the atmosphere.

Most of this trouble was charged against forest fires, the burning of slashings and fires from land clearing operations. A bad forest or brush fire does send up an enormous amount of smoke and these two are the chief offenders contributing to make this nuisance. Land clearing fires, confined to the burning of piles of debris in places where the fires cannot spread, do not cause any considerable amount of smoke. Slashing fires do send up large volumes of smoke. This year, beginning in June, no permits were given to broadcast burn slashings until rains fell in August. As has already been stated, the only time when slashings will burn is when they are fairly dry, and due to the vagaries of the weather, it is difficult to pick a time to burn when a clean burn can be secured, without causing inconvenience of smoke or danger of loss to property. In order to deal out justice to a part of our citizenry who have slashings to burn, some chances must be taken and these slashings burned when they will burn.

Those interested in elimination of the "smoke nuisance" cooperated in every way possible in the prevention of fires. A campaign of this kind rightly conducted, will serve to lessen the number of fires and will help us in our work.

Another year it is hoped that greater results can be accomplished, for, curbing the smoke nuisance means curbing the fires.

During certain spells of weather, fires are started in the woods and on logged-off land from various causes. Often, these are hard to control and put out, and they continue to burn and send off smoke. The hazard is growing worse every year. More logged-off land and more people roaming over it to start fires.

Our virgin timber stand is fast disappearing leaving in its wake a vast and increasing area of logged-off land. What is to become of this is a problem which is being given serious thought and consideration by the people of the state. Much of this area is unfit for any use except that of growing timber. It is the very worst of fire hazards and it is a direct cause, more than anything else, in the gradually increased cost of protection, and this cost is likely to continue on the upgrade as more timber is logged. The obvious thing to do with the land is to grow another crop of timber on it. Protecting it from fire will bring about this result. There is no greater work which this department can do for the benefit of all the people of the state than to see to it that this land is given such protection.

TABLE NO. 1—SHOWING ORIGIN, NUMBER AND CLASSIFICATION OF FIRES FOR SEASON 1925.

COUNTIES	Donkey	Log Locomotive	R R. Locomotive	Tourists & Ca'pers	H'nters & Fishermen	Cigars and Cig'ret	Land Clearing	Burning Without Permit	Clearing Right of Way	Smoldering	Berry Pickers	Lightning	Incendiary	Unknown	Miscellaneous	Total
Chelan			2	1	1	13	5		1			29		1	8	61
Clallam	1			6	4	2	8		1	1	2			18	3	48
Clark			1	1	1	2	3	4	1	1	1		2	6	4	27
Cowlitz	1	2	1	4	1	2	4				1	3	4	3	1	27
Ferry			2			2	1					11		1	1	18
Grays Harbor	5	6	2	6		14	11	1	1	4	10			7	4	71
Island											1			6		7
Jefferson				4		2	1		1		3	2		4	2	19
King	5	9	16	18	2	16	2	1	1	13	1		3	15	12	114
Kitsap	2			3	1	5	3				2		3	7	1	27
Kittitas			5			8						7		9		29
K'ickitat			5	3	1	10			1	1		5	3	15	3	47
Lewis	8	5	1	6		9	3	1		1	4		4	19	5	66
Mason	9	3		6		7		2				2		12	1	42
Okanogan					1	2						21	1	3	3	31
Pacific	1	3	2	1	1			1		1	1		1	2		14
Pend Oreille		1	5	5	1	8	2		1	3		16	12	1	7	62
Pierce	5	4	8	5	2	18	1		1	15	5		9	7	7	87
San Juan				3			1					1		9		14
Skagit	4	2	5	8	8	13				11	4	11	4	19	5	94
Skamania	1		1			1								2	1	6
Snohomish	1	2	3	4	4	8	5		2	7		2	2	7	5	52
Spokane			11	4	2	10	1	6		1		2		17	4	58
Stevens	3	7	19	6	5	12	9	2		6	1	41	15	38	8	172
Thurston	1		5		1	1			1		1		2	12	5	29
Wahkiakum											1			1	1	3
Whatcom		2	1		2	2	1			8	1	2	1	8	7	35
Yakima					2	1						7	1			11
Totals	47	46	95	94	40	168	61	18	14	73	39	162	67	249	98	1,271

CLASSIFICATION OF FIRES, 1925. Class A (under ¼ acre), 424; Class B (¼ to 10 acres), 384; Class C (11 to 100 acres), 277; Class D (101 to 1,000 acres), 157; Class E (over 1,000 acres), 29. Total, 1,271.

U. S. RESERVATIONS AND FORESTS, 1925. The 1,665 fires were classified as follows: Lightning, 1,047; railroads, 40; smokers, 182; camp fires, 260; brush burning, 41; lumbering, 38; incendiary, 20; miscellaneous, 37.

ARRESTS AND FINES, 1925. Number, 40; Amount, $923.30.

TABLE NO. 1—SHOWING ORIGIN, NUMBER AND CLASSIFICATION OF FIRES FOR SEASON 1926.

COUNTIES	Donkey	Log Locomotive	R.R. Locomotive	Tourists & Ca'pers	H'nters & Fishermen	Cigars and Cig'ret	Land Clearing	Burning Without Permit	Clearing Right of Way	Smoldering	Berry Pickers	Lightning	Incendiary	Unknown	Miscellaneous	Total
Chelan	1		3	1		10	6					3		4	5	33
Clallam	2			1	4	13	2		2					7	3	34
Clark		1	3	3	2	2	2	2					4	7	3	29
Cowlitz		1		6	1	3	3			2			1	11	1	29
Ferry						1	1		1							3
Grays Harbor	9	1		9	3	9	7		1		3		5	12	4	63
Island	1			3	3		2							4		13
Jefferson	3			6	1	2	2						1	10	1	26
King	6		5	13		36	5	3	7	1	4		5	23	18	126
Kitsap				3		8	4				1		4	3	2	25
Kittitas	1		11	1	4	8	2							6	1	34
Klickitat	2		4	2	1	7	6			3			7	11	1	44
Lewis	5	1	1	2	2	6	2		1		3	1	5	8	8	45
Mason	7	1		8	2	9	1			1	1		4	8	3	45
Okanogan				1		1						14		5		21
Pacific	3		4	2		2	2			2	2		1	4	3	25
Pend Oreille			5	4	1	8	14		1			40	1	5	2	81
Pierce	6	6	3	5		22	1	1		4	5		6	6	8	73
San Juan				1		1				1				4	1	8
Skagit	2	7	8	3	1	9	1			3	3	7	3	15	7	69
Skamania	1					2								1		4
Snohomish	5	3	4	2		12	1		1	2	9		10	7	6	62
Spokane		1	23	15		12		8			1	3	1	16	4	84
Stevens		2	3	1	1	8	5	2		5		48	7	22	4	108
Thurston	2	1	4					1			3		1	9	3	24
Wahkiakum						3	1								1	5
Whatcom	4			2		4	4				2	10	2	7	1	36
Yakima						1								1		2
Totals	60	25	81	94	26	199	74	17	14	24	37	126	68	216	90	1,151

CLASSIFICATION OF FIRES, 1926. Class A (under ¼ acre), 327; Class B (¼ to 10 acres), 368; Class C (11 to 100 acres), 238; Class D (101 to 1,000 acres), 168; Class E (over 1,000 acres), 50. Total, 1,151.

U. S. RESERVATIONS AND FORESTS, 1926. The 1,504 fires were classified as follows: Lightning, 689; railroad, 84; smokers, 269; camp fires, 247; brush burning, 38; lumbering, 22; incendiary, 82; miscellaneous, 73.

ARRESTS AND FINES, 1926. Number, 69; Amount, $1,375.20.

TABLE NO. 2—FOREST FIRES, OUTSIDE OF NATIONAL FORESTS, REPORTED BY STATE AND ASSOCIATION EMPLOYEES, 1925.

COUNTIES	AREA BURNED OVER						MERCH'TABLE TIMBER		LOGS	LOSS AND DAMAGE TO PROPERTY	
	No. Fires	Mer-ch'nt'ble Timber	Second Growth	Cut Over Land	Old Burn & Brush	Total	M. Feet Killed	M. Feet Dest'y'd	M. Feet Dest'y'd	Lumbering Equip-ment	Settlers and Others
Chelan	61	388	137	37	290	852	248	40	2	.....	$700 00
Clallam	48	1,218	585	6,838	375	9,016	3,680	500	1,015	$6,500 00	1,725 00
Clark	27	40	19	495	199	753	.....	.....	.....	.....	4,900 00
Cowlitz	27	40	244	1,687	202	2,173	2,000	500	50	2,200 00	1,550 00
Ferry	18	.....	.....	7	12	19	3	.....	.....	.....	200 00
Grays Harbor	71	101	.....	12,729	2,265	15,095	1,110	150	3,130	26,695 00	.....
Jefferson	19	1,932	63	3,582	225	5,802	20,000	2,000	200	2,000 00	1,000 00
Island	7	80	620	1,510	680	2,890	.....	.....	.....	750 00	500 00
Klickitat	47	492	107	3,169	167	3,935	.....	.....	.....	.....	.....
King	114	290	793	4,237	5,230	10,550	160	225	1,702	21,116 00	1,800 00
Kitsap	27	733	320	2,250	1,498	4,801	500	25	275	1,200 00	206 00
Kittitas	29	218	130	241	41	630	51	23	15	.....	5 00
Lewis	66	1,020	701	6,331	2,783	10,835	1,725	780	6,350	45,935 00	6,900 00
Mason	42	165	103	4,372	1,343	5,983	167	15	665	1,545 00	.....
Okanogan	31	1,417	58	393	478	2,346	307	202	.....	40 00	400 00
Pacific	14	230	40	1,316	697	2,283	1,685	350	485	18,800 00	.....
Pend Oreille	62	1,464	845	4,219	1,360	7,888	3,100	57	540	2,650 00	1,135 00
Pierce	87	440	58	3,008	1,096	4,602	5,255	264	1,500	1,000 00	385 00
San Juan	14	4	24	14	222	264	10	.....	.....	.....	170 00
Skagit	94	2,198	685	3,981	4,325	11,189	15,736	2,065	3,020	99,000 00	200 00
Skamania	6	4	.....	145	43	192	.....	.....	2	.....	300 00
Snohomish	52	10	106	2,566	670	3,352	107	27	30	1,044 83	135 00
Spokane	58	932	2,380	4,807	2,165	10,284	1,250	.....	20	.....	617 00
Stevens	172	10,916	2,687	1,565	3,952	19,120	1,355	678	494	292 00	12,328 25
Thurston	29	23	119	1,810	289	2,241	.....	.....	600	3,550 00	135 00
Wahkiakum	3	.....	.....	220	115	335	.....	.....	.....	.....	.....
Whatcom	35	1,746	225	2,064	666	4,701	1,620	977	550	37,000 00	.....
Yakima	11	204	4	.....	16	224	22	19	.....	.....	.....
Totals	1,271	26,305	11,053	73,593	31,404	142,355	60,091	8,897	20,645	$271,317 83	$35,291 25
U. S. Forest Service	1,665	.....	.....	.....	.....	36,542	.....	.....	.....	.....	.....

Total loss and damage to all classes of property, $457,170.08.

TABLE NO. 3—FOREST FIRES, OUTSIDE OF NATIONAL FORESTS, REPORTED BY STATE AND ASSOCIATION EMPLOYEES, 1926.

COUNTIES	AREA BURNED OVER						MERCH'TABLE TIMBER		LOGS	LOSS AND DAMAGE TO PROPERTY	
	No. Fires	Mer-ch'nt'ble Timber	Second Growth	Cut Over Land	Old Burn & Brush	Total	M. Feet Killed	M. Feet Dest'y'd	M. Feet Dest'y'd	Lumbering Equip-ment	Settlers and Others
Chelan	33	60	253	66	89	468	35	9	.....	.....	$1,700 00
Clallam	34	246	235	687	204	1,372	160	60	.....	.....	.....
Clark	29	540	2	921	512	1,975	.....	.....	.....	.....	5,000 00
Cowlitz	29	102	14	135	342	593	550	201	200	$200 00	.....
Ferry	3	.....	.....	136	.....	136	.....	.....	5	.....	.....
Grays Harbor	63	460	65	6,720	2,026	9,271	812	100	2,655	4,525 00	400 00
Island	13	85	637	1,200	670	2,592	200	150	60	600 00	.....
Jefferson	26	621	194	1,285	1,304	3,404	500	200	400	6,300 00	.....
King	126	147	2,041	6,757	5,257	14,202	300	.....	300	850 00	680 00
Kitsap	25	190	192	1,445	2,147	3,974	.....	.....	.....	.....	1,500 00
Kittitas	34	636	1,692	1,013	4,045	7,386	77	24	1	.....	1,450 00
Klickitat	44	1,983	904	1,446	2,258	6,591	33	.....	90	20 00	480 00
Lewis	45	1,261	176	1,605	1,595	4,637	2,174	479	450	40,300 00	85 00
Mason	45	585	21	2,169	225	3,000	400	.....	110	800 00	400 00
Okanogan	21	1,109	142	600	4,500	6,351	83	71	.....	.....	.....
Pacific	25	40	.....	1,737	16	1,793	1,000	.....	400	10,700 00	.....
Pend Oreille	81	12,424	9,480	7,853	7,385	37,142	14,334	8	.....	.....	640 00
Pierce	73	3,693	421	10,745	10,602	25,461	18,650	3,420	2,710	20,000 00	835 00
San Juan	8	.....	1	3	11	15	.....	.....	.....	.....	10 00
Skagit	69	657	343	1,763	3,446	6,209	5,170	1,671	.....	600 00	50 00
Skamania	4	.....	40	90	80	210	140	.....	20	.....	.....
Snohomish	62	747	37	5,742	1,794	8,320	4,825	1,550	200	9,900 00	3,710 00
Spokane	84	719	1,038	3,308	626	5,691	465	.....	10	.....	3,410 00
Stevens	108	16,444	10,873	37,789	20,810	85,916	17,450	4,795	1,241	1,025 00	19,610 00
Thurston	24	240	637	3,250	3,541	7,668	2,360	515	850	2,350 00	550 00
Wahkiakum	5	.....	42	408	80	530	.....	.....	.....	.....	75 00
Whatcom	36	22	577	1,838	259	2,696	.....	.....	540	300 00	210 00
Yakima	2	.....	5	13	.....	18	.....	.....	.....	.....	.....
Totals	1,151	43,011	30,062	100,724	73,824	247,621	69,718	13,253	10,242	$98,470 00	$40,795 00
U. S. Forest Service	1,504	.....	.....	.....	.....	131,634	.....	.....	.....	.....	.....

Total loss and damage to all classes of property, $240,476.00.

Table No. 4.

STATE APPROPRIATION—OPERATIONS.

Unexpended December 1, 1924— (Appropriation April 1, 1923, to April 1, 1925)		$655 84
EXPENDITURES—		
Administration	$4 76	
Field Personnel	20 00	
All Other Expenditures	627 40	
		652 16
Reverted to Treasury, April 1, 1925		$3 68

STATE APPROPRIATION—STORM ZONE.

Unexpended December 1, 1924 (Appropriation April 1, 1923, to April 1, 1925)—		$6,587 04
EXPENDITURES—		
Field Personnel	$1,547 00	
Improvement, Tools and Equipment	1,539 88	
Fire Suppression	225 50	
All Other Expenditures	328 88	
		3,641 26
Reverted to Treasury, April 1, 1925		$2,945 78

STATE APPROPRIATION—GENERAL FUND.

APPROPRIATION (April 1, 1925, to April 1, 1926)		$90,000 00
EXPENDITURES—		
Administration	$4,644 69	
Field Personnel	65,339 90	
Improvements, Tools and Equipment	1,971 07	
Fire Suppression	4,519 05	
All Other Expenses	5,063 55	
		81,538 26
Reverted to Treasury, April 1, 1926		$8,461 74

STATE APPROPRIATION—GENERAL FUND.

APPROPRIATION (April 1, 1926, to April 1, 1927)		$80,000 00
EXPENDITURES—		
Administration	$3,647 81	
Field Personnel	63,974 85	
Improvements, Tools and Equipment	2,650 04	
Fire Suppression	4,400 61	
All Other Expenses	1,236 79	
		75,910 10
Balance, September 30, 1926		$4,089 90

Table No. 5.

FEDERAL ALLOTMENTS—WEEKS LAW.

Unexpended December 1, 1924		$4,554 22
Federal Reimbursement		1,829 43
		$6,383 65
EXPENDITURES—		
Administration	$3,611 67	
Field Personnel	237 47	
Improvements, Tools and Equipment	1,471 82	
Fire Suppression	44 50	
All Other Expenses	980 50	
		6,345 96
Balance April 1, 1925		$37 69

FEDERAL ALLOTMENTS—WEEKS LAW.

Unexpended April 1, 1925		$37 69
Federal Reimbursement		615 00
		$652 69
EXPENDITURES—		
Administration	$45 38	
Fire Suppression	594 00	
All Other Expenses	13 31	
		$652 69

Closed September, 1925

FEDERAL ALLOTMENTS—CLARKE McNARY.

Federal Reimbursement		$31,450 00
Interest earned September, 1925 to April 1, 1926		103 74
Recovery—Fire Fighting Claim		20 00
		$31,573 74
EXPENDITURES—		
Administration	$4,125 41	
Field Personnel	13,441 73	
Improvements, Tools and Equipment	639 26	
Fire Suppression	9,371 48	
All Other Expenses	152 63	
		27,730 51
Balance April 1, 1926		$3,843 23

FEDERAL ALLOTMENTS—CLARKE McNARY.

Unexpended April 1, 1926		$3,843 23
Federal Reimbursement		27,304 13
Interest Earned April 1, 1926, to September 30, 1926		53 16
Recovery—Fire Fighting Claim		80 40
		$31,280 92
EXPENDITURES—		
Administration	$750 15	
Field Personnel	3,643 39	
Improvements, Tools and Equipment	958 93	
Fire Suppression	8,518 42	
All Other Expenses	241 97	
		14,112 86
Balance September 30, 1926		$17,168 06

Table No. 6.

FOREST ASSESSMENT COLLECTIONS.

(December 1, 1924, to April 1, 1925.)

	CLERKS FUND		STATE FUND		Associations	Total
Unexpended		$11,186 55		$4,093 39		$15,279 94
Collections received from County Treasurers		1,281 74		1,854 72	14,613 45	17,749 91
		$12,468 29		$5,948 11	$14,613 45	$33,029 85
EXPENDITURES—						
Administration	$433 87					
Field Personnel	25 00		$140 48			
Improvements and Equipment			14 93			
Fire Suppression			14 20			
Remitted to Associations					14,613 45	
Totals		458 87		169 61	$14,613 45	15,241 93
Balance April 1, 1925		$12,009 42		$5,778 50		$17,787 92

(April 1, 1925, to April 1, 1926.)

	CLERKS FUND		STATE FUND		Associations	Total
Unexpended, April 1, 1925		$12,009 42		$5,778 50		$17,787 92
Collections received from County Treasurers		4,207 06		16,895 36	$82,647 40	103,749 82
Interest on Deposits		115 87		23 30		139 17
Recovery—Fire Fighting				20 00		20 00
		$16,332 35		$22,717 16	$82,647 40	$121,696 91
EXPENDITURES—						
Administration	$4,421 57					
Field Personnel	3,817 62		$6,623 04			
Improvements and Equipment			856 15			
Fire Suppression			5,491 27			
All Other Expenses	95 75		134 41			
Remitted to Associations					82,647 40	
Totals		8,334 94		13,104 87	$82,647 40	104,087 21
Balance April 1, 1926		$7,997 41		$9,612 29		$17,609 70

(April 1, 1926, to September 30, 1926.)

	CLERKS FUND		STATE FUND		Associations	Total
Unexpended, April 1, 1926		$7,997 41		$9,612 29		$17,609 70
Collections received from County Treasurers		4,337 81		10,020 22	$69,814 17	84,172 20
Interest on Deposits		86 60		242 84		329 44
		$12,421 82		$19,875 35	$69,814 17	$102,111 34
EXPENDITURES—						
Administration	$2,206 69					
Field Personnel	1,126 73		$6,726 01			
Improvements and Equipment			323 87			
Fire Suppression			10,245 64			
All Other Expenses	220 50		487 66			
Remitted to Associations					69,814 17	
Totals		3,553 92		17,783 18	$69,814 17	91,151 27
Balance Sept. 30, 1926		$8,867 90		$2,092 17		$10,960 07

Table No. 7—RECOVERIES FOR FIRE FIGHTING.

(December 1, 1924, to September 30, 1926.)

	December 1, 1924 to April 1, 1925		April 1, 1925, to April 1, 1926		April 1, 1926, to September 30, 1926	
Recoveries	.....	$235 00	.....	$145 55	.....	$123 90
Refunded to State Treasurer	$235 00	.....	.....	.....	.....	.....
Paid to Fire Fighters	.....	.....	105 55	.....	.....	.....
Credited to State Assessment	.....	.....	20 00	.....	.....	.....
Credited to Clarke McNary	.....	.....	20 00	.....	$80 40	.....
Total	.....	$235 00	.....	$145 55	.....	$80 40
Balance	.....	.....	.....	.....	.....	$43 50

Summary—EXPENDITURES FROM ALL FUNDS.

(December 1, 1924, to September 30, 1926.)

Administration	$23,892 00
Field Personnel	166,663 22
Improvement, Tools and Equipment	10,425 95
Fire Suppression	43,424 67
All Other Expense	9,583 35
Total	$253,989 19

TABLE NO. 8—STATEMENT SHOWING AMOUNT EXPENDED IN EACH COUNTY FOR FIRE SUPPRESSION AND PROTECTION, AND THE AMOUNT DUE THE STATE FROM THE COUNTIES FOR ONE-THIRD OF EXPENDITURES FROM STATE APPROPRIATION (5785 Rem.).

COUNTIES	December 1, 1924 to April 1, 1925			April 1, 1925 to April 1, 1926			April 1, 1926 to September 30, 1926		
	Weeks Law, Clarke-McNary, Clerks and State Fund	State Appropriation	Due From Counties	Weeks Law, Clarke-McNary, Clerks and State Fund	State Appropriation	Due From Counties	Weeks Law, Clarke-McNary, Clerks and State Fund	State Appropriation	Due From Counties
Chelan	$137 33	.....	.....	$2,265 08	$1,061 71	$353 90	$1,492 23	$831 59	$277 20
Clallam	.....	.....	.....	1,304 02	4,829 74	1,606 91	175 00	4,248 67	1,416 22
Clark	.....	.....	.....	460 57	1,293 30	431 10	40 00	1,681 47	560 49
Cowlitz	.....	.....	.....	658 87	2,704 05	901 35	248 29	2,400 72	800 24
Ferry	.....	.....	.....	432 10	1,417 21	472 40	124 69	1,240 93	413 64
Grays Harbor	.....	.....	.....	478 39	3,037 50	1,012 50	53 24	2,831 46	943 82
Island	.....	.....	.....	913 39	1,147 53	382 51	7 98	953 13	317 71
Jefferson	51 63	.....	.....	1,783 33	4,461 58	1,483 86	671 32	3,199 54	1,066 51
King	.....	.....	.....	2,084 40	6,384 91	2,128 30	194 86	6,009 67	2,003 22
Kitsap	.....	.....	.....	526 50	913 62	304 54	92 35	1,393 23	464 41
Kittitas	26 66	.....	.....	2,186 20	1,023 01	341 00	2,568 04	1,521 30	507 10
Klickitat	44 74	.....	.....	1,966 88	1,327 68	442 56	1,424 76	2,007 80	669 27
Lewis	52 00	.....	.....	1,394 26	4,484 50	1,494 83	550 51	4,186 59	1,395 53
Lincoln	.....	.....	.....	.....	.....	.....	63 84	.....	.....
Mason	.....	.....	.....	349 70	1,724 79	574 93	189 03	1,499 39	499 80
Okanogan	67 09	.....	.....	2,104 19	1,183 38	394 46	7,330 80	1,784 87	594 96
Pacific	.....	.....	.....	478 69	2,123 31	707 77	246 36	2,415 77	805 26
Pend Oreille	.....	$20 00	$6 67	1,190 91	3,875 97	1,291 99	1,124 51	3,602 62	1,200 87
Pierce	.....	.....	.....	522 06	3,497 23	1,165 74	1,098 22	4,550 04	1,516 68
San Juan	.....	.....	.....	277 65	599 45	199 82	.....	615 48	205 16
Skagit	.....	.....	.....	4,509 18	3,004 44	1,001 48	191 29	3,068 84	1,022 95
Skamania	.....	.....	.....	865 06	1,536 55	512 18	64 40	1,332 51	444 17
Snohomish	.....	.....	.....	1,654 29	6,049 90	2,016 63	145 73	4,126 54	1,375 51
Spokane	30 20	.....	.....	2,772 39	1,036 63	345 54	2,021 81	838 80	279 60
Stevens	25 00	.....	.....	2,684 57	4,073 10	1,357 70	6,598 11	3,555 35	1,185 12
Thurston	27 00	.....	.....	721 00	1,772 71	590 90	545 87	2,587 78	862 59
Wahkiakum	.....	.....	.....	323 43	904 90	301 63	88 59	707 42	235 81
Whatcom	.....	.....	.....	1,645 32	3,238 54	1,079 51	639 52	4,018 19	1,339 40
Yakima	.....	.....	.....	2,696 71	1,170 71	390 24	2,271 74	1,145 76	381 92
Total	$461 65	$20 00	$6 67	$39,339 14	$69,858 95	$23,286 28	$30,260 19	$68,355 46	$22,785 16

TABLE NO. 9—STATEMENT SHOWING NUMBER OF ACRES OF PRIVATELY OWNED FOREST LANDS ASSESSED FOR PROTECTION COSTS.

COUNTIES	1917	1918	1919	1920	1921	1922	1923	1924	1925
Chelan	.....	.....	.....	.....	.....	204,743	198,517	206,453	204,749
Clallam	86,661	93,400	93,162	90,303	90,265	90,867	92,494	129,236	142,138
Clark	6,965	6,891	16,709	17,688	17,787	15,419	17,007	49,475	54,139
Cowlitz	13,915	13,978	46,177	54,416	73,392	71,504	77,399	77,790	123,351
Ferry	.....	.....	.....	51,750	58,697	59,388	.....	58,483	56,151
Grays Harbor	95,352	85,659	99,037	115,524	123,042	120,880	137,257	145,824	292,183
Island	.....	1,803	1,798	3,171	3,171	3,171	3,142	3,062	34,576
Jefferson	37,337	70,683	70,561	69,459	60,662	68,835	61,549	80,411	84,029
King	35,127	48,548	82,707	88,476	86,414	84,321	86,652	107,977	140,219
Kitsap	2,120	2,119	2,279	2,508	2,348	2,508	2,348	15,645	33,491
Kittitas	.....	.....	.....	.....	.....	193,407	201,103	233,661	230,079
Klickitat	.....	.....	.....	.....	.....	104,680	157,152	250,533	266,299
Lewis	46,280	46,280	88,556	106,555	97,406	100,326	99,472	96,719	118,341
Mason	32,232	32,824	37,901	42,777	44,639	39,391	56,131	78,384	136,445
Okanogan	.....	.....	.....	.....	.....	54,677	64,285	76,066	92,006
Pacific	68,770	71,430	86,729	94,445	106,541	105,935	106,713	132,569	144,501
Pend Oreille	.....	107,384	165,454	157,595	228,441	220,972	229,711	223,555	221,027
Pierce	21,945	26,886	31,678	42,759	47,470	48,064	39,448	44,389	94,226
Skagit	81,032	120,511	121,001	129,200	126,926	132,810	120,630	122,496	144,640
Skamania	.....	51,848	59,069	59,845	60,704	59,864	58,437	78,201	108,697
Snohomish	15,663	22,320	26,997	40,758	39,081	42,418	41,813	57,850	89,698
Spokane	.....	.....	.....	.....	.....	70,591	82,065	81,684	91,493
Stevens	.....	.....	214,220	231,290	182,859	186,346	482,254	494,353	543,744
Thurston	44,643	38,566	38,546	44,990	51,997	49,192	61,247	71,566	76,262
Wahkiakum	21,936	25,344	30,177	30,750	32,083	32,144	30,171	27,765	47,151
Whatcom	41,756	38,791	53,835	59,001	73,660	61,115	71,456	86,006	103,263
Yakima	.....	.....	.....	.....	.....	67,819	67,847	82,007	81,491
Total	651,734	905,265	1,366,593	1,533,260	1,607,585	2,591,387	2,646,300	3,112,160	3,754,389

TABLE NO. 10—STATEMENT OF FOREST PATROL ASSESSMENTS AND COLLECTIONS FROM DECEMBER 1, 1924, TO SEPTEMBER 30, 1926.

COUNTIES	1917 ASSESSMENT				1918 ASSESSMENT				1919 ASSESSMENT			
	Balance Dec. 1, 1924	Received from County Treasurer	Cancel-lations and Credits	Balance Unpaid Sept. 30, 1926	Balance Dec. 1, 1924	Received from County Treasurer	Cancel-lations and Credits	Balance Unpaid Sept. 30, 1926	Balance Dec. 1, 1924	Received from County Treasurer	Cancel-lations and Credits	Balance Unpaid Sept. 30, 1926
Clallam	$9 46	.....	$9 46	.....	$142 14	$102 92	$13 70	$25 52	$125 19	$105 61	$12 43	$7 15
Clark	27 64	.....	.....	$27 64	57 15	1 20	.....	55 95	8 51	2 00	3 00	3 51
Cowlitz	17 16	.....	.....	17 16	30 54	.....	.....	30 54	115 01	34 89	3 00	77 12
Grays Harbor	11 09	$6 55	4 54	.....	10 82	10 82	.....	.....	35 05	29 20	5 19	66
Island	.....	.....	.....	.....	.....	.....	.....	.....	1 00	.....	1 00	.....
Jefferson	19 64	.....	.....	19 64	23 21	6 40	.....	16 81	152 56	37 35	.....	115 21
King	5 28	.....	.....	5 28	48 64	21 54	.....	27 10	134 79	52 00	.....	82 79
Kitsap	3 27	.....	.....	3 27	14 39	.....	.....	14 39	22 65	.....	.....	22 65
Lewis	3 06	.....	.....	3 06	.....	.....	.....	.....	67 01	28 06	.....	38 95
Mason	.....	.....	.....	.....	.....	.....	.....	.....	46 18	40 06	4 39	1 73
Pacific	16 53	11 20	.....	5 33	100 54	41 37	.....	59 17	159 46	81 87	.....	77 59
Pend Oreille	.....	.....	.....	.....	6 01	.....	.....	6 01	267 66	91 50	112 78	63 38
Pierce	4 88	1 60	.....	3 28	14 46	7 20	.....	7 26	117 81	7 00	1 00	109 81
Skagit	11 60	.....	.....	11 60	79 49	.....	.....	79 49	102 75	21 41	.....	81 34
Skamania	.....	.....	.....	.....	431 39	2 40	.....	428 99	429 86	10 00	.....	419 86
Snohomish	5 00	.....	.....	5 00	44 38	9 00	4 80	30 58	78 76	8 60	4 00	66 16
Stevens	.....	.....	.....	.....	.....	.....	.....	.....	175 65	118 57	.....	57 08
Thurston	38 07	.....	.....	38 07	27 14	.....	.....	27 14	55 07	55 07	.....	.....
Wahkiakum	22 08	.....	.....	22 08	143 97	53 02	20 34	70 61	146 36	47 99	16 95	81 42
Whatcom	15 71	.....	1 62	14 09	39 63	2 40	12 00	25 23	86 41	16 96	15 00	54 45
Totals	$210 47	$19 35	$15 62	$175 50	$1,213 90	$258 27	$50 84	$904 79	$2,327 74	$788 14	$178 74	$1,360 86

TABLE NO. 11—STATEMENT OF FOREST PATROL ASSESSMENTS AND COLLECTIONS FROM DECEMBER 1, 1924, TO SEPTEMBER 30, 1926.

COUNTIES	1920 ASSESSMENT				1921 ASSESSMENT				1922 ASSESSMENT			
	Balance Unpaid Dec. 1, 1924	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926	Balance Unpaid Dec. 1, 1924	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926	Balance Unpaid Dec. 1, 1924	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926
Chelan	.....	.....	.....	.....	.....	.....	.....	.....	$422 79	$126 54	$90 68	$205 57
Clallam	$403 73	$167 67	$18 62	$217 44	$447 55	$151 78	$14 90	$280 87	888 08	180 58	23 50	684 00
Clark	134 54	15 08	1 50	117 96	125 53	23 22	1 20	101 11	377 40	36 45	2 00	338 95
Cowlitz	302 60	97 86	4 50	200 24	366 34	79 62	.....	286 72	971 69	247 10	7 75	716 84
Ferry	341 34	51 06	65 43	224 85	450 43	68 56	65 43	316 44	606 42	120 55	69 03	416 84
Grays Harbor	161 39	41 80	16 04	103 55	159 50	37 95	13 50	108 14	446 17	119 36	22 50	304 31
Island	23 82	75	2 70	20 37	24 96	1 80	2 16	21 00	49 75	5 00	4 00	40 75
Jefferson	332 37	149 99	.....	182 38	333 88	79 54	.....	254 34	600 62	114 43	.....	486 19
King	407 77	167 43	.....	240 34	361 61	141 73	.....	219 88	540 80	168 05	.....	372 75
Kitsap	12 75	1 50	.....	11 25	26 00	2 20	.....	23 80	29 65	3 65	.....	26 00
Kittitas	.....	.....	.....	.....	.....	.....	.....	.....	79 53	45 87	1 98	31 68
Klickitat	.....	.....	.....	.....	.....	.....	.....	.....	225 65	79 38	.....	146 27
Lewis	339 47	178 41	.....	161 06	292 40	94 02	.....	198 38	855 60	466 70	2 00	386 90
Mason	85 15	78 25	.....	6 90	85 98	68 58	.....	17 40	377 15	171 30	45 35	160 50
Okanogan	.....	.....	.....	.....	.....	.....	.....	.....	263 52	44 44	11 20	207 88
Pacific	350 62	200 87	.....	158 75	380 22	204 63	.....	175 59	766 83	374 48	.....	392 35
Pend Oreille	808 40	240 05	.....	568 35	2,015 41	293 75	.....	1,721 66	3,304 52	497 72	8 00	2,798 80
Pierce	113 97	23 68	5 25	85 04	137 66	43 14	4 80	89 72	363 50	131 13	6 00	226 37
Skagit	277 05	78 82	.....	198 23	288 18	43 34	.....	244 84	758 02	138 48	.....	619 54
Skamania	637 80	12 75	.....	625 14	586 85	189 41	.....	397 44	1,350 02	238 08	14 00	1,097 94
Snohomish	466 94	72 76	6 00	388 18	301 22	58 41	4 80	238 01	532 57	166 29	8 00	358 28
Spokane	.....	.....	.....	.....	.....	.....	.....	.....	168 50	.....	.....	168 50
Stevens	2,511 34	535 42	1 25	1,974 67	2,052 67	510 01	1 55	1,541 11	3,875 40	943 65	10 60	2,921 15
Thurston	166 95	37 23	5 82	123 90	142 47	53 79	4 68	84 00	290 74	98 71	8 25	183 78
Wahkiakum	422 00	74 79	26 93	320 28	329 94	115 71	21 54	192 69	724 25	112 95	35 90	575 40
Whatcom	212 75	38 80	18 68	155 27	255 09	33 80	19 53	201 76	777 18	112 99	40 55	623 64
Yakima	.....	.....	.....	.....	.....	.....	.....	.....	23 32	9 00	45	13 87
Totals	$8,521 84	$2,264 97	$172 72	$6,084 15	$9,163 98	$2,294 99	$154 09	$6,714 90	$19,669 67	$4,752 88	$411 74	$14,505 05

TABLE NO. 12—STATEMENT OF FOREST PATROL ASSESSMENTS AND COLLECTIONS FROM DECEMBER 1, 1924, TO SEPTEMBER 30, 1926.

COUNTIES	1923 ASSESSMENT				1924 ASSESSMENT				1925 ASSESSMENT			
	Balance Unpaid Dec. 1, 1924	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926	1924 Assessment	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926	1925 Assessment	Received from County Treasurer	Cancellations and Credits	Balance Unpaid Sept. 30, 1926
Chelan	$999 91	$640 48	$35 03	$324 40	$3,614 98	$2,908 00	$64 30	$642 68	$4,094 98	$2,092 90	$14 16	$1,987 92
Clallam	1,663 86	925 18	21 36	717 32	6,461 80	4,429 25	15 55	2,017 00	7,106 90	3,095 11	2 00	4,009 79
Clark	354 48	123 64	6 80	224 04	2,473 75	1,781 25	10 50	682 00	2,706 90	1,104 24	1 00	1,601 66
Cowlitz	1,209 14	449 66	3 80	755 68	3,889 50	2,706 56	9 75	1,173 19	6,167 55	3,467 98	9 75	2,689 82
Ferry	.....	.....	.....	.....	1,754 49	1,071 04	71 43	612 02	1,684 23	680 88	2 40	1,000 95
Grays Harbor	902 28	549 81	18 00	334 47	7,291 20	6,533 72	76 00	681 48	14,609 15	10,397 09	112 68	4,099 38
Island	56 04	15 56	3 20	37 28	153 10	105 65	.....	47 45	1,692 40	696 88	.....	995 52
Jefferson	993 15	462 42	.....	530 73	4,020 55	2,896 85	9 65	1,114 05	4,201 45	2,168 36	.....	2,033 09
King	1,161 22	844 55	3 12	327 15	5,397 85	4,756 25	6 15	635 45	7,010 95	4,711 59	39 00	2,260 36
Kitsap	46 72	15 00	.....	31 72	782 25	598 27	.....	183 98	1,674 55	819 08	.....	855 47
Kittitas	350 70	301 66	1 98	47 06	3,506 49	3,357 92	28 21	120 36	4,601 58	3,887 44	56	880 93
Klickitat	475 65	257 87	.....	217 78	5,637 21	4,550 75	72 45	1,014 01	5,325 98	3,451 01	6 40	1,701 22
Lewis	1,116 67	731 09	12 80	372 78	4,835 95	4,226 87	35 35	573 73	5,917 05	4,162 54	95 45	1,659 06
Mason	590 11	414 20	7 00	168 91	3,919 20	3,572 30	34 50	312 40	6,819 00	4,943 29	100 55	1,775 16
Okanogan	619 35	265 00	14 00	340 35	2,091 81	1,388 24	23 15	680 42	1,809 90	907 21	8 40	894 29
Pacific	1,265 48	848 44	.....	417 04	6,628 45	5,587 66	32 65	1,008 14	7,225 05	4,663 18	17 25	2,544 62
Pend Oreille	5,958 18	2,267 94	18 95	3,671 29	11,197 75	6,671 43	121 40	4,404 92	11,051 35	4,437 30	62 72	6,551 33
Pierce	505 58	375 63	4 80	125 15	2,219 45	1,894 82	8 10	316 53	4,711 30	2,979 62	39 85	1,691 83
Skagit	1,552 60	870 39	.....	682 21	6,124 80	5,002 55	24 00	1,098 25	7,232 00	4,445 23	4 75	2,782 02
Skamania	1,447 05	404 92	11 20	1,030 93	3,886 40	2,138 65	14 00	1,733 75	5,434 83	2,096 37	136 00	3,202 46
Snohomish	787 58	419 68	8 00	359 90	2,892 50	1,940 56	34 00	917 94	4,484 90	2,528 72	25 15	1,931 03
Spokane	498 27	187 81	.....	310 46	2,450 52	2,112 55	2 35	335 62	2,744 79	1,948 99	17 52	778 28
Stevens	7,602 32	3,168 31	49 55	4,384 46	23,212 07	15,880 22	297 19	7,034 66	16,980 88	7,559 64	38 29	9,382 95
Thurston	756 14	423 02	11 76	321 36	3,578 27	2,971 91	77 95	528 41	3,811 07	2,594 48	46 65	1,169 94
Wahkiakum	584 70	128 96	3 20	452 54	1,388 25	731 64	2 00	654 61	2,357 55	1,081 31	19 65	1,256 59
Whatcom	1,205 32	406 09	28 76	770 47	4,300 30	3,015 10	.....	1,285 20	5,163 15	2,911 21	38 20	2,213 74
Yakima	141 13	109 45	54	31 14	1,640 14	1,573 92	72	65 50	1,629 82	1,406 59	.....	223 23
Totals	$32,843 63	$15,606 76	$263 85	$16,973 02	$125,349 03	$94,403 93	$1,071 35	$29,873 75	$148,249 26	$85,238 24	$838 38	$62,172 84

TABLE NO. 13—PERMITS ISSUED BY STATE AND ASSOCIATION; CLASSIFICATION AND ACREAGE OF LAND BURNED UNDER PERMITS.

COUNTIES	SEASON 1925						SEASON 1926					
	Number Permits	Camp Fire	Agriculture	Grazing	Protection	Cost to Owners	Number Permits	Camp Fire	Agriculture	Grazing	Protection	Cost to Owners
Chelan	46	15	52	.....	6,111	$1,635 00	73	19	67	.....	1,485	$380 00
Clallam	283	1	1,293	68	121	.....	188	1	870	3	2,745	.....
Clark	485	127	1,860	7	165	.....	462	85	1,226	2	527	.....
Cowlitz	614	58	2,290	56	8,197	460 00	482	70	1,563	91	1,172	20 00
Ferry	20	6	180	.....	.....	.....	73	26	939	.....	43	.....
Grays Harbor	728	3	1,842	160	8,836	2,342 00	658	6	1,349	3	4,777	65 00
Island	22	.....	162	.....	.....	.....	32	.....	203	.....	.....	.....
Jefferson	177	23	1,208	.....	579	.....	107	8	430	.....	236	144 00
King	1,538	4	5,961	.....	8,974	2,022 00	1,848	20	6,301	19	10,623	2,021 40
Kitsap	291	.....	640	16	6,049	260 00	283	.....	707	192	6,143	670 00
Kittitas	14	5	219	.....	2,751	2,951 00	59	8	134	.....	1,354	1,121 75
Klickitat	174	20	2,498	.....	4,966	.....	352	49	3,805	140	7,546	832 90
Lewis	1,905	57	10,920	453	11,661	1,580 00	1,812	73	8,342	673	12,496	346 00
Mason	412	.....	1,179	.....	2,327	150 00	295	.....	496	5	2,610	75 00
Okanogan	20	33	25	.....	525	.....	36	77	242	.....	31	.....
Pacific	202	4	828	235	861	10 00	115	3	505	44	654	240 00
Pend Oreille	163	5	538	5	28	.....	20	.....	53	.....	.....	.....
Pierce	1,246	21	7,553	112	7,886	1,791 00	802	29	3,414	5	2,947	390 00
San Juan	147	16	881	98	103	.....	101	2	921	.....	42	.....
Skagit	848	19	4,143	24	10,583	3,315 00	613	17	2,578	14	916	940 00
Skamania	225	36	339	.....	1,460	320 00	84	47	31	.....	107	.....
Snohomish	2,415	8	12,966	147	8,567	400 00	1,618	16	6,660	10	4,473	.....
Spokane	199	21	1,819	.....	1,219	.....	150	.....	1,360	.....	314	.....
Stevens	343	44	2,997	45	266	564 00	146	.....	1,269	.....	54	.....
Thurston	762	.....	2,988	319	7,752	75 00	968	2	3,244	472	4,113	.....
Wahkiakum	93	4	267	197	1,543	.....	93	10	461	10	326	.....
Whatcom	1,082	32	6,271	534	4,553	1,075 00	978	26	2,721	1,400	3,015	1,015 00
Yakima	.....	88	.....	.....	.....	.....	8	18	.....	.....	33	.....
Totals	14,454	650	71,919	2,476	106,083	$18,950 00	12,456	612	49,891	3,083	68,782	$8,261 05

Honorable Erle J. Barnes, Director
Dept. of Conservation and Development,
Olympia, Washington.

Sir: It gives me pleasure to submit, herewith, report of the Division of Hydraulics for the Biennium, October 1, 1924, to September 30, 1926.

We have included in the report only such data as will be informative to yourself, to the Governor and members of the Legislature, and of interest to the public. A large mass of daily routine work which is of vital importance to the individuals concerned but not of public interest, is mentioned only in the summary of results.

I desire here to acknowledge the good services of the entire office staff, and especially to express my hearty appreciation and thanks to the water masters and patrolmen for their patient and tactful handling of many difficult problems, and to the water users and the public generally for the splendid cooperation received at their hands during two unusually dry and trying seasons.

Respectfully submitted,
R. K. TIFFANY,
State Supervisor of Hydraulics.

PERSONNEL

DIVISION OF HYDRAULICS

At Close of Biennium, 1925-1926.

R. K. Tiffany	Supervisor
Chas. J. Bartholet	Assistant Supervisor
Eleanor M. MacCallum	Secretary
Elma Dodds	Reporter
Marie Brower	Stenographer
C. E. Hewitt	Deputy Supervisor Division No. 1
Clarence E. Douglass	Hydrographer and Inspector

FOREWORD.

Land without water is a desert waste. It will not support even the simplest form of life. It is absolutely without value to humankind for any purpose.

Land with an ample supply of water takes a thousand useful forms. The majestic forest, the fertile field, the fruitful orchard—it supports life in infinite variety. With water a plot of ground may become the site of a happy home or a great industry, a temple of worship, a modern city, a power plant furnishing silent energy to serve a million people. Without water none of these things can exist.

We have had from time immemorial a sound system of land titles, but until 1917 rights to the use of flowing water in this State were in a chaotic condition. They were, in effect, much like the old "squatter's right" to land before the day of land surveys and Federal patents, and county records.

But the Water Code of 1917 established a method of securing title to water as clear and definite as land titles, and for orderly record and transfer of such title. It also provided means for regulation and division of stream flow between established rights; for conservation of public waters; for certain supervision of construction of hydraulic works; and for other duties and services in connection with this valuable State resource—to be performed by a properly qualified Hydraulic Engineer. That the code is filling a real need is evidenced by some of the results of its operation.

In the nine years since its passage nearly nineteen hundred applications for new water rights have been received, and approximately 1,197 titles to old rights have been adjudicated through 28 different court procedures, initiated and carried through by this Division on behalf of the water users. Forty-two cases involving probably four thousand individual water rights are still pending.

Beginning with 1918 we have had a period of sub-normal rainfall and a consequent deficiency of water supply on all streams, springs and lakes in the State. This culminated with the driest fall of record in 1925 followed by a very light winter and spring precipitation which caused new minimum flow records for 1926 on nearly every stream in the State.

This water shortage keenly stimulated all branches of activity in connection with water rights and with the natural growth of the State has caused a large increase in the work and, it is hoped, in the usefulness of this office. Among these activities may be discerned evidence of several phases of development that have been in process during the biennium or that are in contemplation and worthy of special mention, as follows:

1. A steady growth of hydro-electric power capacity showing an increase from 544,437 horsepower to 657,000 horsepower, or 21.2 per cent during the biennium. This increase is about equally divided between private and municipal developments.

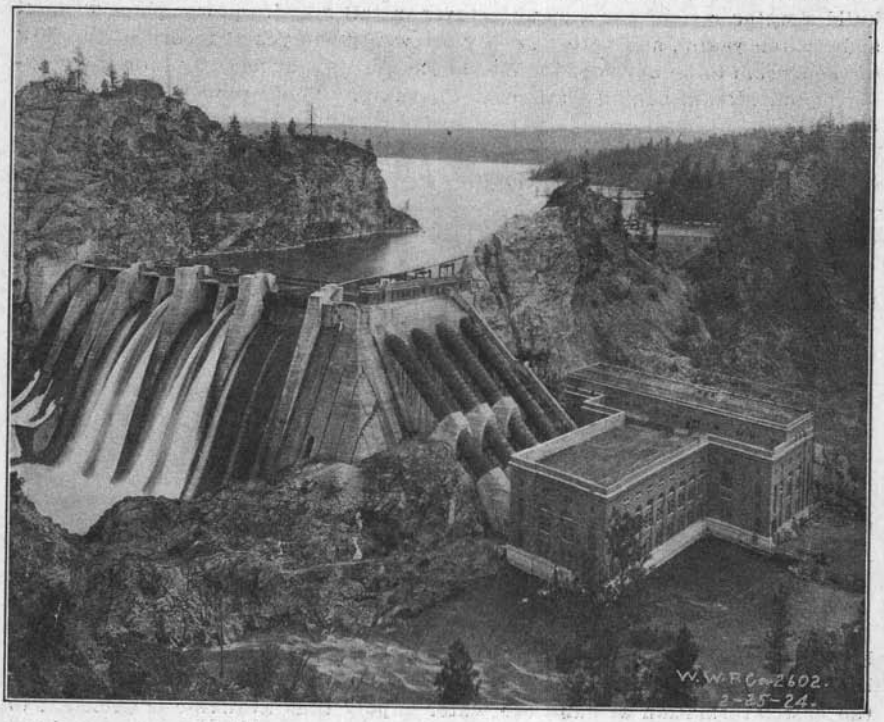
2. A steady growth of towns and cities necessitating provision for enlarged municipal water supplies.

3. The hundreds of applications for small water supplies for domestic and irrigation use on farms indicate a steady growth in agricultural development, especially on the West side.

4. Scores of applications for water rights for tourist camps, resorts, hotels, etc., reflect the tendency to capitalize our scenic and recreational advantages.

5. Many recent filings on water supplies especially adapted to industrial uses indicate prospective development in this direction. Several paper and pulp mills are already under construction, and much larger developments along this line are in prospect.

The State has vast forests of hemlock and spruce, valuable chiefly for paper, pulp and related industries. Sawmill wastes, too, can be utilized in



Long Lake Dam and Power Plant of Washington Water Power Company on Spokane River.

a large degree thru modern scientific methods and much that now goes into burners can be made into such products as straw board, Insulite, Bakelite, linoleum, Arquetite, paper mache and scores of others. A proper State policy and program of conservation and development should include encouragement toward the establishment of such industries, that the harvest of the mature forests of spruce and hemlock may be begun to make room for new growth—that the waste of our sawmills be utilized so far as is economically feasible—that the dormant power of our streams be put to work for the welfare of our people to whom it belongs. The potential importance of this industry may be sensed from the fact that in Canada in 1924, of a total of 3,569,000 hydro-electric horsepower developed, over 731,000 horsepower

(more than the total development in the State of Washington today) was used in the pulp and paper industry.

6. A considerable number of applications for water to be used for commercial propagation of fish and in connection with game and fur farms indicate that this may develop into a considerable industry as the natural supply of these products becomes further depleted or less accessible.

The above mentioned activity in development of water resources during the biennium and the many inquiries promising even more rapid development in the future bring forcibly to our attention the serious lack of definite information in regard to our sources of water supply. A city may not safely build a water system nor a manufacturer install a hydro-power plant without at least ten years', and better twenty or twenty-five years' record of the flow of the stream to be developed. We should multiply at least by four the number of our stream gaging stations in the State. **This would be a productive investment.** Its cost would be returned directly by the users of the water. Indirectly the State would profit many fold through the earlier utilization of its other resources by the industries to be created.

The Water Code has been in effect without substantial change since 1917. On recommendation of this Department a change in schedule of fees was made by the last Legislature, the result of which has been largely to eliminate purely speculative filings and materially to increase the revenue of the Division. It is possible that other beneficial changes might be made. Constructive criticism by anyone qualified to advise or interested in the work of the Division will be welcomed.

WATER RESOURCES OF THE STATE.

Irrigation.

The extent of irrigation development in the State of Washington will be limited by the supply of water available within the reach of good agricultural land through construction at a cost that the land will bear. According to the best information at hand the water supply thus available is sufficient to serve about 3,000,000 acres of land, of which some 580,000 acres are now irrigated. The present development is found largely in Okanogan, Chelan, Kittitas, Yakima, Benton, Walla Walla, Stevens and Spokane Counties, with smaller areas in thirteen other counties including Clallam and Thurston on the Western Slope.

Engineering studies have been made in more or less detail of most of the possible projects, and these studies indicate that a few of the smaller developments may be built at a cost of $50.00 to $100.00 per acre, but that the larger projects including the Horse Heaven, new divisions of the Yakima, the Quincy and the Columbia Basin projects will probably cost $150.00 and upward per acre. This figure seems high when compared to the earlier projects, the cost of which ranged from $60.00 to $100.00 per acre, but the cost is really not excessive if the land can be placed in the hands of actual settlers at its real value.

Every year sees in Western Washington a greater appreciation of the value of irrigation. This is evidenced by the scores of applications to appropriate water from streams for individual irrigation systems, by the growing practice of irrigating by pumping from wells or streams in the Puyallup and similar valleys, and by the prosperous developments under community ditches in the Sequim and Yelm districts.

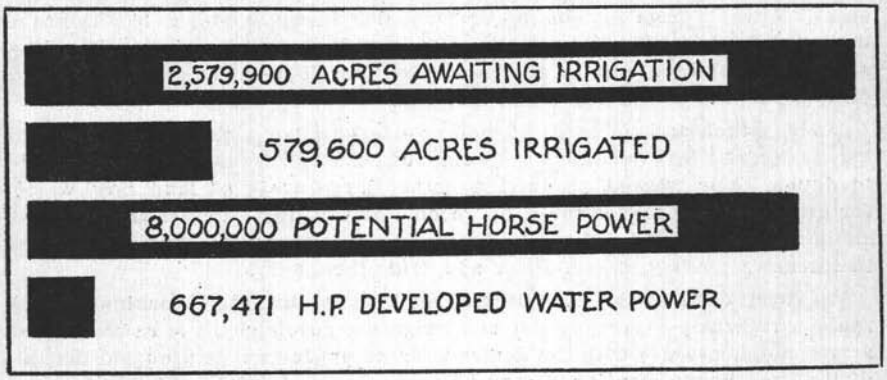
Many thousands of acres of land now farmed but yielding little or nothing during the late summer on account of seasonal drought, could be made to double their present production—other large areas of land now waste, for example, the prairies south of Tacoma and north of Centralia and other similar districts, can be placed under water at moderate cost, and are adapted to intensive poultry, dairy, truck and fruit farming.

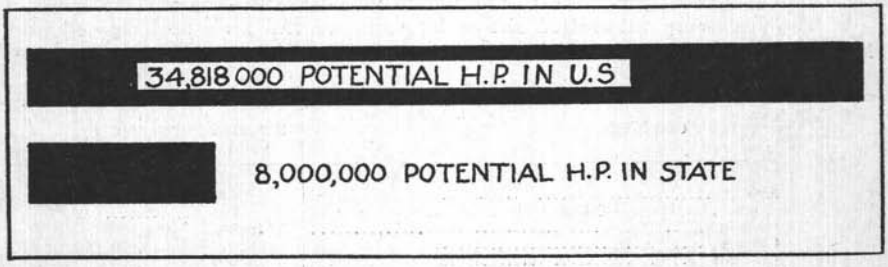
Crop reports of the U. S. Bureau of Reclamation give Washington first rank in returns per acre, and if our irrigation development is carried on at a rate commensurate with the demand for its products it is probable that all of the area above mentioned may be profitably reclaimed, and that its reclamation will add immensely to the wealth and prosperity of the State.

The following tabulation shows by counties the area of irrigated and irrigable lands in the State:

COUNTY	Irrigated Land	Irrigable Land
Asotin	4,600	.....
Adams, exclusive of Columbia Basin	2,000	.....
Benton	50,000	304,400
Chelan	34,000	15,000
Clallam	10,500	10,000
Columbia	3,000	.....
Douglas	7,100	26,000
Ferry	2,600	16,000
Franklin, exclusive of Columbia Basin	3,000	2,000
Garfield	1,000	.....
Grant, exclusive of Columbia Basin	8,000	.....
Kittitas	75,000	89,000
Klickitat	12,500	29,000
Lincoln	3,800	.....
Okanogan	40,900	42,800
Pend Oreille	3,000	3,000
Skamania	1,000	4,500
Stevens	15,000	10,200
Spokane	17,000	10,000
Thurston	2,000	5,000
Walla Walla	25,000	50,000
Yakima	250,600	163,000
Western Washington Scattering Developments	8,000	.....
Total exclusive of Columbia Basin	579,600	778,900
Columbia Basin	.....	1,800,000
.....	.....	2,579,900

Present and Potential Power and Irrigation Development in Washington.





Water Power.

No area in the United States offers more favorable opportunity for development of water power than the slopes of the Cascade and Olympic mountain ranges in Washington. The general elevation of these high ranges is from 3,000 to 8,000 feet above sea level, with four high glacial peaks from 10,000 to 14,000 feet in elevation.

The streams draining these areas reach sea level in a comparatively short distance, making available the rapid fall essential for economical development of water power. Another feature which adds greatly to the value of these streams for power development is the heavy precipitation in the mountains, ranging from 80 to 240 inches annually. The winter precipitation forms snow fields and glaciers insuring an abundant water supply and a well-maintained flow during the summer season.

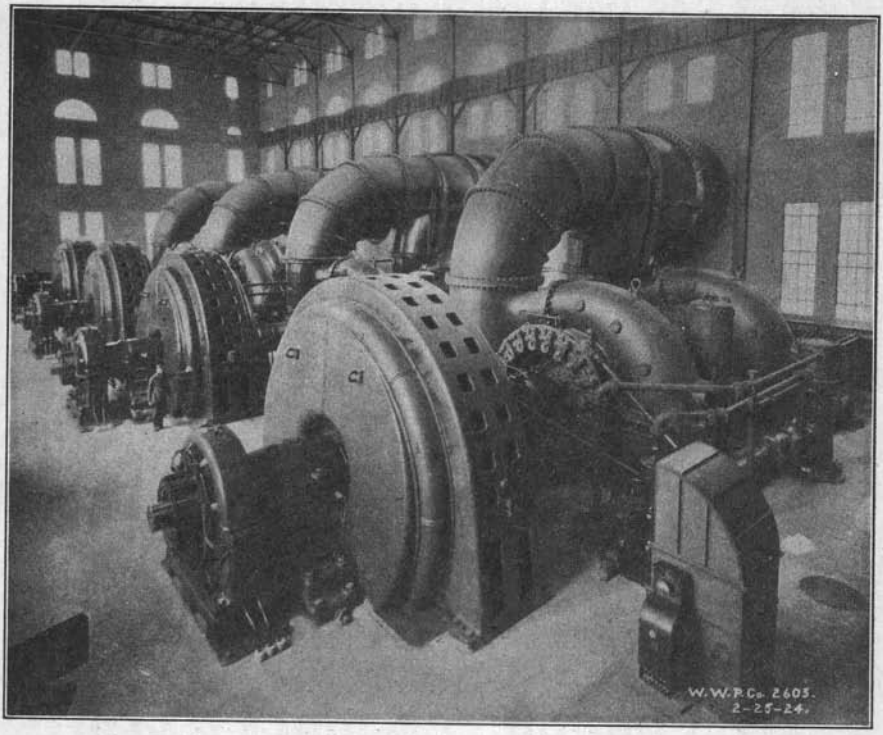
For maximum development on most streams, however, some storage is desirable, and good storage sites are available in connection with most of the power streams. Climatic conditions are such that ice has never been known to cause interruption in the operation of hydro-electric plants on the Western Slope, and as most of the power streams are within the humid portion of the State there is no conflict with irrigation development.

There are sixty-seven hydro-electric plants in operation at the present time with two large plants under construction and enlargements or extensions planned to several others. The principal developments during the biennium are briefly noted as follows:

Lake Cushman power project by the City of Tacoma, on the North Fork of the Skokomish River. 50,000 horsepower installed being the first unit of an ultimate development of 175,000 horsepower. The present storage capacity in Lake Cushman is 450,000 acre-feet.

Baker River project of the Puget Sound Power & Light Company. Present installation, 65,000 horsepower; now being enlarged by increasing the height of the dam to provide 140,000 acre-feet of additional storage.

City of Seattle—Skagit River project. First unit of 50,000 horsepower completed. Ultimate development to be 350,000 horsepower. It is understood that Seattle is



Interior of Long Lake Power Plant. Installed Capacity of 90,000 Horsepower.

planning to carry on this development as rapidly as warranted by demand for additional power.

Chelan Electric Company—at Chelan Falls, with 600,000 acre-feet of storage in Lake Chelan. First unit of 34,000 horsepower under construction. Ultimate development to be 136,000 horsepower.

The Northwestern Power and Light Co. has started construction of an additional plant on Elwha River in Clallam County with a capacity of 16,500 horsepower.

Elaborate engineering investigation is being made looking toward development of upwards of 100,000 horsepower on the Cowlitz River between Mayfield and the mouth of the Cispus River.

Installed capacity of hydro-electric plants in the State has increased during the biennium from 544,437 horsepower to 657,000 horsepower, or 21.2 per cent.

DEVELOPED WATER POWER IN THE STATE OF WASHINGTON.

Plants Under Operation.

Note: Numbers refer to location on the map.

No.	COUNTY	STREAM	LOCATION			Developed Horse-power	HEAD	OWNERSHIP
			Section	Twp.	Range			
1	Pend Oreille	Sullivan Creek	22	39 N.	43 E.	6,000	460	Inland Portland Cement Co.
2	Stevens	Colville River	29	36 N.	38 E.	1,600	133	Stevens County Power & Light Co.
3	Ferry	O'Brien Creek	.....	36 N.	33 E.	150	75	Republic Light and Power Co.
4	Pend Oreille	North Fork Calispel Creek	35	32 N.	43 E.	500	309	Calispel Light and Power Co.
5	Stevens	Jump-off Joe Creek	26	31 N.	40 E.	300	85	Kulzer Electric System.
6	Spokane	Little Spokane River	2	28 N.	43 E.	400	24	Mount Spokane Power Co.
7	Spokane	Spokane River	11	25 N.	43 E.	3,800	16-24	Spokane Municipal Water Supply.
8	Spokane	Spokane River, Upper Falls	18	25 N.	43 E.	13,400	65	Washington Water Power Co.
9	Spokane	Spokane River, Lower Falls	18	25 N.	43 E.	11,800	64-74	Washington Water Power Co.
10	Spokane	Spokane River, Nine Mile Falls	6	26 N.	42 E.	16,000	58	Washington Water Power Co.
11	Lincoln	Spokane River, Long Lake	13	27 N.	39 E.	94,000	172	Washington Water Power Co.
12	Stevens	Spokane River, Little Falls	20	27 N.	39 E.	32,800	73	Washington Water Power Co.
13	Okanogan	Similkameen River	13	40 N.	26 E.	2,500	79	Washington Water Power Co.
*14	Chelan	Chelan River	.....	27 N.	23 E.	32,000	378	Washington Water Power Co.
15	Okanogan	Methow River	2	34 N.	21 E.	100	43	Upper Methow Valley Light & Power Co.
16	Okanogan	Twisp River	12	33 N.	21 E.	171	33-26	Twisp Light & Power Co.
17	Okanogan	Twisp River	8	33 N.	22 E.	172	21	Twisp Roller Mills & Power Co.
18	Adams	Palouse River	6	14 N.	37 E.	95	29	G. W. Gildersleeve.
19	Walla Walla	Snake River	30	9 N.	31 E.	1,000	10	Burbank Irrigation District.
20	Benton	Yakima River, Sunnyside Canal	20	9 N.	25 E.	200	77	United States Bureau of Reclamation.
21	Benton	Yakima River, Sunnyside Canal	26	9 N.	24 E.	200	52	United States Bureau of Reclamation.
22	Benton	Yakima River, Sunnyside Canal	30	9 N.	24 E.	200	21	United States Bureau of Reclamation.
23	Yakima	Yakima River, Sunnyside Canal	27	9 N.	23 E.	200	73	United States Bureau of Reclamation.
24	Yakima	Yakima River, Sunnyside Canal	9	10 N.	22 E.	800	46	United States Bureau of Reclamation.
25	Yakima	Yakima River, Sunnyside Canal	2	9 N.	22 E.	500	63	United States Bureau of Reclamation.
26	Yakima	Columbia River	2	13 N.	23 E.	2,000	26	Pacific Power and Light Co.
27	Columbia	Tucannon River	19	12 N.	38 E.	150	19	Pacific Power and Light Co.
28	Yakima	Naches River	23	13 N.	18 E.	500	38	Pacific Power and Light Co.
29	Yakima	Naches River	13	14 N.	17 E.	10,100	151	Pacific Power and Light Co.
30	Yakima	Naches River	3	14 N.	17 E.	1,900	53	Pacific Power and Light Co.
31	Klickitat	Spring Creek	19	4 N.	15 E.	250	285	Pacific Power and Light Co.
32	Klickitat	White Salmon River	30	4 N.	11 E.	100	15	Pacific Power and Light Co.
33	Klickitat	White Salmon River	10	3 N.	10 E.	18,000	168	Northwestern Electric Co.
34	Klickitat	White Salmon River	24	6 N.	10 E.	300	10	Trout Lake Power and Light Co.
35	Kittitas	Yakima River	32	18 N.	18 E.	1,600	52	City of Ellensburg.
36	Chelan	Wenatchee River	10	24 N.	17 E.	250	59-62	Tumwater Light & Power Co.

* Under construction.

DEVELOPED WATER POWER IN THE STATE OF WASHINGTON—Continued.

Plants Under Operation.

Note: Numbers refer to location on the map.

No.	COUNTY	STREAM	LOCATION Section	Twp.	Range	Developed Horse-power	HEAD	OWNERSHIP
37	Chelan	Wenatchee River	10	24 N.	17 E.	7,000	187	Puget Sound Power and Light Co.
38	Chelan	Wenatchee River	26	24 N.	18 E.	3,284	55	Puget Sound Power and Light Co.
39	Chelan	Entiat River	18	25 N.	21 E.	2,000	78	Puget Sound Power and Light Co.
40	Whatcom	North Fork Nooksack River	31	40 N.	8 E.	3,200	175	Puget Sound Power and Light Co.
41	Whatcom	Baker River	2	35 N.	8 E.	50,000	215	Puget Sound Power and Light Co.
42	King	Snoqualmie River	19	24 N.	8 E.	10,000	280	Puget Sound Power and Light Co.
43	King	Snoqualmie River	30	24 N.	8 E.	15,000	260	Puget Sound Power and Light Co.
44	Pierce	White River	7	20 N.	5 E.	84,000	460	Puget Sound Power and Light Co.
45	Pierce	Puyallup River	4	17 N.	5 E.	30,000	865	Puget Sound Power and Light Co.
46	Thurston	Deschutes River	26	18 N.	2 W.	1,600	84	Puget Sound Power and Light Co.
47	Cowlitz	Kalama River	7	6 N.	1 E.	981	40	Puget Sound Power and Light Co.
48	Clark	Big Tree Creek	1	4 N.	3 E.	110	148	C. R. Miller.
49	Clark	Washougal River	32	2 N.	4 E.	294	15	Western Light & Power Co.
50	Clark	Washougal River	5	1 N.	4 E.	200	12-15	C. W. Cottrell.
51	Lewis	Tilton River	4	12 N.	4 E.	75	13	Marton Electric Co.
52	Pierce	Paradise River	22	15 N.	8 E.	1,350	450	Rainier National Park Co.
53	Pierce	Evans Creek	34	18 N.	6 E.	175	190	Montezuma Coal Mining Co.
54	Pierce	Nisqually River	32	16 N.	4 E.	32,000	425	City of Tacoma.
55	Mason	Skokomish River	5	22 N.	4 W.	50,000	260	City of Tacoma.
56	Mason	Goldsborough Creek	24	20 N.	4 W.	159	15	Shelton Light and Power Co.
57	Grays Harbor	Cloquallum Creek	19	18 N.	5 W.	115	25	Northwest Electric and Water Works Co.
58	Grays Harbor	Sylvia Creek	31	18 N.	7 W.	300	65	Northwest Electric and Water Works Co.
59	Pacific		15	14 N.	9 W.	200	500	Willapa Power Co.
60	Clallam	Elwha River	15	30 N.	7 W.	14,600	110	Northwestern Power and Manufacturing Co.
*61	Clallam	Elwha River	17	29 N.	7 W.	16,500	200	Northwestern Power and Manufacturing Co.
62	Skagit	Bear Creek	11	36 N.	8 E.	2,700	420	Superior Portland Cement Co.
63	Whatcom	Newhalem Creek	28	37 N.	12 E.	2,000	535	City of Seattle.
64	Whatcom	Skagit River	21	37 N.	12 E.	50,000	250	City of Seattle.
65	King	Cedar River	3	22 N.	8 E.	33,000	618	City of Seattle.
66	King	Cedar River	.....	Lake	Union	2,000	410	City of Seattle.
67	Snohomish	McCoy Creek	7	27 N.	8 E.	190	220	Sultan Electric Co.
68	Snohomish	Pilchuck Creek	19	30 N.	7 E.	100	18	Granite Falls Electric Light Co.
69	Snohomish	Jim Creek	9	31 N.	6 E.	300	65	Washington Coast Utilities.
	Total Developed	Horsepower	.....	.....	.....	667,471		

* Under construction.

PARTIAL TABULATION OF UNDEVELOPED POWER SITES IN THE STATE OF WASHINGTON.

The following tabulation of potential power sites is by no means intended as a complete inventory of the State's power resources, but rather as a conservative enumeration of the principal sites which are known to exist and which have received sufficient investigation to indicate with a degree of certainty their potential value. There are, therefore, unquestionably many excellent sites not included in this tabulation, and likewise it may be found upon detailed study that any individual site or group of sites may be capable of developing a greater or lesser amount of power than here shown or may even for physical or economic reasons for the present, at least, prove entirely non-feasible. The definite determination of the physical and economic feasibility of a power project ordinarily requires a great deal of costly study, and such determination is not within the present scope of this office.

Note: Numbers refer to location on map.

No.	STREAM	FLOW	COUNTY	Available Power 50% of Time at 70% Efficiency H. P.
1	Nooksack River—South Fork	Regulated	Whatcom	22,000
	Skagit River—			
2	Gorge Creek Site	Regulated	Whatcom	270,000
3	Ruby Creek and Diablo Canyon Sites	Regulated	Whatcom	520,000
4	County Line	Regulated	Whatcom	40,000
5	Below Baker River	Regu'ated	Skagit	60,000
6	Cascade River	Regulated	Skagit	50,000
7	Sauk River Water Shed	Unregulated	Snohomish	225,000
8	Stilaguamish—South Fork	Regulated	Snohomish	30,000
9	Pi'chuck and Deer Creeks	Regulated	Snohomish	20,000
10	Sultan River and Wallace River	Regulated	Snohomish	80,000
11	Skykomish River—North and South Forks	Partly Regulated.	Snohomish	45,000
12	Foss River	Regulated	King	25,000
13	Miller Creek	Regulated	King	15,000
14	Snoqualmie River—North Fork	Unregulated	King	20,000
15	Snoqualmie River—South Fork	Unregulated	King	15,000
16	White River—Upper River	Part y Regulated.	King	75,000
17	Puyallup River (below Electron)	Unregulated	Pierce	16,000
18	Nisqually River (be ow LaGrande)	Unregulated	Pierce	10,000
19	Skokomish River, North Fork, Hoods Canal Plant	Regulated	Mason	90,000
20	Skokomish River, South Fork (Developed in connection with North Fork)	Regulated	Mason	35,000
21	Lilliwaup River	Regulated	Mason	1,500
22	Hamma Hamma River	Regulated	Mason	7,500
23	Dosewallips River	Partly Regulated.	Jefferson	30,000
24	Dungeness River	Unregulated	Clallam	4,000
25	Elwha River (Glines Canyon Dev.)	Regu'ated	Clallam	16,500
26	Lyre River	Partly Regulated.	Clallam	6,500
27	Hoh River (Big Bend Site)	Regulated	Jefferson	33,000
28	Hoh River, Upper Hoh	Partly Regulated.	Jefferson	24,000
29	Queets River	Partly Regulated.	Jefferson	16,000
30	Quinault River	Partly Regulated.	Grays Harbor.	10,000
31	Wynooche River	Regulated	Grays Harbor.	20,000
	Cowlitz River—			
32	Mayfield Site	Regulated	Lewis	33,000
33	Mossy Rock Site	Regulated	Lewis	80,000
34	Big Bend Site	Regulated	Lewis	16,500
35	Cispus River	Partly Regulated.	Skamania and Lewis	40,000
36	Toutle River (Silver Lake Plan)	Regulated	Cowlitz	30,000
37	Lewis River (Various sites above Yale)	.....	.....	60,000
38	Lewis River (Yale site)	Partly Regulated.	Cowlitz	42,000
39	Lewis River (Ariel site)	.....	.....	20,000
40	Kalama River	Unregulated	Cowlitz	30,000
41	White Salmon River—Various Sites	Unregulated	Klickitat	70,000
42	K'ickitat River—Lower eight miles	Unregulated	Klickitat	4,000
43	Snake River—Five Mile Rapids	Unregulated	Wa'la Walla and Franklin	100,000
44	Yakima River—Union Gap	.....	Yakima	30,000
45	Yakima River Water Shed (other sites doubtful due to regulation for irrigation)	.....	.....	.....

PARTIAL TABULATION OF UNDEVELOPED POWER SITES IN THE STATE OF WASHINGTON.—Continued.

Note: Numbers refer to location on map.

No.	STREAM	FLOW	COUNTY	Available Power 50% of Time at 70% Efficiency H. P.
46	Icicle Creek		Chelan	
47	Chiwawa River	Regulated	Chelan	10,000
48	Railroad Creek and Dumpky Lake	Partly Regulated		
49	Clark Fork at Z Canyon	Regulated	Pend Oreille	220,000
50	Clark Fork at Metaline Falls	Regulated	Pend Oreille	30,000
	Columbia River at—			
51	Little Dalles	Regulated	Stevens	242,000
52	Kettle Falls	Regulated	Stevens	323,000
53	Grand Coulee	Regulated	Grant	1,170,000
54	Foster Creek	Regulated	Douglas	837,000
55	Rock Island Rapids	Regulated	Douglas	400,000
56	Priest Rapids	Regulated	Yakima	508,000
57	*Umatilla Rapids	Regulated	Benton	263,000
58	*The Dalles	Regulated	Klickitat	489,000
59	*Cascade	Regulated	Skamania	230,000

NOTE.—In estimating power available from streams in Eastern Washington due regard is had to their present and future utilization for irrigation.

* H. P. shown represents one-half of that available at site; other half credited to Oregon.

Water for Municipal, Manufacturing and Domestic Use.

In most parts of the State there are ample supplies of pure, clear water for the uses above mentioned. Many of the streams rise in forest reserves and in high mountains where there is no possibility of pollution by reason of human residence. The supply is generally abundant, and the rapid fall of the streams usually offers ideal conditions for delivery of ample quantities of water at moderate cost.

Recently many filings have been made by towns, cities and port commissions looking toward the securing of ample water supplies for a potential industrial development. The particular thing most generally in mind is the paper and pulp industry which requires large quantities of clear soft water.

There are other industries such as woolen or silk mills, tanneries, the ceramic industries and others which are dependent to a greater or less extent upon a good water supply. All of these things indicate that it is of the utmost importance to the social and economic welfare of the State that we should have the best possible information in regard to this valuable resource.

Underground Waters.

In certain parts of the State where good streams are not plentiful there have been found abundant underground water supplies. The City of Spokane, for example, draws upward of 60,000,000 gallons daily from comparatively shallow wells, and over 5,000 acres of land in the Spokane Valley are irrigated from the same source. Good artesian wells have been developed in the Palouse country, in the vicinity of Walla Walla and in parts of the Yakima Valley, the most notable of these being the recent developments in the Cold Creek Valley from whence reports are received of many

gushers, the best delivering over 8,000 gallons of water per minute or nearly 18 cubic feet per second, a flow sufficient, if sustained, to irrigate nearly three sections of land. Unfortunately some of these artesian basins have been drained by over drilling. Some protective legislation along this line would seem desirable.

NEW WATER RIGHTS UNDER WATER CODE.

Method of Acquiring Rights.

The Water Code, which was enacted by the Legislature of 1917, contains this provision, "Subject to existing rights all waters within the state belong to the public, and any right thereto, or to the use thereof, shall be hereafter acquired only by appropriation for a beneficial use and in the manner provided and not otherwise."

Any person may initiate a right to appropriate or to store water for a beneficial use by filing an application on printed forms which may be secured from the office of the Supervisor of Hydraulics, with a map showing the point of proposed diversion and place of use. The applicant is required to publish notice of his proposed appropriation in a local newspaper and an investigation is made to determine whether there is public water available for appropriation and whether the proposed use will be in conflict with existing rights or detrimental to public welfare.

If conditions warrant permit is issued fixing the time within which construction of the project must be started and completed; and on completion of the project and satisfactory proof of application of the water to beneficial use a Certificate of Water Right is issued. This certificate is recorded in the office of the Supervisor of Hydraulics and of the Auditor of the County in which the project is located and has the same effect as a land patent or deed.

Record of Applications and Permits During the Biennium.

During the biennium, 660 applications for permits to appropriate water have been received, 345 have been approved and permits issued, and development under 75 permits has been completed and final Water Right Certificates issued.

Since the office was established in 1917, 1893 applications have been filed; 357 cancelled; 795 permits granted; 741 applications are now pending; and construction under 134 permits has been completed and final Water Right Certificates issued thereunder.

Water Right Applications, Various Uses.

Of the applications filed during the biennium, 137 were for hydroelectric development. In this class many filings are apparently speculative.

Ten preliminary permits requiring further investigation and report and estimates have been issued and only 46 permits covering 26 projects to proceed with actual construction.

Forty applications were received for appropriation of water for municipal purposes, and under these 17 permits for construction have issued.

Applications in these two classes are published in detail on the following pages.

Applications for irrigation rights amounting to 1 cubic foot per second or more number 80, and 17 permits were issued. A list of the more important of these applications is given below.

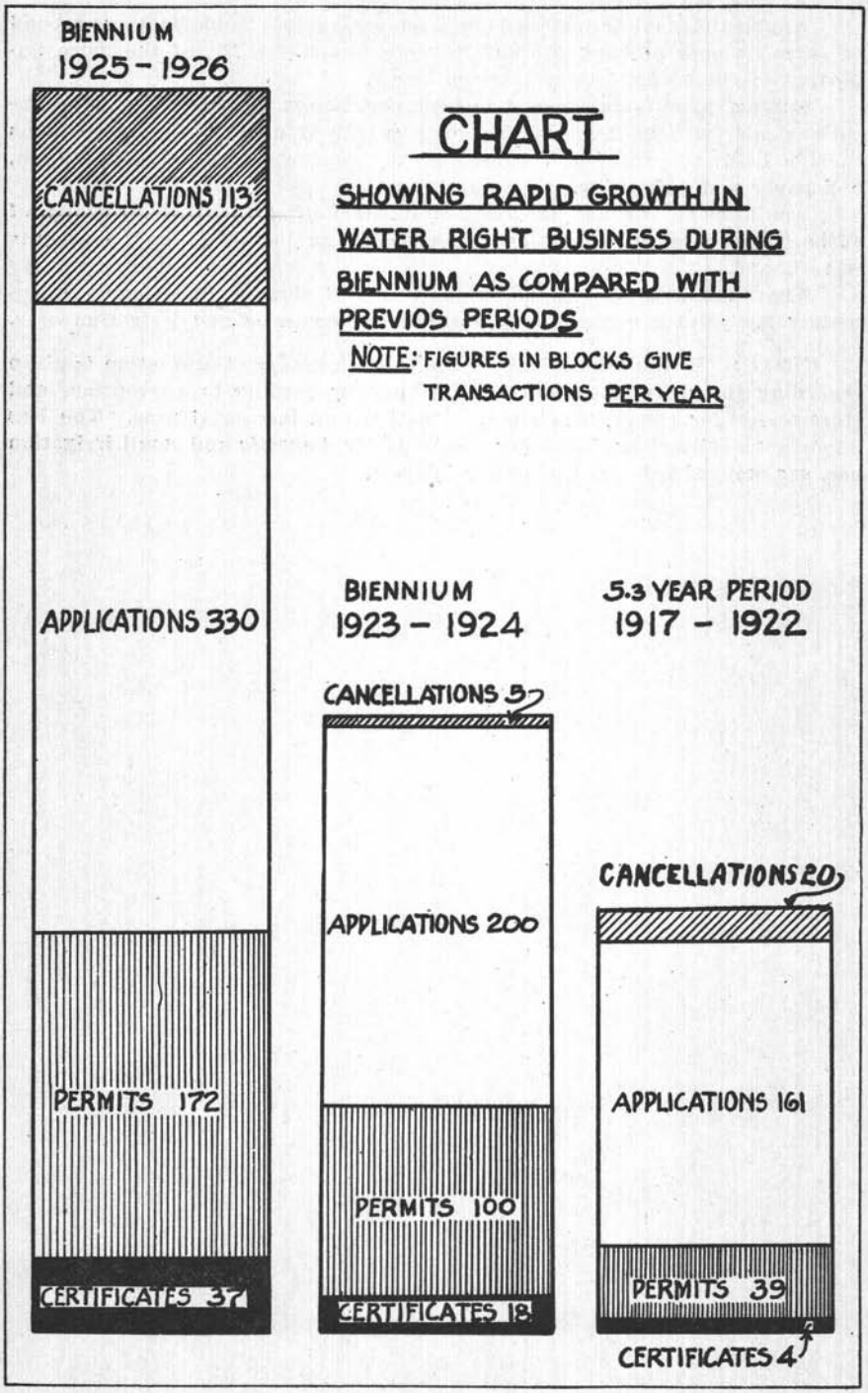
Mining, manufacturing and miscellaneous uses accounted for 32 applications and 12 permits. Developments promised under these applications include hydraulic sluicing, milling of ore, construction of logging flumes, and paper and pulp mills.

Applications for use in fish culture including the U. S. Bureau of Fisheries, county, state and private projects, numbered 17 and 5 permits were issued.

The remaining 354 applications received during the biennium are mainly for private water supply systems for domestic and irrigation uses.

NOTE: In the tabulations on the following pages information is given regarding the more important applications for permits to appropriate and store water for power, municipal, irrigation and industrial uses. The less important applications, including hundreds for domestic and small irrigation use, are omitted being not of public interest.

Plate III.


BIENNIUM
1925 - 1926
CANCELLATIONS 113
APPLICATIONS 330
PERMITS 172
CERTIFICATES 37
CHART
SHOWING RAPID GROWTH IN WATER RIGHT BUSINESS DURING BIENNIUM AS COMPARED WITH PREVIOS PERIODS
NOTE: FIGURES IN BLOCKS GIVE TRANSACTIONS PER YEAR
BIENNIUM
1923 - 1924
CANCELLATIONS 5
APPLICATIONS 200
PERMITS 100
CERTIFICATES 18
5.3 YEAR PERIOD
1917 - 1922
CANCELLATIONS 20
APPLICATIONS 161
PERMITS 39
CERTIFICATES 4

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Diversion Point Twp.	Diversion Point R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
18	Fred W. Landwehr.....	Sauk River.....	10,000	32	33 N.	10 E.	.....	113,636	.....	.....	
19	Fred W. Landwehr.....	Sauk River.....	10,000	36	32 N.	10 E.	.....	244,318	.....	.....	
20	Fred W. Landwehr.....	Suiattle River.....	10,000	32	33 N.	10 E.	.....	710,228	.....	.....	
33	City of Seattle.....	Skagit River.....	800	21	37 N.	12 E.	$4,000,000	28,000	5	.....	
61	Frank MacKean.....	Tolt River.....	450	32	26 N.	9 E.	3,000,000	69,034	.....	.....	
62	Frank MacKean.....	N. and S. Forks Lynch's Lake Res...	16,000 a.f.	26	26 N.	8 E.	175,000	.....	.....	.....	Reservoir for storage of water under Application 61.
66	Frank Lesh	Company Creek.....	6	21	33 N.	17 E.	1,000	100	40	.....	
212	Grant A. Stewart.....	Big Boulder Creek..	50	35	36 N.	39 E.	1,000	124	83	.....	
235	J. J. Hewitt.....	Puyallup River.....	400	33	18 N.	5 E.	750,000	12,700	77	.....	
240	Western Wash. Land & Irrig. Co.....	S. Fork Jenkins Creek.....	50	31	22 N.	6 E.	50,000	100	399	.....	
261	Peter Klavano, et al.....	Waitts Lake.....	25	17	31 N.	40 E.	25,000	200	506	74	
326	Peter Klavano, et al.....	Waitts Lake Res....	600 a.f.	17	31 N.	40 E.	5,000	.....	R. 26	.....	Reservoir for storage of water under Permit 506.
281	Methow Valley Irrig. Dist...	Methow River.....	150	25	34 N.	21 E.	20,000	375	113	.....	Exclusively for irrigation purposes. Works completed.
310	Nippon Lumber Co.....	Tye River.....	100	26	26 N.	12 E.	10,000	454	.....	.....	
332	Good Hope Gold & Copper Mining & Developm't Co..	Silver Lake and E. Fork Silver Cr....	5	28	29 N.	11 E.	5,000	390	120	.....	
333	Good Hope Gold & Copper Mining & Developm't Co..	Silver Lake Res.....	900 a.f.	28	29 N.	11 E.	3,000	.....	R. 6	.....	Reservoir for storage of water under Permit 120.
353	City of Tacoma.....	Skokomish River.... N. Fork.	1,000	5	22 N.	4 W.	6,000,000	75,000	252	.....	First step of development completed—50,000 H. P.
354	City of Tacoma.....	Lake Cushman Res..	190,000 a.f.	5	22 N.	4 W.	1,768,000	.....	R. 18	.....	Reservoir for storage of water under Permit 252.
365	J. M. Reece.....	Dan's Creek.....	100	8	32 N.	10 E.	2,000	100	152	.....	
394	City of Seattle.....	Newhalem Creek....	150	28	37 N.	12 E.	200,000	3,500	145	38	Development completed.
420	Calispel Lt. & Power Co...	Calispel Creek..... N. Fork	20	27	32 N.	43 E.	40,000	680	158	35	Development completed.
431	Calispel Lt. & Power Co...	.....	10,000 a.f.	27	32 N.	43 E.	80,000	.....	R. 13	.....	Reservoir for storage of water under Per. 158.
425	Hugh L. Cooper.....	Clark Fork Res.....	105,000 a.f.	14	40 N.	43 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 426.
426	Hugh L. Cooper.....	Clark Fork.....	.....	14	40 N.	43 E.	70,000,000	600,000	.....	.....	Water rights also initiated before passage of Water Code.
432	City of Seattle.....	Columbia R. Skagit R., Stettatle Cr. & Thunder Cr.	3,500	Unsurveyed			25,000,000	286,000	181	.....	First step of development completed—50,000 H. P.

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Twp.	R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
433	City of Seattle	Skagit River	3,500	Unsurveyed			$10,000,000	153,000	166	.....	
434	City of Seattle	Ruby Reservoir	1,000,000 a.f.	Unsurveyed			6,000,000	.....	R. 11	.....	Reservoir for storage of water under Permits 166 and 181.
439	W. D. Shannon	Skykomish River S. Fork	1,000	27	27 N.	10 E.	5,000,000	42,613	.....	.....	
440	W. D. Shannon	Lake Dorothy Res.	26,000 a.f.	Unsurveyed			.....	.....	.....	.....	Reservoir for storage of water under App. 439.
445	W. D. Shannon	Skykomish River N. Fork	500	3	27 N.	10 E.	.....	22,727	.....	.....	
446	W. D. Shannon	Blanca Lake Res.	25,000 a.f.	.....	28 N.	11 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 445.
459	Mt. Spokane Power Co.	Otter Creek	50	24	29 N.	43 E.	4,600	369	.....	.....	
466	Spirit Lake Ry. & Pr. Co.	Toutle River	10,000	15	9 N.	5 E.	3,000,000	732,954	.....	.....	Temporary permit issued.
535	Big West Copper Syn.	Litchy Creek	38	Unsurveyed			15,000	864	.....	.....	
536	Big West Copper Syn.	Litchy Creek	100	Unsurveyed			100,000	4,545	.....	.....	
537	Big West Copper Syn.	Big Western Creek	38	Unsurveyed			15,000	864	.....	.....	
546	Sam Samson	Falls Creek	25	14	5 N.	7 E.	.....	1,500	510	.....	To be operated in connection with existing plant on Rock Creek.
553	Riverside Irrig. Dist.	Okanogan River	2,000	20	36 N.	27 E.	300,000	5,681	.....	.....	Plan to develop power for pumping water for irrigation.
560	Spirit Lake Ry. & Pr. Co.	Toutle River	1,300	20	10 N.	1 W.	.....	.....	.....	.....	Temporary permit issued.
560a	Spirit Lake Ry. & Pr. Co.	Toutle River	600	16	10 N.	1 W.	1,500,000	16,363	.....	.....	Temporary permit issued.
560b	Spirit Lake Ry. & Pr. Co.	Toutle River	500	32	10 N.	3 E.	2,500,000	26,136	.....	.....	Temporary permit issued.
560c	Spirit Lake Ry. & Pr. Co.	Toutle River	400	2	9 N.	4 E.	3,000,000	36,363	.....	.....	Temporary permit issued.
560d	Spirit Lake Ry. & Pr. Co.	Green River	300	1	10 N.	2 E.	700,000	8,523	.....	.....	Temporary permit issued.
561	Spirit Lake Ry. & Pr. Co.	Spirit Lake Res.	80,000 a.f.	15	9 N.	5 E.	.....	.....	.....	.....	Reservoir for storage of water under Apps. 466, 560, 560a, 560b, 560c and 560d.
562	J. G. Kelley	Kalama River	800	3	6 N.	1 E.	.....	7,272	.....	.....	
577	James Campbell	Hoko River	550	12	31 N.	14 W.	250,000	6,375	.....	.....	Part of general scheme to divert Hoko River for power and log booming. Contract let for construction.
585	Royal Dev. Co. of Montana.	Unnamed stream	2.62	Unsurveyed			4,000	150	.....	.....	
590	Okanogan Pr. & Light Co.	Similkameen River	500	20	40 N.	27 E.	280,000	3,409	.....	.....	
591	Okanogan Pr. & Light Co.	Similkameen R. Res.	2,500 a.f.	20	40 N.	27 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 590.
592	H. F. Hubbard	Fish Creek	12	28	32 N.	18 E.	5,000	177	.....	.....	Small plant is being operated by applicant on same stream.
601	Fred M. Mitchell	Stranger Creek	10	12	32 N.	36 E.	10,000	275	259	.....	
606	J. L. Keeler	Dungeness River	.....	12	29 N.	4 W.	100,000	750	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point			Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
				Sec.	Twp.	R'nge					
607	J. L. Keeler	Dungeness River	.....	13	29 N.	4 W.	$75,000	750	.....	.....	
611	Peoples West Coast Hydro-Elec. Corp.	Naselle River	1,000	31	11 N.	8 W.	250,000	14,772	.....	.....	
646	City of Prosser	Yakima River	350	2	8 N.	24 E.	100,000	1,114	.....	.....	
691	E. M. Chandler	Hamma Hamma R.	600	16	24 N.	3 W.	1,000,000	27,273	.....	.....	
1616	E. M. Chandler	Hamma Hamma Rs	100,000 a.f.	16	24 N.	3 W.	750,000	.....	.....	.....	Reservoir for storage of water under App. 691.
693	City of Aberdeen	Wynooche River	600	1	21 N.	8 W.	.....	25,000	247	.....	Combined water supply and power development authorized and bonds voted.
694	City of Aberdeen	Weatherwax Basin Res.	80,000 a.f.	1	21 N.	8 W.	.....	.....	R. 16	.....	Reservoir for storage of water under Per. 247.
705	Upper Methow Valley Light & Power Co.	Methow River	50	4	34 N.	21 E.	10,000	244	.....	.....	Project completed.
708	Wash. Water Power Co.	Columbia River	50,000	2, 11	36 N.	37 E.	20,000,000	426,126	.....	.....	Temporary permit issued.
709	Wash. Water Power Co.	Kettle Falls Res.	60,000 a.f.	2, 11	36 N.	37 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 708.
737	Bonanza Copper Min. Co.	Unnamed stream	10	6	22 N.	15 E.	2,000	340	.....	.....	
738	Bonanza Copper Min. Co.	Boulder Creek	20	1	22 N.	14 E.	3,000	568	.....	.....	
811	C. H. Barkdull	Unnamed stream	8.13	19	39 N.	26 E.	5,000	1,109	.....	.....	
822	Cascade Electric Co.	Cowlitz River	1,000	6	11 N.	6 E.	2,000,000	22,727	.....	.....	Temporary permit issued.
857	Delta Elec. & Water Co.	Pilchuck Creek	650	15	32 N.	5 E.	200,000	553	388	.....	Company started construction work but went into hands of receiver. Feasibility of project doubtful.
858	Delta Elec. & Water Co.	Pilchuck Creek Res.	14,000 a.f.	15	32 N.	5 E.	200,000	.....	R. 21	.....	Reservoir for storage of water under Per. 388.
884	Palm & Son	Deep Creek	62	14	39 N.	40 E.	1,000	125	384	.....	Works completed. Power operates sawmill.
885	E. W. Backus	Cowlitz River	3,500	29	12 N.	2 E.	650,000	43,750	.....	.....	Extensive surveys completed. Plans in preparation under preliminary permit.
1516	E. W. Backus	Mayfield Reservoir	730,000 a.f.	29	12 N.	2 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 885.
897	Stirling B. Hill	Nooksack River	1,000	27	37 N.	5 E.	2,000,000	32,954	.....	.....	
899	Stirling B. Hill	S. Fork South Fork Res.	30,000 a.f.	35	37 N.	5 E.	150,000	.....	.....	.....	Reservoir for storage of water under App. 897.
898	Stirling B. Hill	Whatcom Creek	200	30	38 N.	3 E.	400,000	6,591	.....	.....	
900	Stirling B. Hill	Lake Whatcom Res.	65,000 a.f.	28	38 N.	3 E.	100,000	.....	.....	.....	Reservoir for storage of water under App. 898.

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Diversion Point Twp.	Diversion Point R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
902	Charles A. Moffett.....	Mineral Creek..... N. Fork	40	18	14 N.	5 E.	$25,000	454	.....	.....	
903	Charles A. Moffett.....	Mineral Creek.....	60	25	14 N.	5 E.	30,000	682	.....	.....	
916	Superior Portld Cement Co.	Jackman Creek.....	55	8	35 N.	9 E.	175,000	4,250	.....	.....	
956	Edward A. Smith.....	Twenty-five Mile Cr.	10	36	29 N.	20 E.	2,000	170	.....	.....	
1010	Puget Sd. Power & Lt. Co.	Sultan River.....	400	17	28 N.	8 E.	600,000	4,000	398	.....	
1011	Puget Sd. Power & Lt. Co.	Baker River.....	4,000	2	35 N.	8 E.	3,500,000	65,000	413	90	First step of development completed—65,000 H. P.
1012	Puget Sd. Power & Lt. Co.	Lower Baker Res...	50,000 a.f.	2	35 N.	8 E.	1,500,000	.....	R. 24	110	Reservoir for storage of water under Per. 413.
1022	Northwestern Pr. & Lt. Co.	Elwha River.....	600	17	29 N.	7 W.	800,000	10,227	525	.....	First step of development completed—10,227 H. P. Enlargement under way to 16,500 H. P.
1287	Northwestern Pr. & Lt. Co.	Glines Canyon Res..	15,000 a.f.	17	29 N.	7 W.	800,000	.....	R. 27	.....	Reservoir for storage of water under Per. 525 and Per. 683.
1031	Mrs. F. B. Denney.....	Boulder Creek.....	22	36	23 N.	14 E.	10,000	1,875	.....	.....	
1038	Trout Lake Pr. & Lt. Co..	White Salmon River.	350	24	6 N.	10 E.	3,000	300	416	.....	Power plant completed.
1048	Port of Kalama.....	Kalama River.....	520	36	7 N.	1 E.	750,000	10,341	.....	.....	
1049	Port of Kalama.....	Swift Creek.....	180	16	7 N.	5 E.	1,300,000	16,363	.....	.....	
1050	Port of Kalama.....	Kalama River.....	300	7	7 N.	4 E.	2,000,000	23,863	.....	.....	
1085	Sultan Electric Co.....	May Creek.....	25	36	28 N.	9 E.	500,000	5,000	617	.....	Plant will be operated with an existing plant on McCoy Cr.
1086	Sultan Electric Co.....	Lake Isabel Res.....	10,000 a.f.	36	28 N.	9 E.	5,000	.....	R. 41	.....	Reservoir for storage of water under Per. 617.
1126	Grays Hbr. Ry. & Lt. Co..	Quinault River..... N. Fork	500	.....	24 N.	8 W.	.....	.....	.....	.....	
1127	Grays Hbr. Ry. & Lt. Co..	North Fork Res.....	30,000 a.f.	.....	24 N.	8 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1126.
1128	Grays Hbr. Ry. & Lt. Co..	Quinault R. E. Fork	500	.....	24 N.	7 W.	.....	.....	.....	.....	
1129	Grays Hbr. Ry. & Lt. Co..	East Fork Res.....	25,000 a.f.	.....	24 N.	7 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1128.
1130	E. N. Sanderson.....	Queets River	3,000	36	24 N.	13 W.	1,000,000	23,181	.....	.....	
1131	E. N. Sanderson.....	Fisher Rapids Res..	35,000 a.f.	33	24 N.	13 W.	1,000,000	.....	.....	.....	Reservoir for storage of water under App. 1130.
1132	Grays Hbr. Ry. & Lt. Co..	Queets R., Hee Hee. Cr. & Pelton Cr.	250	29,31, 6	26 N. 25 N.	8 W. 8 W.	 1,600,000	 22,812	....	....	
1133	Grays Hbr. Ry. & Lt. Co..	Hoh River	250	11	27 N.	8 W.	3,250,000	33,806	.....	.....	
1134	Grays Hbr. Ry. & Lt. Co..	Lower Basin, Upper Hoh Reservoir	1,500 a.f.	11	27 N.	8 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1133.
1144	A. F. Horton et al.....	Bead Lake	150	9	32 N.	45 E.	25,000	2,556	.....	.....	
1161	Port of Kalama.....	Kalama River	400	28	7 N.	2 E.	1,100,000	11,365	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Twp.	R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
1162	Port of Kalama	Kalama River Reservoir No. 1	1,000 a.f.	36	7 N.	1 E.	$250,000	.....	.....	.....	Reservoir for storage of water under App. 1161.
1165	Northwestern Electric Co.	Lewis R., N. Fork.	3,780	32	6 N.	4 E.	4,000,000	60,136	.....	.....	Will be operated in connection with extensive properties in Southwest Washington. Temporary permit issued.
1167	Sultan Electric Co.	Tomtit Lake, Roesiger Lake & McCoy Creek.	6	7	27 N.	8 E.	.....	190	618	107	Plant will be operated with an existing plant on McCoy Cr.
1168	Sultan Electric Co.	Tomtit & Roesiger. Lake Reservoir	800 a.f.	21	27 N.	8 E.	.....	.....	R. 42	106	Reservoir for storage of water under Per. 618.
1178	C. W. Cottrell	Washougal River	300	5	1 N.	4 E.	7,000	250	465	121	Plant completed.
1237	E. N. Sanderson	Hoh River	2,500	.....	27 N.	12 W.	3,000,000	46,875	.....	.....	
1238	E. N. Sanderson	Big Bend Res.	97,000 a.f.	.....	27 N.	12 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1237.
1255	L. J. Vogter	Dosewallips River	500	24	26 N.	4 W.	2,000,000	56,818	.....	.....	
1256	L. J. Vogter	Jump Off Res.	10,000 a.f.	24	26 N.	4 W.	200,000	.....	.....	.....	Reservoir for storage of water under App. 1255.
1282	Henry Waldo Coe	Toutle River	225	2	9 N.	4 E.	1,100,000	17,898	.....	.....	Temporary permit issued.
1283	Henry Waldo Coe	Spirit Lake Res.	16,125 a.f.	15	9 N.	5 E.	15,000	.....	.....	.....	Reservoir for storage of water under App. 1282.
1288	Chas. T. Wright	Kalama River	1,000	26	7 N.	2 E.	1,000,000	17,045	.....	.....	
1307	H. L. Gilbert	Lewis River	2,000	24	7 N.	6 E.	3,000,000	86,363	.....	.....	
1321	Louis Carl Mory	Dosewallips River	700	28	26 N.	2 W.	250,000	7,954	.....	.....	
1322	Louis Carl Mory	Rocky Brook Cr.	40	21	26 N.	2 W.	100,000	1,363	.....	.....	
1324	H. L. Gilbert	Cispus River	400	8 or 9	10 N.	10 E.	.....	45,450	.....	.....	
1325	H. L. Gilbert	Cispus River	500	17	10 N.	9 E.	.....	56,818	.....	.....	
1365	Chelan Electric Co.	Chelan River	4,000	13	27 N.	22 E.	10,000,000	100,000	584	.....	First step of development under construction, 34,000 H. P., to be completed in 1927.
1366	Chelan Electric Co.	Chelan Lake Res.	640,000 a.f.	13	27 N.	22 E.	.....	.....	R. 37	.....	Reservoir for storage of water under Per. 584.
1371	Startup Water System	Wallace Lakes & Olney Creek.	10	20	28 N.	9 E.	.....	1,818	.....	.....	Temporary permit issued.
1373	Startup Water System	Startup Water System Res.	150 a.f.	25	28 N.	8 E.	.....	.....	R. 47	.....	Reservoir for storage of water under App. 1371.
1375	H. L. Gilbert	Walupt Lake Creek	1,000	20	11 N.	11 E.	.....	.....	.....	.....	
1376	H. L. Gilbert	Walupt Lake Res.	50,000 a.f.	20	11 N.	11 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 1375.
1377	J. G. Kelley	Cowlitz River	6,000	26	12 N.	1 E.	.....	54,545	.....	.....	
1378	H. W. Crozier	Cowlitz River	1,650	6	11 N.	6 E.	3,500,000	43,687	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Diversion Point Twp.	Diversion Point R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
1492	H. W. Crozier	Big Bend Res.	10,000 a.f.	6	11 N.	6 E.	$50,000	.....	.....	.....	Reservoir for storage of water under App. 1378.
1379	H. W. Crozier	Cowlitz River	4,000	29	12 N.	2 E.	1,500,000	57,272	.....	.....	
1381	H. W. Crozier	Mayfield Reservoir	25,000 a.f.	29	12 N.	2 E.	1,500,000	.....	.....	.....	Reservoir for storage of water under App. 1379.
1380	H. W. Crozier	Cowlitz River	4,000	8	12 N.	3 E.	6,000,000	147,727	.....	.....	
1382	H. W. Crozier	Mossy Rock Res.	25,000 a.f.	8	12 N.	3 E.	1,500,000	.....	R. 36	.....	Reservoir for storage of water under App. 1380.
1544	H. W. Crozier	Mossy Rock Res.	1,000,000 a.f.	8	12 N.	3 E.	6,000,000	.....	.....	.....	Increased storage of water under App. 1380.
1393	Lilliwaup Pr. & Water Co.	Lilliwaup River	250	13	23 N.	4 W.	200,000	4,261	.....	.....	
1500	Lilliwaup Pr. & Water Co.	Lilliwaup Reservoir.	50,000 a.f.	24	23 N.	4 W.	250,000	.....	.....	.....	Reservoir for storage of water under App. 1393.
1453	H. L. Gilbert	Meadow Creek	150	36	7 N.	7 E.	750,000	9,375	.....	.....	
1454	H. L. Gilbert	Rush & Hardtime Creeks	200	34 3	7 N. 6 N.	7 E. 7 E.	2,500,000	30,750	.....	.....	
1455	H. L. Gilbert	Lone Butte Res.	18,000 a.f.	13 36	7 N. 7 N.	7 E. 7 E.	800,000	.....	.....	.....	Reservoir for storage of water under Apps. 1453 and 1454.
1455	H. L. Gilbert	Big Creek	150	13	7 N.	7 E.	2,600,000	32,386	.....	.....	This project is an alternative to the project under Apps. 1453 and 1454.
1457	H. L. Gilbert	Lewis River	500	18	8 N.	8 E.	1,250,000	15,625	.....	.....	
1458	H. L. Gilbert	Quartz Reservoir	84,000 a.f.	18	8 N.	8 E.	1,800,000	.....	.....	.....	Reservoir for storage of water under App. 1457.
1459	H. L. Gilbert	Little Creek	75	27	7 N.	7 E.	705,000	8,812	.....	.....	
1460	H. L. Gilbert	Lewis River	300	33	8 N.	7 E.	450,000	6,000	.....	.....	
1461	H. L. Gilbert	Muddy River	200	23	8 N.	6 E.	500,000	5,000	.....	.....	
1462	H. L. Gilbert	Clearwater Res.	12,000 a.f.	23	8 N.	6 E.	300,000	.....	.....	.....	Reservoir for storage of water under App. 1461.
1463	H. L. Gilbert	Cedar Flats Res.	15,000 a.f.	24	7 N.	6 E.	300,000	.....	.....	.....	
1464	H. L. Gilbert	Pine Creek	200	14	7 N.	6 E.	300,000	5,000	.....	.....	
1485	Lilliwaup Ld. & Resort Co.	Lilliwaup River	250	.....	.....	.....	500,000	21,306	.....	.....	
1486	Lilliwaup Ld. & Resort Co.	Lilliwaup River	250	19	23 N.	3 W.	250,000	.....	.....	.....	
1487	Lilliwaup Ld. & Resort Co.	Melbourne Lk. Res.	2,000 a.f.	.....	23 N.	4 W.	5,000				
1488	Lilliwaup Ld. & Resort Co.	Lilliwaup Swamp Reservoir.	10,000 a.f.	.....	23 N.	4 W.	25,000	.....	.....	.....	Reservoirs for storage of water under Apps. 1485 and 1486.
1489	Lilliwaup Ld. & Resort Co.	Tenos Lake Res.	2,000 a.f.	.....	23 N.	4 W.	5,000				
1495	Lilliwaup Pr. & Water Co.	Price's Lake	60	23	23 N.	4 W.	75,000	1,500	.....	.....	
1522	Swauk Mining & Dredg. Co.	Ingalls Creek	150	.....	.....	.....	.....	12,784	.....	.....	
1525	Hamma Hamma Logg. Co.	Hamma Hamma River	500	16	24 N.	3 W.	200,000	11,363	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point			Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
				Sec.	Twp.	R'nge					
1526	Hamma Hamma Logg. Co.	Hamma Hamma Reservoir.	12,825 a.f.	16	24 N.	3 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1525.
1529	Charles H. Ballard.....	Canyon Creek	20	Unsurveyed			$50,000	681	.....	.....	
1538	R. W. Lincoln.....	Toutle River	2,000	19	10 N.	1 E.	2,000,000	.....	.....	.....	Temporary permit issued.
1539	R. W. Lincoln.....	Reservoir	60,000 a.f.	19	10 N.	1 E.	1,000,000	.....	.....	.....	Reservoir for storage of water under App. 1538.
1541	Harold H. Hartman.....	Cowlitz River	3,500	29	12 N.	2 E.	8,200,000	119,318	.....	.....	
1542	Harold H. Hartman.....	Mayfield Res.	730,000 a.f.	29	12 N.	2 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 1541.
1551	R. B. Metcalfe.....	Hoffsteadt Cr. & Green River.	1,000	6	10 N.	3 E.	1,500,000	56,818	.....	.....	
1552	R. B. Metcalfe.....	Toutle River	500	2	9 N.	4 E.	1,500,000	38,352	.....	.....	
1561	F. B. Allard.....	Foss River	300	28	25 N.	12 E.	.....	34,091	.....	.....	Temporary permit issued.
1571	Pearl E. Richard.....	Cle Elum River....	1,000	21	22 N.	14 E.	1,000,000	10,681	.....	.....	Temporary permit issued.
1591	City of Seattle.....	Skagit River	3,500	Unsurveyed			8,000,000	120,000	640	.....	First step of development completed.
1592	City of Seattle.....	Diablo Reservoir....	90,000 a.f.	8	37 N.	13 E.	3,000,000	.....	R. 43	.....	Reservoir for storage of water under Per. 640.
1597	J. R. Snider.....	North River	5,000	.....	15 N.	9 W.	1,450,000	71,023	.....	.....	
1598	J. R. Snider.....	Reservoir	272,000 a.f.	.....	15 N.	9 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1597.
1624	W. T. Batcheller and E. A. Olsen.....	Miller R., E. Fork..	160	28	25 N.	11 E.	750,000	14,545	.....	.....	
1625	W. T. Batcheller and E. A. Olsen.....	Miller R., W. Fork.	100	17	25 N.	11 E.	200,000	9,091	.....	.....	
1626	W. T. Batcheller and E. A. Olsen.....	Dorothy Lake Res.	45,000 a.f.	4	24 N.	11 E.	350,000	.....	.....	.....	Reservoir for storage of water under App. 1624.
1632	Mark F. Mendenhall, Sr.....	Bull Dog Creek.....	10	26	31 N.	40 E.	10,976	198	.....	.....	Stream developed to capacity under old rights.
1633	Mt. Spokane Power Co.....	Jump Off Joe Cr...	10	36	31 N.	40 E.	15,700	250	721	.....	To be operated in connection with existing plant.
1634	H. Lloyd Miller.....	Yakima River	2,000	33	15 N.	19 E.	2,000,000	27,272	.....	.....	Development contingent on release of waters withdrawn for use of U. S. Bureau of Reclamation.
1635	H. Lloyd Miller.....	Yakima River	3,000	17	13 N.	19 E.	2,500,000	40,909	.....	.....	Development contingent on release of waters withdrawn for use of U. S. Bureau of Reclamation.
1638	Northwestern Pr. & Lt. Co.	Elwha River	200	17	29 N.	7 W.	1,000,000	16,500	683	.....	Raising of dam under way to provide increased storage capacity for present plant.

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER—Continued.

Power.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point Sec.	Twp.	R'nge	Estimated Cost	Estim't'd Theoretic H. P.	Permit No.	Cert. No.	REMARKS
1639	Northwestern Pr. & Lt. Co.	Glines Canyon Res..	50,000 a.f.	17	29 N.	7 W.	.....	.....	R. 45	.....	Reservoir for storage of water under Per. 683.
1646	F. M. Mitchell.....	Hall Creek	50	1	32 N.	36 E.	10,000	539	.....	.....	
1657	Edward Fitzpatrick	Lapoel Creek	30	Unsurveyed			50,000	4,091	.....	.....	
1658	W. E. Theodore.....	Eagle Creek	20	Unsurveyed			45,000	5,227	.....	.....	
1660	Royal Development Co.....	Phelps Creek	30	15	30 N.	16 E.	40,000	1,080	696	.....	Under construction.
1661	Henry L. Gray.....	Naselle R., N. Br'ch	670	31	11 N.	8 W.	1,500,000	12,182	.....	.....	
1662	Henry L. Gray.....	Naselle River Res...	20,000 a.f.	31	11 N.	8 W.	1,500,000	.....	.....	.....	Reservoir for storage of water under App. 1661.
1670	L. W. Johnson.....	Snoqualmie River,.. N. Fork	700	18	24 N.	9 E.	2,000,000	39,773	.....	.....	
1671	C. F. Uhden.....	Cross Creek	20	Unsurveyed			.....	3,409	.....	.....	
1674	Verona Mining Co.....	Bagley Creek	10	17	39 N.	9 E.	10,000	1,500	.....	.....	
1679	L. J. Vogter.....	Constance Creek ..	10	12	26 N.	4 W.	.....	4,545	.....	.....	
1683	George E. Quinan.....	Deer Creek	2,000	7	33 N.	7 E.	2,500,000	.....	.....	.....	
1684	George E. Quinan.....	Lake Cavanaugh .. Reservoir.	70,000 a.f.	.....	33 N.	6 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 1683.
1685	Henry A. Keil.....	Toutle River	2,500	14	10 N.	1 E.	6,000,000	.....	.....	.....	
1686	Henry A. Keil.....	Silver Lake Res....	100,000 a.f.	25, 31	10 N.	1 W.	500,000	.....	.....	.....	Reservoir for storage of water under App. 1685.
1708	Verona Mining Co.....	Galena Creek	10	17	39 N.	9 E.	5,000	568	.....	.....	
1715	Miller & Aall.....	Clear Creek	100	6	31 N.	10 E.	.....	.....	.....	.....	
1723	Wallace Huntington	Doubtful Lake	41	Unsurveyed			100,000	3,028	.....	.....	
1724	City of Tacoma.....	Skokomish, R., ... S. Fork	600	10	22 N.	5 W.	5,000,000	46,364	.....	.....	
1725	City of Tacoma.....	South Fork Res...	220,000 a.f.	21	22 N.	5 W.	.....	.....	.....	.....	Reservoir for storage of water under App. 1724.
1726	Startup Water System.....	Olney Creek	70	25	28 N.	8 E.	25,000	1,273	.....	.....	
1727	Startup Water System.....	Olney Reservoir ..	2,220 a.f.	25	28 N.	8 E.	25,000	.....	.....	.....	Reservoir for storage of water under App. 1726.
1811	O. C. Carlson.....	Unnamed Stream ..	5	8	12 N.	5 E.	2,500	113	.....	.....	
1813	D. W. Stuver.....	Troublesome Creek. W. Fork.	10	3	28 N.	11 E.	150,000	1,591	.....	.....	
1814	D. W. Stuver.....	Troublesome Cr., .. E. Fork.	30	11	28 N.	11 E.	500,000	5,795	.....	.....	
1815	D. W. Stuver.....	Sultan River	5	35	29 N.	10 E.	50,000	568	.....	.....	
1816	D. W. Stuver.....	Twin Lakes Res....	7,500 a.f.	3	28 N.	11 E.	150,000	.....	.....	.....	Reservoirs in connection with Appropriation Apps. 1813, 1814 and 1815.
1817	D. W. Stuver.....	Blanca Lake Res...	25,000 a.f.	11	28 N.	11 E.	500,000	.....	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER.

IRRIGATION.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point			Estimated Cost	Acreage	Permit No.	Cert. No.	REMARKS
				Sec.	Twp.	R'nge					
1241	Stemilt Irrig. Dist.....	Stemilt Cr., S. Fork	450 a.f.	23	21 N.	20 E.	$73,870	.....	R. 35	.....	To supplement present supply.
1275	Millerdale Water Users Assn.	Squilchuck Cr.	10	7	21 N.	20 E.	75,000	543	550	.....	Additional supply.
1276	Millerdale Water Users Assn.	Millerdale Res.	260 a.f.	3	21 N.	20 E.	65,000	.....	R. 31	.....	Reservoir for storage of water under Per. 550.
1291	Stemilt Irrig. Dist.....	Stemilt Cr., S. Fk..	25	22	21 N.	20 E.	85,000	504	580	.....	Additional supply.
1385	Wenas Irrig. Dist.....	Wenas Creek	.....	2	15 N.	17 E.	42,500	2,000	579	.....	
1386	Wenas Irrig. Dist.....	Wenas Creek Res...	1,300 a.f.	2	15 N.	17 E.	.....	.....	R. 34	.....	Reservoir for storage of water under Per. 579.
1417	Lake Chelan Recl. Dist.....	Lake Chelan	55	15	28 N.	21 E.	40,000	4,500	.....	.....	To supplement gravity supply.
1418	Lake Chelan Recl. Dist.....	Lake Chelan.....	5	35	28 N.	21 E.	20,000	40	.....	.....	To supplement gravity supply.
1555	Wenatchee-Beebe Orch. Co...	Chelan River	8	30	27 N.	23 E.	25,000	520	684	.....	Additional supply.
1576	E. C. Burlingame.....	Walla Walla River..	15	3	6 N.	35 E.	.....	1,218	.....	.....	
1577	Clifford C. Riggs et al.....	Walla Walla River..	50	3	6 N.	35 E.	.....	4,000	.....	.....	
1668	W. E. Buell.....	Entiat River	100	28	26 N.	20 E.	.....	.....	.....	.....	
1669	W. E. Buell.....	Entiat Reservoir ...	15,000 a.f.	11	27 N.	19 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 1668.
1673	Baar & Cunningham.....	Klickitat River	300	25	3 N.	12 E.	250,000	4,000	.....	.....	For North Dalles Irrigation District.
1682	Robt. M. & F. A. Fancher..	Antwyne Creek	400 a.f.	35	39 N.	28 E.	11,000	.....	.....	.....	
1735	Boston-Okanogan Apple Co.	Okanogan River ...	5	3	32 N.	25 E.	20,000	300	.....	.....	
1762	Lake Chelan Recl. Dist.....	Alkali Lake	10	23	28 N.	21 E.	10,000	1,900	.....	.....	To supplement gravity supply.
1770	Helensdale Recl. Dist.....	Okanogan River ...	5	9	32 N.	25 E.	15,000	640	.....	.....	
1774	Harry J. Kerr, Trustee.....	Okanogan River ...	7	9	33 N.	26 E.	40,000	1,200	.....	.....	
1787	Stemilt Irrig. Dist.....	Columbia River	5	19	22 N.	21 E	35,000	504	.....	.....	To supplement gravity supply.
1824	Icicle Irrig. Dist.....	Konaqua Lake	25	3	24 N.	14 E.	4,000				
1825	Icicle Irrig. Dist.....	Eight Mile Lake....	25	33	24 N	16 E.	5,000	7,000	.....	.....	Supp'emental supply.
1825a	Icicle Irrig. Dist.....	Cole Chuck Lake...	50	10	23 N	16 E.	5,000				
1838	Chelan River Irrig. Dist.....	Chelan River	5	13	27 N.	22 E.	40,000	400	.....	.....	

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER.
MUNICIPAL USE.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point			Estimated Cost	Popul't'n to be Served	Permit No.	Cert. No.	REMARKS
				Sec.	Twp.	R'nge					
1268	City of Anacortes.....	Lake Campbell	4	7	34 N.	2 E.	$31,000	6,000	535	.....	
1269	City of Anacortes.....	Lake Campbell Res.	1,000 a.f.	13	34 N.	1 E.	.....	.....	R. 30	.....	Reservoir for storage of water under Per. 535.
1270	City of Montesano.....	Camp Cr., W. Fork	10	28	18 N.	7 W.	.....	10,000	.....	.....	
1271	City of Montesano.....	Camp Cr., E. Fork	10	28	18 N.	7 W.	.....	.....	.....	.....	
1277	Illahee Imp. Co.....	Unnamed Springs ..	1	36	25 N.	1 E.	2,000	500	.....	.....	To supply Illahee, Wash.
1292	Forks Water Co.....	Elk Creek	1.5	11	28 N.	13 W.	11,000	2,000	564	91	To supply Forks, Wash.
1304	City of Auburn.....	Coal Cr. Springs....	15	28	21 N.	5 E.	200,000	15,000	549	.....	
1306	Paul Lindberg	Woods Creek	1	30	25 N.	1 E.	5,000	200	.....	.....	To supply Silverdale, Wash.
1336	City of Everett.....	Storm Lake	2	2	28 N.	6 E.	300,000	50,000	546	.....	Re-location of Sultan River pipe line.
1337	City of Everett.....	Flowing Lake	2	2	28 N.	6 E.	.....	.....	547	.....	Re-location of Sultan River pipe line.
1338	City of Everett.....	Flowing Lake Res..	3,360 a f.	2	28 N.	6 E.	.....	.....	R. 32	.....	Reservoir for storage of water under Per. 547.
1339	City of Everett.....	Storm Lake Res....	1,540 a.f.	1	28 N.	6 E.	.....	.....	R. 33	.....	Reservoir for storage of water under Per. 546.
1348	J. C. Sams.....	Beatty Springs	6	15	18 N.	1 E.	250,000	30,000	570	.....	To supply Olympia and Norpia.
1349	J. C. Sams.....	McAllister Springs .	25	19	18 N.	1 E.	750,000	.....	571	.....	To supply Olympia and Norpia.
1352	J. C. Sams.....	Long Lake	10	22	18 N.	1 W.	250,000	10,000	.....	.....	To supply Norpia.
1354	J. E. Kalmback.....	Unnamed Stream ..	2	13	9 N.	2 W.	.....	1,500	577	.....	To supply Castle Rock.
1371	Startup Water System.....	Wallace Lakes	10	20	28 N.	9 E.	.....	850	.....	.....	To supply Startup and Goldbar.
1372	Startup Water System.....	Wallace Lakes and Olney Creek	.....	25	28 N.	8 E.	.....	.....	.....	.....	Secondary application.
1373	Startup Water System.....	Wallace Lakes and Olney Creek	150 a.f.	25	25 N.	8 E.	.....	.....	.....	.....	Reservoir for storage of water under App. 1371-2.
1388	City of Olympia.....	Satsop R. Middle F.	50	17	21 N.	6 W.	.....	50,000	.....	.....	
1406	Wm. J. Roberts.....	Unnamed Stream ..	1.5	14	20 N.	2 E.	50,000	4,000	593	.....	To supply University Place Water District.
1439	Henry Morey et al.....	Quilcene River	700	.....	.....	.....	5,000,000	.....	.....	.....	Municipal and irrigation supply for Port Townsend.
1440	Henry Morey et al.....	Little Quilcene River	300	2	27 N.	2 W.	3,000,000	.....	.....	.....	Municipal and irrigation supply for Port Townsend.
1441	Henry Morey et al.....	Lords Lake Res.....	.....	.....	.....	.....	.....	.....	.....	.....	Reservoir for storage of water under Apps. 1439-40.
1490	Vashon Water District.....	Beall Creek	.9	29	23 N.	3 E.	12,500	1,000	588	.....	To supply Vashon and community.
1497	Town of Elma.....	Porter Cr., S. Fork	10	12	17 N.	5 W.	70,000	3,800	.....	.....	
1499	Thos. G. Mortland.....	Unnamed Springs ..	2	21	28 N.	5 E.	12,500	.....	.....	.....	
1536	City of Kelso.....	Cowlitz River	30	27	8 N.	2 W.	3,000,000	60,000	629	.....	Municipal and manufacturing.
1550	Chas. I. Signer.....	Skookumchuck Rvr.	20	13	15 N.	1 E.	380,000	25,000	.....	.....	To supply city of Olympia.

APPLICATIONS FOR PERMITS TO APPROPRIATE WATER.
MUNICIPAL USE—Continued.

App. No.	NAME OF APPLICANT	Source of Appropriation	Amount of Water Cusecs.	Diversion Point			Estimated Cost	Popul't'n to be Served	Permit No.	Cert. No.	REMARKS
				Sec.	Twp.	R'nge					
1557	Jacobs & Ober.....	Skookumchuck Rvr.	250	20	15 N.	2 E.	3,700,000	25,000	.....	.....	To supply city of Olympia.
1665	Port of Kalama.....	Kalama River	150	33	8 N.	4 E.	.....	.....	.....	.....	Municipal and manufacturing.
1713	Frank Wenke, Mayor.....	South Prairie Creek	2	31	19 N.	7 E.	42,000	5,000	717	.....	To supply town of Buckley.
1728	Lewis D. Williams, Jr.....	Doman Creek	3	13	10 N.	11 W.	.....	5,000	.....	.....	To supply Long Beach and Seaview.
1764	Town of Shelton.....	Shelton Springs	5	Blk.	13, Shelton		60,000	5,000	745	.....	
1839	Startup Water System.....	Olney Creek	.....	5	28 N.	9 E.	.....	.....	.....	.....	
1844	City of Raymond.....	Willapa R., S. Fork	15	31	14 N.	8 W.	100,000	25,000	.....	.....	Municipal and manufacturing.
1853	City of Snohomish.....	Pilchuck River	30	9	29 N.	7 E.	250,000	6,000	.....	.....	Municipal and manufacturing.
1873	City of Tumwater.....	McAleer Spring	1.5	35	18 N.	2 W.	20,000	2,000	.....	.....	
1875	East Wenatchee Domestic Water Assn.	Columbia River	6	2	22 N.	20 E.	100,000	2,500	.....	.....	

METHODS AND EXTENT OF WATER SUPERVISION.

The fundamental idea of the Water Code is that all rights to the beneficial use of water in the State of Washington will be evidenced eventually by certificates of water right issued through this office and based upon either permits under the Water Code or determination of old rights under the court procedure authorized by the Code.

The office is charged with the regulation and control of the diversion of water in accordance with the rights thereto. Such regulation and control is undertaken only when the rights have been established by court decrees or by the procedure prescribed under the Code. Frequent requests are made for regulation, the rights to which have not been so determined. In such cases representatives of the office will give such information and advice as may seem appropriate, but will assume no authority.

The regulation of water is accomplished by means of water masters and stream patrolmen. Water masters are appointed upon proper showing of necessity, each to serve a certain definite district, usually a county. Compensation is paid for the time actually employed, by the county served.

When a given stream requires more time for its regulation than can be given by the water master, a stream patrolman may be employed upon request of interested parties, the cost of his services to be paid by those receiving water from the stream.

During the biennium the following water masters and stream patrolmen have been appointed to regulate the diversion of water in various parts of the state:

WATER MASTERS.

1925	*1926*	*County*	*Division No.*
C. E. Hewitt	C. E. Hewitt	Yakima	1
Ben Vaughn	Ben Vaughn	Kittitas	1
A. A. Whipple	C. E. Chapman	Chelan	2
M. McCain	M. McCain	Okanogan	2
H. M. Dorman	H. M. Dorman	Stevens	4
J. C. Stegner	J. C. Stegner	Pend Oreille	4
L. N. Felmley	Harlow Barney	Walla Walla and Columbia	3
	Walter Belt	Clallam	5
Gus Markgraf	A. G. Hanson	Klickitat	6

STREAM PATROLMEN.

1925	*1926*	*Stream*
J. S. Nystrom	Martin Haberman	Wilson Creek
W. H. Dunnagan	W. H. Dunnagan	Squillchuck Creek and Stemilt Creek
Fred Beisner	Fred Beisner	Wenas Creek
	Axel W. Lennstrom	Colockum Creek
Everett Dearing	M. E. Charlton	Nanum Creek
H. H. Kelly	H. H. Kelly	Peshastin Creek
Gus Markgraf	Brooks Livingston	Bird and Frazier Creeks
J. H. Wetzel	J. H. Wetzel	Manashtash Creek
J. O. Moen	A. J. Sutton	Reecer Creek
H. G. Hope	H. G Hope	Beaver and Frazier Creeks
E. H. Smith	E. H. Smith	Colman Creek
Jas. Cunningham	Glen Wood	Cowiche Creek
Walter Butler	Preston Armstrong	Ahtanum Creek
F. E. France	Geo. S. Sisk	Ahtanum Creek
James H. Pettit	Chas. O. Jameson	Mission Creek
	Bud Cook	Cook Creek
R. P. Reddick	R. P. Reddick	McFarland Creek
	Charles Conger	North Fork Salmon Creek
Peter Caraher	Peter Caraher	Taneum Creek
	Gene Smith	Loop Loop Creek
J. Swain	J. Swain	Alpowa Creek
D. J. Wood	D. J. Wood	Myers Creek
	R. S. Meader	Johnson Creek

MISCELLANEOUS ACTIVITIES.

The Division of Hydraulics is charged with responsibility for supervision of the construction of hydraulic works generally so far as necessary to assure safety to life and property. Under this provision builders of dams or other hydraulic works of magnitude are required to submit plans for criticism or approval.

On account of the limited engineering force available, it has not been possible to give more than perfunctory inspection to the actual construction. As a rule it is necessary to place dependence in the engineering organization of cities and other corporations building the more important works. More careful attention is given to structures built by individuals or small concerns that do not have competent engineering advice and assistance.

The Division also investigates the source and sufficiency of water supply for any proposed irrigation district and reports to the county commissioners in advance of the organization hearing.

During the biennium in the absence of engineers assigned for duty in the Division of Reclamation and the Division of the Columbia Basin, the Supervisor of Hydraulics and other employes of the office have given considerable time to the work of these two divisions. This work will be more fully set out in the reports of the respective divisions.

LITIGATION.

During the biennium six decisions have been handed down from the Supreme Court involving rulings made by the Supervisor of Hydraulics. Each of these decisions supported the rulings of the Supervisor and strengthened former decisions of the court.

Included in this group are three outstanding cases.

First, the case of *Proctor v. F. W. Sims et al.*, 134 Wash. 606:

In this case the respondent had obtained a state permit to appropriate water for irrigation from a small lake which was entirely within the land of the appellant. The court held that although the appellant owned the bed and banks of the lake, he did not have the right to exclusive use of the water, but only to such an amount as he could beneficially use on his own land; that the respondent was entitled to appropriate any water in excess of the needs of the appellant.

This case in effect limits irrigation rights under riparian claims to beneficial use, present or prospective.

Second, *In re Ahtanum Creek:*

In this case the court held that the water duty for a given tract of land is not necessarily a fixed and immutable thing but that "it may change from time to time according to water, soil and climatic conditions."

The court in this case overruled claims to certain rights by reason of adverse use and prescription, but showed that under given conditions such rights might be established, and reaffirmed former decisions that waters of springs which feed a stream are subject to use by prior appropriators on that stream even though the owner of the land on which the springs are located has used the water therefrom for many years.

Third, *State of Washington v. American Fruit Growers, Inc.*, 135 Wash. 156:

This was a proceeding to adjudicate the waters of Stemilt Creek in Chelan County, Washington. The court held that riparian rights for ir-

rigation did not attach to part of the land involved in this proceeding for which such rights were claimed, for the reason that those lands were high in elevation and were, therefore, held to be not agricultural land.

All of these cases clarified the law and established certain basic principles which will be extremely valuable in future adjudication proceedings.

DETERMINATION OF EXISTING RIGHTS.

In the irrigated sections of the State water problems have been the cause of long and costly litigation. The method for determination of old rights provided by the Water Code is intended greatly to reduce the amount and cost of such litigation. It does not attempt to create new rights or to abolish or modify old rights, but simply to determine the extent of each and the relative priority between all claimants on a stream system. The results are set out in a court decree which is the basis of water right certificates issued by the Division of Hydraulics, recorded in the respective counties and subject to sale, division, transfer, etc., in the same manner as land titles.

This determination work was undertaken shortly after the Code became effective and has been carried on steadily since that time. The first cases were purposely limited to small streams until methods and procedure were fairly well developed. As the most serious conflicts often occur on the smaller streams, this order of procedure offered relief where it was most needed. Many important cases are now pending and their settlement is being strongly urged by interested water users. It is believed that larger funds for this work should be made available so that it may be speeded up. The cost is, in any event, to be paid by the water users.

EXTENT OF WATER RIGHT DETERMINATIONS UNDER THE WATER CODE.

Since June 15, 1917, the date when the Water Code became effective, proceedings of this nature have been completed in 28 cases involving 1,197 water rights for as many farms, having a total area of 113,573.99 acres. The cost of this work has averaged 18½ cents per acre. In four of the cases above mentioned decrees have not been entered, but so far as this office is concerned the work is complete, reports having been rendered to the court in each case.

Only one stream involving the use of water for power purposes has been adjudicated. This is the Similkameen River on which ultimately 7,000 horsepower will be developed under the rights decreed.

During the biennium adjudication of six streams involving 108 water rights for 7,662 acres of land, as shown elsewhere in this report, has been completed, and proceedings have been instituted to determine water rights of the Walla Walla River and twenty of its tributaries which is by far the largest case yet undertaken by this office. The number of water rights involved will exceed 1000 for the irrigation of as many farms, mostly under intensive cultivation. All field work in this case is completed. The testimony in support of claims, taken before Deputy Supervisor C. J. Bartholet, as referee of the court, in the spring of 1926, made some 6000 typed pages. The task of digesting and analyzing such a mass of evidence is one of real magnitude.

Plate I.

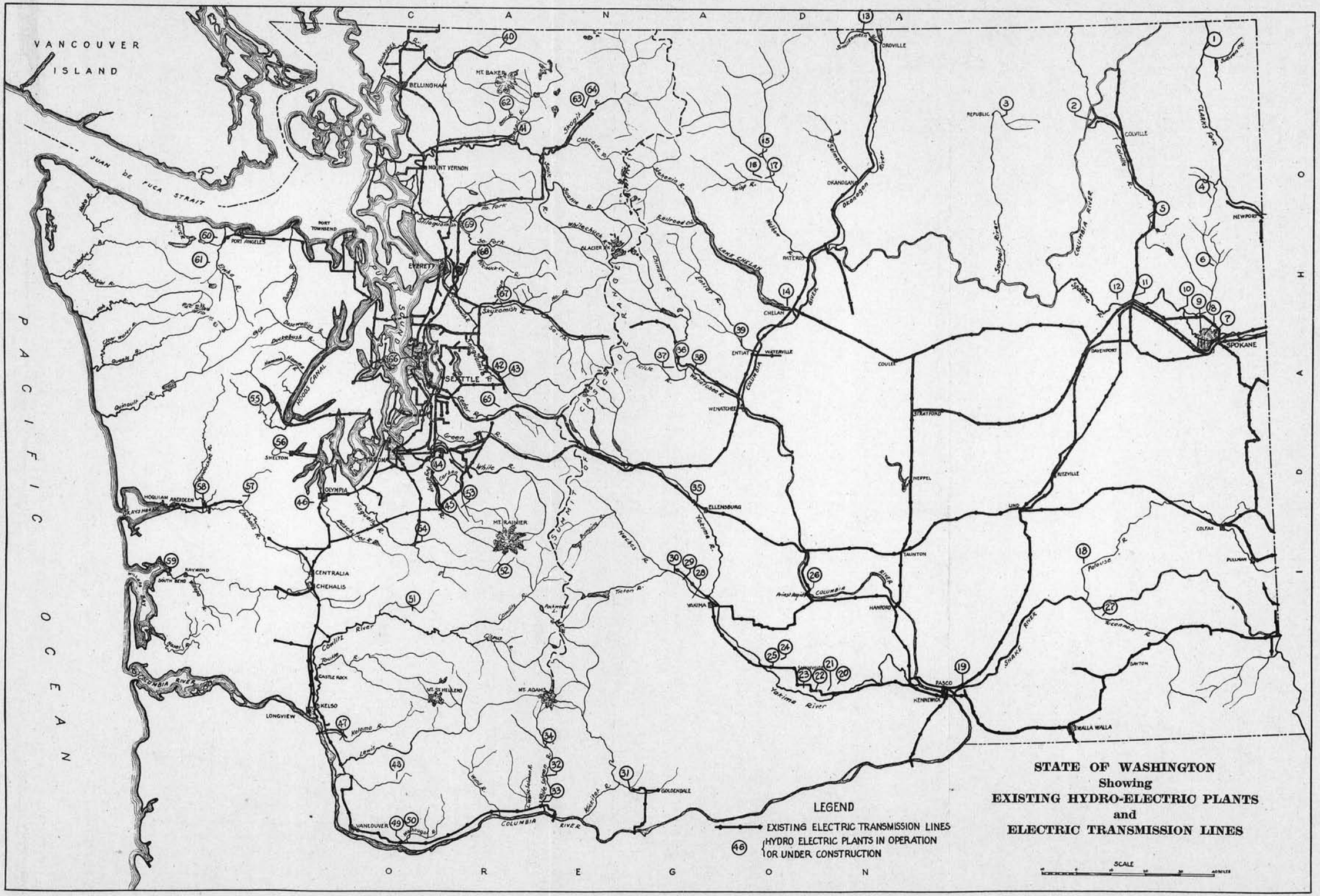
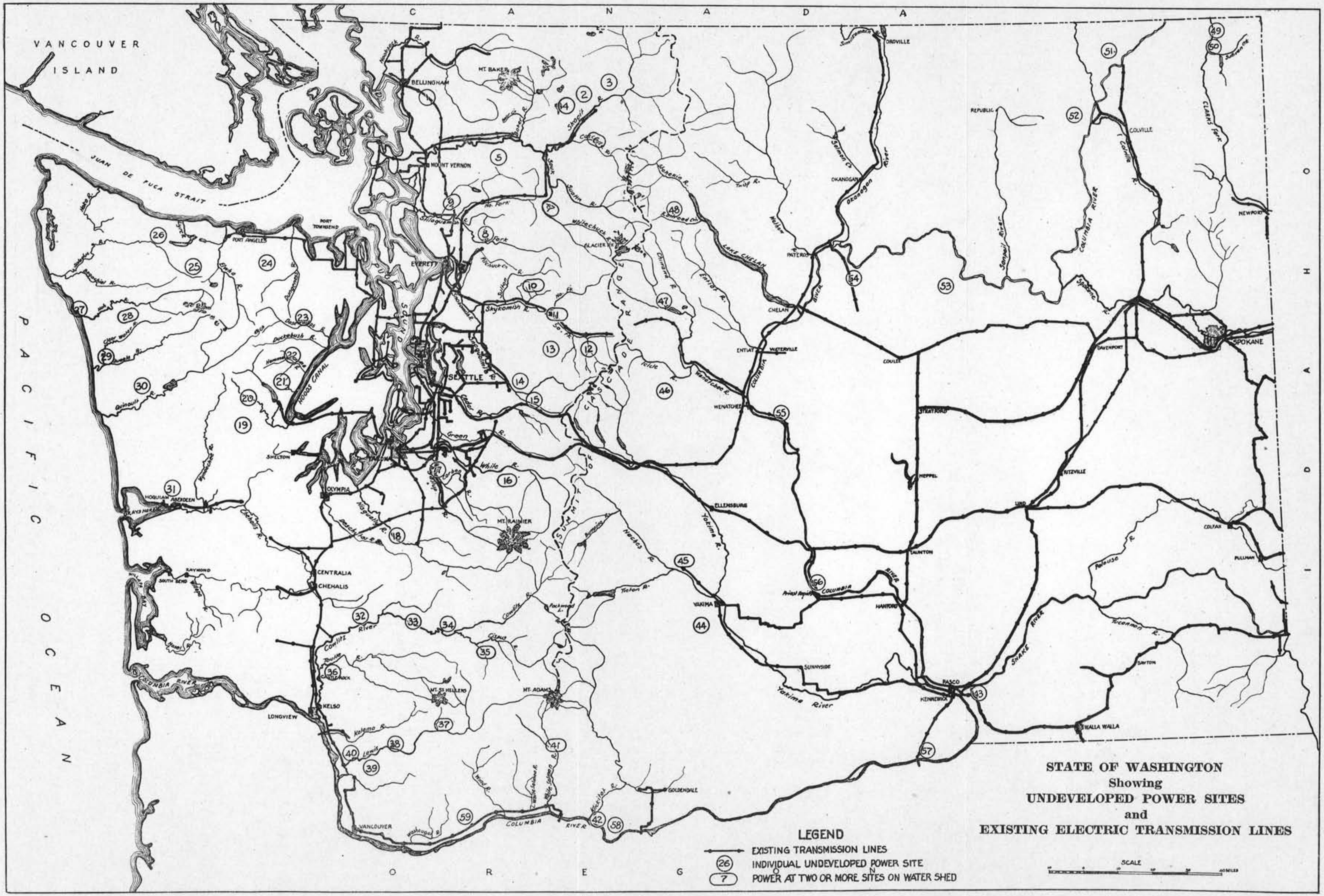

STATE OF WASHINGTON
Showing
EXISTING HYDRO-ELECTRIC PLANTS
and
ELECTRIC TRANSMISSION LINES
LEGEND
EXISTING ELECTRIC TRANSMISSION LINES
HYDRO ELECTRIC PLANTS IN OPERATION OR UNDER CONSTRUCTION
SCALE
CANADA
OREGON
IDAHO
PACIFIC OCEAN
VANCOUVER ISLAND
JUAN DE FUCA STRAIT
BELLINGHAM
MT. BAKER
MOUNT VERNON
PORT TOWNSEND
PORT ANGELES
EVERETT
SEATTLE
TACOMA
OLYMPIA
SHELTON
HOQUIAM
ABERDEEN
RAYMOND
SOUTH BEND
CENTRALIA
CHEHALIS
CASTLE ROCK
KELSO
LONGVIEW
VANCOUVER
MT. RAINIER
MT. ST. HELLENS
MT. ADAMS
YAKIMA
ELLENSBURG
GOLDENDALE
WENATCHEE
ENTIAT
WATERVILLE
CHELAN
PATERSON
OKANOGAN
OROVILLE
REPUBLIC
COLVILLE
NEWPORT
SPOKANE
DAVENPORT
COULEE
STRATFORD
NEPPEL
RITZVILLE
LIND
TAUNTON
HANFORD
PASCO
KENNEWICK
WALLA WALLA
COLFAX
PULLMAN
DAYTON
GLACIER
LAKE CHELAN
COLUMBIA RIVER
SNAKE RIVER
YAKIMA RIVER
PUGET SOUND
HOOD CANAL
CASCADE RANGE
SUMMIT OF CASCADES

Plate II.



C A N A D A
VANCOUVER ISLAND
JUAN DE FUCA STRAIT
PACIFIC OCEAN
O R E G O N
I D A H O
BELLINGHAM
MT. BAKER
MOUNT VERNON
PORT TOWNSEND
PORT ANGELES
EVERETT
SEATTLE
TACOMA
OLYMPIA
SHELTON
HOQUIAM
ABERDEEN
CENTRALIA
CHEHALIS
RAYMOND
SOUTH BEND
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OKANOGAN
PATEROS
CHELAN
ENTIAT
WATERVILLE
WENATCHEE
ELLENSBURG
YAKIMA
SUNNYSIDE
HANFORD
PASCO
KENNEWICK
WALLA WALLA
DAYTON
COULEE
STRATFORD
ODESSA
RITZVILLE
LIND
COLFAX
PULLMAN
DAVENPORT
SPOKANE
NEWPORT
COLVILLE
REPUBLIC
COLUMBIA RIVER
SNAKE RIVER
Yakima River
Lake Chelan
STATE OF WASHINGTON
Showing
UNDEVELOPED POWER SITES
and
EXISTING ELECTRIC TRANSMISSION LINES
LEGEND
EXISTING TRANSMISSION LINES
26 INDIVIDUAL UNDEVELOPED POWER SITE
7 POWER AT TWO OR MORE SITES ON WATER SHED
SCALE

Field surveys have been commenced on Squillchuck Creek in Chelan County for the purpose of obtaining data incident to the determination of the water rights of that stream. Such surveys consist of locating and determining land areas, mapping of ditches and streams, soil surveys and studies for the purpose of determining the amount of water necessary for the proper irrigation of the lands. The Squillchuck determination will be followed by that of the Touchet River in Walla Walla and Columbia Counties. This determination will probably involve as much work as the Walla Walla River and tributaries, as the stream is sixty to seventy miles in length with several large tributaries, all of which traverse irrigated lands over their entire length.

DEMAND FOR DETERMINATION OF WATER RIGHTS.

During the biennium 11 petitions have been filed with the Supervisor of Hydraulics for the determination of water rights on the same number of streams. During that period 13 petitions previously filed have been disposed of by adjudication proceedings. This number includes six tributaries of the Walla Walla River on which petitions for determination have been received, the entire group being incorporated in one case. Included in this case, also, are fourteen other tributaries not covered by petition but so closely related to the other streams as to be the cause of much dispute over water rights. For this reason they were all included in the Walla Walla proceeding.

During the entire period 69 petitions have been filed. Of this number, determination proceedings have been completed on 34. Eventually the water rights of all our irrigation streams and many of our power streams must be adjudicated. While it is difficult to estimate the percentage of this work that has been completed, we believe it is approximately 15%. About 20% of the irrigated lands within the state has decreed water rights appurtenant thereto. Inasmuch as the funds appropriated for that purpose are entirely inadequate to meet the demand for the determination of water rights, it is necessary to select those streams on which this need appears most urgent.

Petitions for the determination of water rights are now pending before the Supervisor of Hydraulics upon the following streams, on which it has not been possible, as yet, to institute proceedings.

PETITIONS FILED PRIOR TO OCTOBER 1, 1924.

Name of Stream	*County In Which Stream Is Located*
Antoine Creek	Chelan
Antwyne Creek	Okanogan
Bonaparte Creek	Okanogan
Black Canyon Creek	Okanogan
Clugston Creek	Stevens
Crosner Creek	Stevens
Cottonwood Creek	Stevens
Deer Creek	Stevens
Douglas Creek	Douglas
East Chewelah Creek	Stevens
Five-Mile Lake	King
French or Crab Creek	Okanogan
Helm Creek	Stevens
Jewett Creek	Okanogan
Johnson or Wells Creek	Chelan
LeFleur Creek	Ferry
Marshall or Lake Creek	Spokane
Methow River and tributaries	Okanogan
Mosquito Creek	Okanogan
No Name, tributary Entiat River	Chelan
North Pine Creek	Okanogan
Quillisascut Creek	Stevens
Sherwood Creek	Stevens
Squillchuck Creek	Chelan
Touchet River	Walla Walla
Twelve Mile Creek	Stevens
Wawawai Creek	Whitman
White Salmon River	Klickitat
Wilson Creek	Walla Walla
Wolf Draw	Okanogan

PETITIONS FILED DURING THIS BIENNIUM.

Name of Stream	*County In Which Stream Is Located*
Bowman Creek	Klickitat
Colville River	Stevens
Upper Crab Creek	Lincoln
Deadman Creek	Garfield
Duck Lake	Okanogan
Dry Creek	Walla Walla
Duck Lake Creek	Okanogan
O'Brien Creek	Ferry
Snow Creek	Chelan
Tucannon River	Columbia
Wilmott Creek	Ferry

STREAMS ADJUDICATED.

Determination proceedings were completed or substantially so, on the following streams, prior to September 30, 1924.

Name of Stream	*County In Which Stream Is Located*
Alder Creek	Stevens
Alpowa Creek	Garfield and Asotin
Beaver and Frazer Creeks	Okanogan
Big Creek	Kittitas
Bird and Frazier Creeks	Klickitat
Cheweka Creek	Stevens
Cooke Creek	Kittitas
Cowiche Creek	Yakima
Crab Creek and Moses Lake	Grant and Adams
Doan Creek	Walla Walla
Hunter Creek	Stevens
Libby Creek	Okanogan
McFarland Creek	Okanogan
Meadow Gulch Creek	Garfield
Safety Harbor Creek and tributaries	Chelan
Stemilt Creek	Chelan
Stone Creek	Walla Walla
Teanaway River	Kittitas
Wenas Creek	Yakima
Similkameen River	Okanogan
Roaring Creek	Chelan
Ahtanum Creek	Yakima

Determination proceedings have been completed on the following streams during the present biennium:

Bull Dog Creek: Stevens County. Tributary of Colville River. Report o Referee filed showing 283 acres entitled to water for irrigation under 11 rights.

Corus Creek: Stevens County. Tributary of Columbia River. Report of Referee filed showing 38 acres entitled to water for irrigation under 2 rights.

Johnson Creek: Okanogan County. Tributary of Okanogan River. 435 acres of land entitled to water for irrigation under 22 rights. Costs assessed against water users amounting to $724.82. Water Right Certificates issued.

Salmon Creek: Okanogan County. Tributary of Okanogan River. 5000 acres of land entitled to water for irrigation under 55 rights. Costs assessed against water users amounting to $312.72. Water Right Certificates issued.

Thompson Creek: Okanogan County. Tributary of Methow River. Report filed showing 254 acres of land entitled to water for irrigation under 9 rights.

Wolf Creek: Okanogan County. Tributary of Methow River. Report filed showing 1652 acres of land entitled to water for irrigation under 9 rights.

COOPERATIVE HYDROGRAPHIC WORK.

R. K. TIFFANY, Supervisor.

The legislature appropriated $10,000 for cooperative hydrographic work during the biennium. This was expended in cooperation with the U. S. Geological Survey under direction of the District Engineer, G. L. Parker, located in Tacoma. The actual work of stream measurement, compilation of data, etc., is done by the trained experts of the Geological Survey. The selection of the streams upon which work shall be done and the character of hydrographic investigations to be made is determined by mutual agreement between the Supervisor of Hydraulics and the District Engineer.

Seventy-eight gaging stations were maintained and 602 stream measurements made during the year. Other concerns cooperating in the stream gaging work are as follows:

U. S. Indian Service.
U. S. Bureau of Reclamation.
Inter-county River Improvement Commission.
Skagit County.
City of Aberdeen.
City of Everett.
City of Seattle.
City of Tacoma.
Interurban Land Company.
Northwestern Electric Company.
Northwestern Power & Light Company.
Puget Sound Power & Light Company.
Sound Power Company.
Washington Water Power Company.
W. F. Crowe.
Chelan Electric Company.
Grays Harbor Railway & Light Company.

The funds available are by no means sufficient for all work that could be done to advantage, making it necessary to select those streams where development is most eminent and where information is necessary to determine the size and feasibility of various power and irrigation developments.

There is handled thru the District Office of the Geological Survey a large amount of work other than stream measurement which has a more or less direct bearing upon development of the State's water resources. This includes power site surveys to determine the available fall, location and capacity of feasible reservoir sites, etc.

Total expenditures thru the District Office of the U. S. Geological Survey during the biennium were approximately $29,300. This does not include the cost of publication of water supply papers during the period amounting to about $4,900.

It would be of great advantage to the State if this work could be carried on at a much more rapid rate and if water records could be secured on many streams not now covered on account of lack of funds. No engineer can safely recommend and no banker approve a power project without fifteen to twenty years' record of stream flow. The tragedy of an irrigation de-

velopment without sufficient water supply data has been exemplified on more than one project in this State. The skeletons of thousands of orchard trees, the wrecks of scores of deserted homes—mute witnesses of past mistakes—plead earnestly the cause of better information as a basis for future projects.

OTHER HYDROGRAPHIC WORK.

Records of stream flow are usually made for the "climatic year" ending September 30th. The unusually low precipitation in the fall of 1925 and the winter and spring of 1926 indicated that the climatic year of 1925-1926 would be one of the lowest of record.

There are hundreds of potentially useful streams in the State on which few if any records have been made. For most water projects the low-water flow is a controlling factor, and it was therefore deemed wise to secure as many low-water measurements as possible during this climatic year. Two hydrographers were therefore kept in the field during the months of August and September. Five hundred eighty-six miscellaneous stream measurements were made, most of these being on small streams where there is some probability of early development and on which no regular records have been kept. A record of these and similar previous measurements is available to anyone interested, but the measurements are not of sufficient general interest to warrant publication. A general description of most of these streams giving the character of water-shed, present and potential development, and miscellaneous stream gagings was published in Bulletin No. 2 of this Division, copies of which are still available.

RECEIPTS FOR THE BIENNIUM.

	Oct. 1, 1924 to Sept. 30, 1925	Oct. 1, 1925 to Sept. 30, 1926
Examination Fees (New Water Rights)	$1,430 00	$1,935 00
Additional Examination Fees (Under amendment passed by 1926 Legislature)	.....	1,781 50
Filing and Recording Permits	1,006 06	3,589 11
Filing and Recording Certificates	58 10	95 50
Miscellaneous Copying and Recording	123 05	162 07
Extension of Time for Beginning Construction (Under amendment passed by 1926 Legislature)	.....	34 45
Miscellaneous Engineering Services, etc.	35 13	38 00
Adjudication of Water Rights	975 13	1,302 27
Totals	$3,627 47	$8,937 90

WHITE BLUFFS-HANFORD STATE LAND SETTLEMENT PROJECT

C. W. Karney, Chief Assistant Director.

Chapter 188 of the Laws of 1919, known as the Land Settlement Act, carried with it an appropriation of $150,000 out of the reclamation revolving fund to be used for the settlement of portions of the undeveloped lands of the state of Washington by citizens of the United States, preference in the selection of settlers to be given to ex-service men.

As this appropriation was deemed insufficient by the Reclamation Board and therefore not expended, it was reappropriated by the 1921 Legislature with a like amount. The Department of Conservation and Development, to which were assigned the duties and powers of the Reclamation Board, made an investigation of various projects offered for settlement throughout the state, and on November 11, 1921, selected White Bluffs-Hanford as the location for the land settlement project. Fifty-eight tracts of approximately twenty acres each were purchased and prepared for settlement prior to March 31, 1923.

The 1923 Legislature appropriated $365,000, with which to increase the number of farm units to one hundred, assist the settlers in the purchase of milch cows, and to provide for supervision.

At the beginning of the biennium, October 1, 1924, there were one hundred two farm units of approximately twenty acres each embraced within the White Bluffs-Hanford State Land Settlement Project. These tracts were, for the most part, equipped with a set of buildings, consisting of a three-room plastered house, a barn and chicken house. There were individual irrigation systems on each tract, consisting of a well equipped with a pump and electric motor, and either a creosoted wood stave pipe or vitrified clay pipe distribution system. In many cases the State had also fenced and leveled the tracts.

Contracts were entered into with the settlers which provided for the repayment of all moneys expended on the tracts by the State, including an arbitrary charge of $20 per acre for supervision, by the down-payment of ten per cent of the price of the land and the cost of the improvements, other than the pump and motor, upon which an initial payment of forty per cent of the cost was required. The balance of the contract price was made payable as follows: one dollar on the principal and interest at four per cent per annum on deferred payments for the first three years of the contract, and the balance of the principal amortized at four per cent in twenty equal yearly payments.

Of the sixty-nine settlers on the project, all but six were ex-service men.

As work was completed on all tracts which had been sold under contract, and the other tracts, though in most cases ready for settlement, being unoccupied, the present administration closed the White Bluffs office on May 11, 1925, dispensed with the services of the Project Manager, and stopped all further work on the tracts.

The total investment of the State in the tracts was $488,497.43, an average of $4,789.19 per tract. The State's investment in unsold tracts was $132,437.95, an average of $3,895.23 per tract.

Land Settlement Adjustment Board

The settlers, through their representatives, appeared before the special session of the 1925-1926 Legislature with a request for an adjustment of their contracts with the State, alleging misrepresentation of facts by the State.

This resulted in the passage of a law (Chapter 62, Session Laws of 1925-1926) creating a Land Settlement Adjustment Board with power to make such adjustments in the contracts or such settlements with contract holders as it deemed advisable. The board was also empowered to appraise and dispose of the balance of all property affecting this project.

The board thus provided for consisted of Mr. Erle J. Barnes, Director of the Department of Conservation and Development; Mr. Andrew Semple of Spokane, Washington, appointed by the Speaker of the House; and Mr. G. J. Morrison of Colville, Washington, appointed by the President of the Senate.

A thorough investigation was made of the land settlement project, the board taking up each individual tract and each individual settler's case separately. A synopsis of the report of the board is given herewith.

Synopsis of Board's Report

Negotiations between the board and the settlers resulted in the State giving quit claim deeds to all settlers but six. Sixty-one tracts at a total investment of $347,724.69, an average per tract of $5,700.40, not taking into consideration the cost of administration, were deeded to the settlers for a consideration of $1.00 each. In addition three settlers accepted cash in lieu of deeds, these amounts being $800.00, $1,250.00 and $650.00. Two settlers rejected the board's proposals and are still holding their tracts under the original contract.

Unoccupied Tracts

The board then made an appraisal of the thirty-nine unoccupied tracts, and placed a valuation of $34,925.00 thereon.

The unoccupied tracts were offered for sale by publication of a notice in the Hanford Herald for five weekly issues prior to the date of sale, and by posting the notice of sale for the same period in the office of the County Auditor of Benton County. The sale was held at Prosser, Washington, by the County Auditor of Benton County, at the Court House, at ten A. M., June 1, 1926, the State realizing $48,210.00 from the sale of the tracts, or $13,285.00 more than the appraised value.

The terms of sale were one-tenth down, the balance in nine equal annual payments, with interest at six per cent per annum on deferred payments, the contract due date being June 1st of each year.

To date final payment has been received by the Department for Tract No. 58 and a warranty deed issued therefor to Harrison O. Fletcher of White Bluffs.

Conclusions of the Board

"The board believes that the whole land settlement scheme is uneconomic, un-American, socialistic, paternalistic, and contrary to the best interests of the settlers and State; that any artificial settlement of farm land is unwarranted and harmful; that the natural law of supply and demand will in the future, as it has in the past, furnish ample farmers and ample farm products; that, certainly, until the time arrives when a farmer can gain a fair livelihood from the land and find profitable markets for his crop, there is no need for more farms or farmers.

"The board further believes that the whole scheme of financial State or Government aid to individuals, organizations or corporations, is funda-

mentally wrong and can only result in disaster; that the individual must be self-reliant, and not dependent upon the Government for financial support; that the only reason that our country exists today is because of the independent self-reliance of our forefathers; that the present tendencies to ape the old customs of Europe would, if persisted in, finally result in the old order of things—landlord and tenant—which is, in effect, financial servitude for the farmer."

Signed by Erle J. Barnes, G. J. Morrison and Andrew Semple, the Land Settlement Adjustment Board.

Final Liquidation

The remaining work to complete the final closing out of this project is the disposal of two twenty-acre tracts of land which were unsuitable for development, and the sale of miscellaneous equipment and material. It is proposed to handle the final details so that the affairs of this project can be closed by the end of the present year.

FINANCIAL STATEMENT STATE LAND SETTLEMENT ADJUSTMENT BOARD SEPTEMBER 30, 1926

Appropriation		$10,000.00
Expenditures:		
Salaries	$908.00	
Traveling Expense	290.67	
Subsistence and Lodging	323.50	
Office Expense	6.55	
Telephone and Telegraph	2.10	
Postage	.83	
Miscellaneous Expense	121.57	
Reimbursement to Settlers	2,955.56	
Balance September 30, 1926	5,391.22	
	$10,000.00	$10,000.00

DIVISION OF RECLAMATION.

C. W. Karney, Supervisor.

The agricultural area of the State of Washington aside from Eastern Washington wheat lands is almost exclusively the result of reclamation. This in the arid central portion of the state has been accomplished through irrigation of lands formerly desert. Such desert land not subject to irrigation has a present value of $1 to $5 per acre for grazing purposes. The reclaimed land is valued at $150 to $2,000 per acre and produces crop returns ranging from $25 to upward of $500 annually.

In Western Washington large areas of the most valuable lands in the state, formerly having little value because of river floods or tidal overflow, have been reclaimed by diking or drainage.

In both Eastern and Western Washington the saw and ax of the pioneer have been followed by the mattock and char pit of the would-be farmer, and many thousands of acres of stump land have been reclaimed and developed into prosperous and productive agricultural land.

This process of reclamation has been slow, tedious and costly—costly in the labor and dollars usefully expended, even more costly in the wasteful results due to uneconomic methods of doing the work and lack of proper soil selection.

The wheat area of the State cannot be very largely extended. Further addition to the agricultural area can come only thru reclamation. A realization of this fact and a desire to make sure that agricultural development within the State should keep pace with its industrial and commercial growth prompted the enactment by the Legislature of 1919 of our State Reclamation Law. This law is based on the proposition that the State should encourage, direct and aid in the reclamation of its waste land. It recognized the fact that most reclamation projects during their development stage do not offer bankable security and assumed that the State should undertake to carry the investment in reclamation projects during this development period, to give expert direction and assistance until the project is on a sound financial basis and then resell its securities, thus causing the State Reclamation Fund, in theory, to revolve.

The law has been in operation for seven years. It was recognized at the time of its enactment as an experiment and some losses were to be anticipated. Moderate losses of State funds raised by direct taxation might perhaps be excused if there could be shown on the credit side of the account any real development.

But what does the record disclose? Not only losses of State investments running into millions but actually negative results so far as real reclamation is concerned. **Not a single new project has been established on a firm footing.** On several projects that were new or substantially so a debt has been created so great that the landowners can not see their way out and instead of increased settlement it has been the reverse—many homes deserted and the land again turning to desert.

The remaining reclamation projects in this State are nearly all high cost projects, the estimated cost varying from $100 to $300 per acre. There are few if any new projects—irrigation, diking or drainage—in the State

today that can fairly undertake to meet these high costs plus interest charge of six or seven percent, plus operation and maintenance cost, plus other overhead expense from the very beginning of the construction period, as our State Reclamation Law contemplates.

True, some existing projects were helped thru being able to borrow from the State money needed for extensions or renewals, at lower rates than they could have secured elsewhere. But this assistance to established projects was probably not contemplated in the original State Reclamation Act, and it was cut off from the district most in need of it by an amendment passed by the Legislature of 1923 which limited investment of the State Reclamation Fund to those districts which should be found by the Director to be "in sound financial condition". This amendment has made it mandatory upon the Director to refuse during the biennium, to purchase the bonds of some districts voted for betterment and extension work because of the fact that these districts, on their own book showing, were not financially sound.

For the coming biennium at least, it is believed that the activities of the Division of Reclamation should be confined largely to friendly cooperation with those districts already organized and in need of help, and to study of the general situation as to reclamation, private, State and Federal, with a view to the adoption of a sound and progressive State policy in regard to this very important phase of State development, one that will profit by the experience of the past and that will eventually result in the selection and construction of future projects on a basis that will permit the average settler to make good.

The extent and rate of demand for future reclamation will depend largely on the industrial and commercial growth of the State and of the markets within our trade territory. This being true, it would seem that the State might properly, at the present time, undertake a thorough and comprehensive industrial survey with a view to determine what natural resources may be presently or prospectively developed into profitable industries.

The Department of Conservation and Development should be in a position to furnish to prospective investors definite information as to sources, quantity and quality of raw materials; available statistics on the production of present industries, market outlets, freight rates and so forth, so that new industries for which there is a real need may be encouraged, and conversely those which would bring about undue competition in lines already well developed would be advised of the situation and their activities perhaps diverted to other channels.

The principal activities of the Division during the biennium are described as follows:

WHITESTONE RECLAMATION DISTRICT, OKANOGAN COUNTY.

Under contracts dated July 18th, 1922, and September 8th, 1924, the department contracted to purchase the district's bonds in the amount of $900,000 par value and to plan and supervise the construction of the irrigation system. In the spring of 1925, with the construction fund nearly exhausted, the district's storage dams, the main supply conduits and principal laterals were completed to such an extent that water was being carried from Toats Coulee Creek to Horse Spring Coulee and Spectacle Lake storage reservoirs, while water from Sinlahekin Creek was being stored in Blue Lake

reservoir. The Sinlahekin canal, built to convey water from Sinlahekin Creek to the project, could not yet be used as portion of it required concrete lining before water could be turned in.

On account of very serious leakage developing under and through the foundation of the Horse Spring Coulee dam, it became necessary to discontinue the attempt at storing water in this reservoir. Throughout the remainder of the season, water was delivered to the Enterprise and Spectacle Lake units only.

As the Horse Spring Coulee unit of the project depends on Horse Spring storage for most of its water supply, the Director at once named a board of four engineers to investigate and report upon the feasibility of remedying the situation at the Horse Spring dam and otherwise report upon the project in general. After making a thorough examination of foundation conditions by diamond borings, the board found that depth to bed rock was so great that an impervious cut-off connecting the dam with bed rock would be economically prohibitive. It was pointed out that certain experiments might be conducted to ascertain the feasibility of reducing the leakage to a tolerable amount by means of a clay blanket sluiced onto the valley floor immediately above the dam. As the district funds available for construction were about exhausted no attempt has so far been made to improve conditions at the dam.

Exhaustive water supply studies made by the engineering board indicated that the available water supply would be sufficient for about 5180 acres in case Horse Spring dam could be made serviceable, while without this reservoir only 2500 acres can receive the full supply. It was, however, pointed out that some 3,000 additional acres in Horse Spring Coulee might be served with early spring and summer water sufficient to grow certain profitable crops.

The cost of the engineering investigation, to the extent of $2500, was borne by the department's special investigation fund.

Under the circumstances, the department realized that the district would be unable to ever repay the state the full amount expended for the acquisition of rights and the construction of its irrigation system. Upon being fully advised of the situation in the Whitestone district, the legislature enacted Chapter 138, Extraordinary Session Laws of 1925, which empowers an irrigation district and the Department of Conservation and Development to meet a situation such as exists on the Whitestone project. Under authority of this enactment, the district and the department have determined that the irrigable area, as matters now stand, is 2207 acres, and that the Horse Spring Coulee lands will, for the present at least, be excluded from the district and relieved of all assessments. Tentatively it has been agreed that the district's indebtedness to the state shall be reduced to $100.00 per acre of irrigable area, inclusive of $30,195.00 which the state paid to the district during this present year to be used for the completion of the Sinlahekin canal. It has also been agreed that title to any early water available in excess of that required for the 2207 acres at present being deemed irrigable, together with the right to convey such excess water through the district's conduits, shall revert to the state. Until the state decides to put this early water to beneficial use by means of storage or otherwise, the district is empowered to sell

it to land owners from year to year at such price per acre-foot as may be agreed upon between the district and land owners.

This clause will enable the state, if and whenever conditions may warrant, to attempt sealing of Horse Spring dam and if successful to place Horse Spring Coulee lands under water. Should the attempt at such sealing fail, then arrangement may be made to deliver spring and early summer flood waters to these lands, thus enabling them to produce good grain crops and probably two crops of alfalfa, as well as certain other profitable crops.

Either one of these methods would mean additional returns to the state and a corresponding reduction in the loss which the reclamation fund must inevitably suffer by reason of the Whitestone venture.

Water from Toats Coulee Creek was delivered to the Enterprise and Spectacle Lake units during the 1926 season.

OTHER IRRIGATION DISTRICTS.

During the biennium the department has completed all contracts entered into during former bienniums by taking final delivery on district bonds as follows:

Wolf Creek Reclamation District.....	par	value	$100,000
Wenatchee Heights Reclamation District..	"	"	20,000
Methow Valley Irrigation District.....	"	"	20,000
White Salmon Irrigation District.....	"	"	35,000
Spokane Valley Irrigation District.....	"	"	15,500
First Creek Irrigation District.....	"	"	22,500
Icicle Irrigation District.....	"	"	250,000

Construction work on these projects had been largely completed at the beginning of the present biennium, with the exception of Wenatchee Heights Reclamation District. The major work on the enlargement of the Wenatchee Heights storage dam has been completed during the present biennium.

DRAINAGE DISTRICTS.

Consolidated Drainage Improvement District No. 101, Thurston County.

This drainage improvement was made in 1920 and 1921 with funds obtained from sale of $79,500 in bonds to the reclamation revolving fund. Partly on account of the general agricultural depression, but possibly more due to misunderstanding of the situation on the part of the land owners, assessments against the lands were generally permitted to become delinquent to such an extent that the state was confronted with the possibility of foreclosure proceedings against the lands in order to protect its investment. Sometime prior to the extraordinary legislative session of 1925, the land owners finally realizing their predicament, petitioned the department for some measure of relief, which the department had no authority under law to grant. The situation having been brought to its attention, the legislature enacted Chapter 140, Laws Extraordinary Session of 1925, which, under conditions such as existed on this project, empowers the director of conservation and development to cancel interest and extend time of payment over a period not exceeding five years.

Exercising the authority granted by this act, the department has, by contract with the board of county commissioners, cancelled interest for five years and extended the time of payment of the bonds over a like period.

The lands of this district, consisting of some 1700 acres, are mainly first class, the drainage, while not in all instances entirely adequate, is sufficient to permit the improvement of the major part of the area, and with the relief provided the district should be able to work its way out.

Drainage Improvement District No. 8, Thurston County.

This improvement, completed in the summer of 1924, was made with funds obtained from the reclamation revolving fund under a contract to sell $12,000 par value of bonds to the state. Certain legal faults in the district's proceedings delayed the final delivery of the bonds to the state. This has now been remedied, approximately 30 per cent of the cost has been paid by the land owners in cash, with a probability of further cash payment on or before October 30th, 1926. After that date the state will accept district bonds to cover the unpaid balance.

Diking and Drainage Improvement District No. 4, Wahkiakum County.

During the 1922-1924 biennium the department contracted to buy $95,000 par value of bonds from this district, contingent upon the approval by the Attorney General of the perfecting of the district's legal status, which was in a chaotic condition. Subsequently, the Attorney General ruled that the contract was void for the reason that the district at the time the alleged contract was signed did not constitute a legal district, and upon finding by investigations that the district lands furnished inadequate security for the proposed bond issue, the department declined in the spring of 1925 to finance the district.

BURBANK IRRIGATION DISTRICT.

The Burbank Irrigation District has been handicapped for some years by reason of extremely low water in the Snake River which has made it impossible for the district to divert into its power canal sufficient water to operate its hydraulic pumping equipment.

The directors of the district with the principal bondholders and other creditors, have been considering plans for improvement of this condition. The first essential was to secure a permit from the Federal Power Commission for extension of the timber and rock crib dam at the head of the power canal. Application to the Federal Power Commission for an amendment of the district permit, accompanied by the necessary maps and plans, was prepared in this office by Mr. Lars Langloe, and the application was approved by the Power Commission.

Several meetings of the interested parties have been held, representatives of the Division being generally in attendance, and a Financial Committee was organized and authorized to develop plans for refinancing the project on the basis of developing sufficient power at Five Mile Rapids in Snake River not only to pump water for the Burbank District but also for the irrigation supply of the Attalia and Franklin County (Pasco) Districts and possibly for the Kennewick Highlands.

The engineering plans are to be prepared and the work supervised by the Division of Reclamation, and the financial plan is to meet with the approval of the Director of the Department.

LIST OF IRRIGATION AND DRAINAGE DISTRICT BONDS OWNED AS OF SEPTEMBER 30, 1926.

NAME	Par Value	Cost
Methow Valley Irrigation District	$20,000	$18,000
Kennewick Irrigation District	199,500	179,550
Spokane Valley Irrigation District	28,500	25,650
Burbank Irrigation District	44,000	39,600
Yelm Irrigation District	5,000	4,500
Franklin County Irrigation District No. 1	142,000	127,800
First Creek Irrigation District	22,500	20,250
Icicle Irrigation District	250,000	225,000
White Salmon Irrigation District	35,000	31,500
Wenatchee Hghts. Reclamation District	20,000	18,000
Wolf Creek Reclamation District	100,000	90,000
Consolidated Drainage Improvement District No. 101-2	79,500	77,115
Totals	$946,000	$856,965

ADVANCES TO DISTRICTS FOR WHICH BONDS HAVE NOT BEEN RECEIVED AS OF SEPTEMBER 30, 1926.

NAME	Principal	Accrued Inte'st to Sept. 30, 1926	Total
Consolidated Drainage Improvement Dist. No. 101-2	$2,219 81	.....	$2,219 81
Drainage Imp. District No. 8, Thurston County	6,796 38	.....	6,796 38
Drainage Imp. District No. 6, Thurston County	1,448 89	.....	1,448 89
Greater Wenatchee Irrigation District	1,122 03	$391 80	1,513 83
Methow-Okanogan Reclamation District	72,660 95	813 51	73,474 46
Methow Reclamation District	2,624 12	.....	2,624 12
Methow Valley Irrigation District	794 18	2,084 45	2,878 63
Whitestone Reclamation District	713,755 06	101,917 67	815,672 73
Totals	$801,421 42	$105,207 43	$906,628 85

APPENDIX I.

KITTITAS LAND SETTLEMENT CONTRACT AS ORIGINALLY SUBMITTED TO STATE DEPARTMENT OF CONSERVATION AND DEVELOPMENT.

Department of the Interior—Bureau of Reclamation.

Yakima Kittitas Project—Washington.

Art. 1. THIS AGREEMENT, made this.....day of ....., 192..., in pursuance of the act of June 17, 1902 (32 Stat., 388), and acts amendatory thereof or supplementary thereto, all herein styled the reclamation law, between the United States of America, herein styled the United States, acting in this behalf by..... ....., Secretary of the Interior, herein styled the Secretary; and the State of Washington, acting in this behalf by the Department of Conservation and Development, pursuant to its applicable laws, hereinafter styled the State.

Witnesseth:

Explanatory Recitals.

Art. 2. **Whereas** the United States has heretofore constructed reservoirs of the Yakima project, from which 260,000 acre-feet of stored water for each irrigation season is to be furnished the Kittitas Reclamation District; and

Art. 3. **Whereas** the District desires the United States to construct for its benefit certain additional irrigation works consisting of a diversion dam in the Yakima River and a canal system with other structures in connection therewith; and

Art. 4. **Whereas** under date of.....form of proposed contract between the United States and the District for the construction of the works last described was tentatively approved by the Secretary, and said contract will be duly executed when all requirements of law have been fulfilled and all necessary conditions met; and

Art. 5. **Whereas** the act of Congress approved March 3, 1925, entitled "An act making appropriations for the Department of the Interior for the fiscal year ending June 30, 1926, and for other purposes" (Public No. 580, 68th Congress; 43 Stat.....), makes an appropriation of $375,000 for the construction of the works described, with the proviso that no part of the funds so appropriated shall be used for construction purposes until a contract or contracts shall have been executed between the United States and the State of Washington for the development and settlement of the lands to be irrigated, including the selection and financing of settlers:

Now, Therefore, it is hereby agreed as follows:

Art. 6. That the State shall and does hereby assume the duty and responsibility of promoting the development and settlement of the Kittitas division of the Yakima project after completion, including the subdivision of lands held in private ownership by any individual in excess of 160 irri-

gable acres, the securing, selection and financing of settlers to enable the purchase of the required live stock, equipment, and supplies, and the improvement of the lands to render them habitable and productive.

Art. 7. The State shall and does hereby agree to provide the funds necessary for this purpose and to conduct operations in a manner satisfactory to the Secretary of the Interior.

Art. 8. This contract is subject to appropriations being made by the state legislature from year to year for funds sufficient for carrying out the provisions of this contract.

Art. 9. All work contemplated by this contract shall be conducted in close cooperation between the Secretary and the officials of the State, who shall collaborate in formulating the necessary plans and procedure to effectuate the provisions and intent of this contract, and the law pursuant to which executed.

Art. 10. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom. Nothing, however, herein contained shall be construed to extend to this contract if made with a corporation for its general benefit.

In Witness Whereof the parties hereto have caused this contract to be executed the day and year first above written.

The United States of America

By .....

State of Washington

By .....

Attest:

Secretary of State.

APPENDIX II.

KITTITAS LAND SETTLEMENT CONTRACT BETWEEN THE STATE AND THE KITTITAS RECLAMATION DISTRICT INCLUDING CONTRACT BETWEEN THE STATE AND THE UNITED STATES, AS FINALLY EXECUTED

THIS AGREEMENT, made this 10th day of December, 1925, in pursuance of an act of the Legislature of the State of Washington, approved by the Governor December 10, 1925, by and between the Kittitas Reclamation District, an irrigation district organized and existing under and by virtue of the laws of the State of Washington, hereinafter styled the "irrigation district" and the State of Washington, hereinafter styled the "state."

WITNESSETH:

WHEREAS the United States has presented and tendered to the State of Washington a certain contract under authority of an act of Congress approved March 3, 1925, entitled "An Act making appropriations for the Department of the Interior for the fiscal year ending June 30th, 1926, and for other purposes" which contract is substantially in words, letters and figures as follows:

Art. 1. This Agreement, made this.....day of....., 192..., in pursuance of the act of June 17, 1902 (32 Stat., 388) and acts amendatory thereof or supplementary thereto, all herein styled the reclamation law, between the United States of America, herein styled the United States, acting in this behalf by....., Secretary of the Interior, herein styled the Secretary; and the State of Washington, pursuant to its applicable laws, hereinafter styled the State.

WITNESSETH:

EXPLANATORY RECITALS.

Art. 2. WHEREAS the United States has heretofore constructed reservoirs of the Yakima Project, from which 260,000 acre-feet of stored water for each irrigation season is to be furnished the District; and

Art. 3. WHEREAS the District desires the United States to construct for its benefit certain additional irrigation works consisting of a diversion dam in the Yakima River and a canal system with other structures in connection therewith; and

Art. 4. WHEREAS under date of.....form of proposed contract between the United States and the District for the construction of the works last described was tentatively approved by the Secretary, and said contract will be duly executed when all requirements of law have ben fulfilled and all necessary conditions met; and

Art. 5. WHEREAS the act of Congress approved March 3, 1925, entitled "An Act making Appropriations for the Department of the Interior for the fiscal year ending June 30, 1926, and for other purposes" (Public No. 580, 68th Congress; 43 Stat., ...), makes an appropriation of $375,000 for the construction of the works described, with the proviso that no part of the funds so appropriated shall be used for construction purposes until a contract or contracts shall have been executed between the United States and the State of Washington for the development and settlement of the lands to be irrigated including the selection and financing of settlers;

NOW THEREFORE, It is hereby agreed as follows:

Art. 6. That the State shall and does hereby assume the duty and responsibility of promoting the development and settlement of the Kittitas division of the Yakima project after completion, including the subdivision of lands held in private ownership by any individual in excess of 160 irrigable acres, the securing, selection and financing

of settlers to enable the purchase of the required livestock, equipment, and supplies, and the improvement of the lands to render them habitable and productive.

Art. 7. The State shall and does hereby agree to provide the funds necessary for this purpose, but the State shall not be required to expend therefor an amount in excess of $300,000. The State further agrees to conduct operations in a manner satisfactory to the Secretary of the Interior.

Art. 8. This contract is subject to appropriations being made by the state legislature from year to year for funds sufficient for carrying out the provisions of this contract.

Art. 9. All work contemplated by the contract shall be conducted in close cooperation between the Secretary and the officials of the State, who shall collaborate in formulating the necessary plans and procedure to effectuate the provisions and intent of this contract, and the law pursuant to which executed.

Art. 10. No member of or delegate of Congress, or resident commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom. Nothing, however, herein contained shall be construed to extend to this contract if made with a corporation for its general benefit.

IN WITNESS WHEREOF the parties hereto have caused this contract to be executed the day and year first above written.

THE UNITED STATES OF AMERICA,

By.....

STATE OF WASHINGTON,

By.....

AND WHEREAS, said irrigation district desires to obtain the benefits of said act approved December 10, 1925, and to enter into the indemnity agreement with the State as in said act provided.

NOW THEREFORE, in consideration of the entering into of said contract with the United States by the State of Washington, and the benefits and advantages accruing to said district by reason thereof, and in pursuance of a resolution by the Board of Directors of said district, at a special meeting regularly called, the irrigation district does hereby contract and agree to indemnify the state against any expenses incurred by the state and to indemnify the state against all losses and damages which the state may suffer by reason of entering into the foregoing contract with the United States, and the said irrigation district does hereby contract and agree with the state to repay to the state any and all expenses and any and all losses and damages which the state may expend or suffer under said contract.

That upon the state annually furnishing to the district an estimate of the amount of expenses likely to be incurred in the performance of such contract; together with an estimate of future losses or damages that may occur under such contract, the said district agrees to levy annually against all property within said district an assessment in such amount as may be necessary to repay the state such estimated expenses, losses and damages, and to levy such assessments from time to time in such amounts as shall enable the district to reasonably anticipate and promptly comply with the terms of this contract, so that the district will at all times have sufficient moneys available in "the indemnity fund" to promptly repay the state such expenses, losses or damages, which the district agrees to repay to the state on demand, provided, that if at the time of such demand the district has no money in "the indemnity fund" to repay such expenses, losses or damages, it shall be the duty of the district to cause warrants of said district to be issued for payment of such indebtedness, which warrants shall bear interest at the rate of six per cent per annum and be paid from moneys paid into said "indemnity fund" by assessment as hereinbefore provided, and the district agrees to an-

nually levy enough money to pay said warrants and the estimated expenses, losses and damages hereinbefore referred to.

IN WITNESS WHEREOF the parties hereto have caused this contract to be executed the day and year first above written.

KITTITAS RECLAMATION DISTRICT,

(Seal affixed)

By FRED C. SCHNEBLY,
President.

JOHN N. FAUST,
Director.

HENRY RICHARDS,
Director.

Attest:

F. A. KERN,
Secretary.

STATE OF WASHINGTON
Department of Conservation & Development
Division of Reclamation.

By ERLE J. BARNES,
Director of Department of Conservation and Development.
Approved as to form this 11th day of December, 1925.

B. B. ADAMS,
Assistant Attorney General.

COLUMBIA BASIN SURVEY.

WATER ALLOCATION.

The Legislatures of Washington, Idaho, Oregon and Montana in 1925 authorized the negotiations of an inter-state compact relative to uses of waters of the Columbia River, and the Congress of the United States, on March 4, 1925, gave approval to the preparation of such a compact and provided for the appointment of Federal representatives. The following appointments were made:

Members		*Representing*
Col. W. J. Barden, Chairman	Seattle	War Dept.
Dr. Elwood Mead, Comm. of Reclamation	Washington	Interior Dept.
Rhea Luper, State Engineer	Salem	Oregon
C. S. Heidel, State Engineer	Helena	Montana
W. G. Swendsen, Comm. of Reclamation	Boise	Idaho
R. K. Tiffany, Secretary, Supervisor of Hydraulics	Olympia	Washington

At the request of the Secretary, G. L. Parker, District Engineer, U. S. Geological Survey, Tacoma, was assigned to assist the Board, giving such time as his other duties would permit.

The state representatives were appointed during the first half of the calendar year 1925. Representatives of the Federal Departments, however, were not named until the spring of 1926.

Soon after the appointment of the representative for this State negotiations were opened with representatives of the other states. Washington, through the surveys and studies made in connection with the Columbia Basin Irrigation Project extending over a period of six years, had fairly complete information as to her needs. In the early correspondence it was stated by representatives of both Idaho and Montana that much additional information would be required before they could deal intelligently with the important and complex problems involved in their respective states. Montana had no funds available for such studies. Idaho had a modest appropriation.

Three formal meetings of the Board have been called, as follows:

October 31, 1925	At Spokane
December 7, 1925	At Seattle
July 12, 1926	At Spokane

At the Seattle meeting Messrs. Swendsen, Heidel and Tiffany were appointed a sub-committee with instructions to agree, if possible, on the allotment of water between the three states represented by them, and to report back to the full Board.

In order to furnish Mr. Heidel with essential information Mr. Parker was induced to make an extensive study of power possibilities in Montana, based on storage in Flathead Lake and Hungry Horse Reservoir. These studies were completed and the results furnished to Members of the Board some months ago.

Through Mr. Swendsen arrangements have been made for a topographical survey of shore lands around Lake Pend Oreille which will permit more accurate estimates of storage capacity and overflow damages. This survey, it is hoped, will be completed and maps available sometime during the com-

ing winter. Mr. Swendsen is also having other studies made of the prospective requirements in Idaho.

After the necessary information is in the hands of the Idaho and Montana representatives it must be studied by them and negotiations among the three states again resumed before the sub-committee will be able to report back to the Board.

POWER, MARKET AND ECONOMIC STUDIES.

Appropriations were made in 1925 and again in 1926 for further investigation of the Columbia Basin Project. The Department early announced that its policy would be to consider the Columbia Basin Project as a Federal project and to take up only such further studies as would have approval and cooperation of the U. S. Department of Interior.

At a conference with Commissioner Mead of the U. S. Bureau of Reclamation in Seattle on July 3, 1926, a plan for such cooperation was agreed upon, as a result of which the following studies are now in progress.

1. Power Survey—To study hydro-electric power possibilities in connection with the project with a view to determining whether power returns might eventually effect a net saving in project cost, this survey to be made by the State Department of Conservation and Development.

2. Economic and Production Survey—To be made by the U. S. Bureau of Reclamation in cooperation with representatives of the Washington State College. It is the purpose of this survey to study present production on the land, the attitude of present landowners toward the project, the cost of production of crops likely to be adapted to the project, the willingness of landowners to dispose of surplus lands at satisfactory prices and terms, etc. Six typical areas of approximately nine sections each will be embraced in this survey.

3. Market Survey—To be made by the State Department of Conservation and Development under the direction of Professor Dummeier, Department of Agricultural Economics of the State College. The growth of markets for crops to which the project will be adapted and the possibility of outlet for additional crops will be the chief theme of this study. Investigations will cover the Pacific Northwest territory, and in a large measure the Pacific Coast within the market radius for general farm crops likely to be grown on the project. The past growth and present trend of the commercial and industrial development of the Pacific Coast will be studied. Attention will also be given to the probable outlet for certain special crops adaptable to the region such as poultry and dairy products, fruits, etc.

LETTER OF TRANSMITTAL.

Honorable Erle J. Barnes, Director,
Department of Conservation and Development,
Olympia, Washington.
Sir:

I have the honor to submit herewith the biennial report of the Supervisor of Geology. This covers a period from April 1, 1925, to September 30, 1926. During the early months of this period the Division was in charge of Dr. Solon Shedd who retired as Supervisor early in the summer of 1925. The affairs of the Division were taken over by the present Supervisor in September 1925. In the absence of specific records, the statement of Divisional activities prior to September, 1925, is necessarily incomplete.

I wish to acknowledge with gratitude the courteous cooperation extended to the Division of Geology by members of the faculty of the State College of Washington.

Very respectfully,

HAROLD E. CULVER,
Supervisor.

College Station,
Pullman, Washington,
October 19, 1926.

BIENNIAL REPORT OF THE SUPERVISOR OF THE DIVISION OF GEOLOGY.

THE TWO PERIODS OF THE BIENNIUM.

For the purposes of this report the time covered may be divided into two periods, the first extending from April 1, 1925, to September 15, 1925, the second from the latter date to September 30, 1926. During the early months of the first period the affairs of the Division of Geology continued to be administered by Dr. Solon Shedd who retired as Supervisor early in the summer of 1925. With the opening of the second period, the Division of Geology was taken over by the present Supervisor.

ACTIVITIES OF THE DIVISION.

The work of the Division of Geology readily falls into the following categories: (1) Geologic Studies (2) Topographic Mapping (3) Laboratory and Field Service (4) Collection of Mineral Statistics.

GEOLOGIC STUDIES.

Several types of investigation are included in this phase of the work of the Division. Any classification of geologic studies will show certain apparent omissions and duplications since the work involved in any one type merges into that of other types. Geologic studies may be undertaken with any one of the following aims in view:

(1) To determine the commercial importance of specific deposits in a given district:

A study of this type serves to indicate the reserves and value of some mineral substance in a limited area. Such an investigation was reported in Bulletin 10 of the division publications, "The Coal Fields of Pierce County."

(2) To estimate the resources of the entire state in any one mineral substance:

This sort of investigation unites the study of limited districts and furnishes a basis for reliable estimates of the State's wealth in certain lines. It is illustrated by Bulletin 27 of the division publications, "Iron Ores, Fuels and Fluxes of Washington."

(3) The mineral resources of a limited area:

In this type of geologic work a unit area such as a quadrangle or county is selected and the relations of all geologic units determined. The report of such studies introduces the general geology of the area in full as a basis for the presentation of all available information as to the mineral resources. This type has not been systematically undertaken by the Division of Geology but it is exemplified by the U. S. Geological Survey Series of Folios of which that on the Tacoma quadrangle is one.

(4) The delineation of detailed structures and stratigraphic relations in limited areas:

Exploration and development of districts containing an important mineral deposit are often handicapped by complexity of structure or strati-

graphy. In some cases detailed investigation of the deposit will reveal the fundamental relations and point the way to commercial development of the district. In many instances, however, this procedure cannot be followed on account of unfavorable conditions. In such instances, the desired result may be obtained by extending the investigation to areas of favorable exposures where accurate delineation of the complex relations is possible. The results of such studies although often obtained in regions of no commercial importance can be applied to the valuable mineral deposits, making plain the relations which are otherwise obscure. Such reports may be in themselves largely of scientific importance but ultimately become immensely valuable in the production of mineral wealth.

(5) Determination of regional or state-wide geologic relations:

Like No. 2 above, this sort of investigation is state wide in scope and serves to utilize in a broad and thorough manner the result of detailed studies in limited areas. It is only through these investigations of wide scope that the general relations controlling the origin and development of our mineral deposits can be understood. Hence while purely scientific in plan this type of studies has come to be recognized as of prime importance in the exploitation of mineral resources of a region. The report of the "Tertiary Formations of Western Washington" which appeared as Bulletin 13 of the division publications belongs in this category.

Studies belonging in one or another of the above groups have been undertaken in the past but attention has of necessity been centered on those investigations in which specific results could be obtained in the shortest possible time. As a result, the broader problems, the solution of which demands the accumulation of large amounts of data, have received little or no attention.

During this biennium no major geologic reports have been published. On March 10, 1925, the Supervisor presented for publication the result of two years' field work in the Pasco and Prosser quadrangles, an area lying largely in Benton County. Publication of this report was not immediately possible and the manuscript was shelved until the spring of 1926. Since then an abstract of this report giving the essential data and more important conclusions has been prepared. This abstract in mimeographed form was sent out with the engraved maps of the quadrangles as No. 1 of a new series of publications under the general heading "Reports of Investigations."

An inspection of the previous activities of the Division of Geology emphasized the need of a general survey of the state in an attempt to determine the proper fields for Divisional activities of the future. While certain problems obviously merited attention, it seemed that a fair apportionment of the Division funds between the several meritorious projects could be made only on the basis of accurate knowledge of state wide conditions. First hand data being essential to such an understanding the whole of the field season was given over to the inspection of as large a part of the state as could be covered. In the course of the field season the details of structure and stratigraphy were observed in selected portions of nearly half the counties of the state, and the general geologic relations noted over a much wider area. So far as time permitted mines, quarries, and other industrial operations involving geology were visted. The results of

this general reconnoissance are embodied in the recommendations presented in this report.

TOPOGRAPHIC MAPPING.

As early as 1893 topographic mapping had been begun in the State of Washington under the auspices of the Topographic Branch of the United States Geological Survey. Unappreciated at first, these maps caused little comment, but as soon as larger areas were covered the value of the maps became more and more apparent. Ultimately there was developed a real and specific demand for such maps and their preparation came to be recognized as one of the chief functions of geologic organizations.

About 1910 there was formulated an agreement between the Federal and State agencies whereby topographic mapping would be hastened, the cost being equally divided between the two. Until the opening of the present biennium the State of Washington has enjoyed this cooperation and a total of more than 11,600 square miles has been mapped. Independent mapping by the U. S. Geological Survey, prior to and during the period of cooperative activity, covers an additional area of nearly 21,000 square miles. The grand total mapped to date is thus over 32,000 square miles, or about 46% of the State (plate 1). With the opening of the present biennium, participation on the cooperative basis was denied and no further topographic mapping has been done at State expense.

LABORATORY AND FIELD SERVICE.

One of the incidental but potentially important activities of the Division of Geology is in response to the demand for assistance in determining the value of mineral deposits. This service involves both field and laboratory examinations and requires considerable time and equipment. In this way, however, invaluable service is rendered the State through the intelligent direction of prospecting for, and utilization of, our mineral wealth.

In the past this phase of Divisional work has received particular attention and during this present biennium it has been continued and amplified in certain respects involving the cooperation of various departments of the State College of Washington. The very limited time and funds available have precluded the possibility of meeting any but a very few of the requests for field examination.

COLLECTION OF MINERAL STATISTICS.

This phase of Divisional activities corresponds in character to the work of the Census Bureau and has for its object the collection and tabulation of all data relative to the actual production of mineral wealth within the State. Such data form the only practicable basis for the intelligent comparison and study of many phases of the mineral industry. For a number of years past this Division has cooperated with the Federal agency in charge of the collection of mineral statistics. By this means any duplication of effort is avoided and the State receives the full benefit of the compilation. This cooperation has been continued during the past biennium.

The appended table gives the mineral production for 1923 and 1924. Although the figures are probably subject to some revision, they indicate with sufficient accuracy the importance of the mineral industry in the

State. It is to be noted that of the total of $21,000,000 production, more than $20,000,000 are in the non-metallic group.

MINERAL PRODUCTION OF WASHINGTON FOR 1923 AND 1924.

PRODUCTS	1923		1924	
	Quantity	Value	Quantity	Value
Basalt, tons	553,280	$521,027	668,410	$829,632
Clay	10,491	29,040	19,773	35,699
Coal, tons	2,926,302	10,894,000	2,653,667	9,689,000
Coke, Beehive, tons	(a)	(a)	31,712	289,934
Coke, by-product, tons	31,081	237,148	(a)	(a)
Copper	(a)	(a)	(a)	(a)
Diatom. earth, sh. tons	(b)	(b)	1,045	8,530
Gold	(a)	(a)	(a)	(a)
Granite, sh. tons	56,410	162,271	29,790	87,751
Gypsum, sh. tons	.....	.....	(a)	(a)
Iron Ore	.....	.....	(a)	(a)
Lead	(a)	(a)	(a)	(a)
Lime, tons	25,895	359,510	28,188	353,450
Limestone, tons	53,540	116,243	46,420	108,155
Manganese and manganiferous ore, tons	.....	.....	5,000	100,000
Marble, tons	400	4,000	(a)	(a)
Mineral waters	(a)	(a)	.....	.....
Portland Cement, barrels	2,352,371	4,988,022	1,842,113	4,347,387
Pulp and grindstones	421	37,580	(a)	(a)
Sand and gravel, sh. tons	3,789,109	1,363,006	3,464,557	1,398,506
Sandstone, tons	(a)	(a)	21,070	563,075
Silica, quartz, sh. tons	460	3,120	280	1,680
Silver	(a)	(a)	(a)	(a)
Stone, miscellaneous	(a)	(a)	12,770	7,475
Zinc	(a)	(a)	(a)	(a)
Miscellaneous (c)	.....	2,524,790	.....	1,337,776
Total Value	.....	$21,239,757	.....	$19,158,050

(a) Value included under "Miscellaneous".
(b) Value and quantity for both years combined under 1924.
(c) Includes minerals indicated by (a).

RECOMMENDATIONS.

Geologic Studies: For nearly a quarter century, under the appropriations made by the State Legislatures, geologic investigations in the State have been actively prosecuted, first by the State Geological Survey and later by the Division of Geology.

Of necessity much of the earlier work was of reconnoissance nature whereby relatively large areas were covered in short periods of time. In addition to these general studies, however, detailed reports of certain districts were prepared. Bulletins such as No. 1 on the Republic area, and No. 7 on the Index area show the results of these endeavors. These early activities served to bring out the major features of the rather complex geology of the State and the details of a few selected areas as well. It should be recognized, however, that only a certain amount of the more general investigations can be profitably undertaken. A stage is ultimately reached at which the reconnoissance studies must be supplemented by detailed work if the maximum benefit is to be obtained.

Inspection of the mineral industries of the State indicates that such a stage has now been reached in our investigations. It is therefore necessary for us to consider means by which we can be of further aid to those who are honestly endeavoring to develop the mineral resources of the State. With few exceptions the broader geologic relations of the known mineral de-

posits of the State are fairly well understood. By contrast, there is scarcely a district in which the prospectors and producers would not benefit if the details of structure and stratigraphy could be put at their command. We have already acquired and put into use the more general features but lack the details without which further progress is slow if not impossible.

Geologic problems are rarely simple. By their very nature they involve unknown relations underground and must be attacked by some indirect method. This is particularly true when details are sought for in these cases the solution of a given problem frequently involves the correlation of many apparently unrelated data. It follows that such studies must progress slowly and may demand considerable time and effort.

Since the field to be studied is broad and complex it is particularly desirable that the start should be made at an advantageous point. Two general features of the work should be borne in mind; first the investigations should be planned so that the results of the early studies will be of value for those undertaken later; and second work should be begun and continued on both metallic and non-metallic deposits.

Among those metallic deposits which seem to merit attention may be mentioned the well known lead-silver ores of the northeastern part of the State, the copper ores in the Red Mountain and Sultan districts, the quicksilver deposits of Lewis and other counties, and the manganese ores of the Olympic belt. The non-metallic resources are in general simpler in their geologic relations and are consequently better understood. Among the outstanding exceptions to this general rule, however, may be noted the magnesite deposits of the Chewelah district, the artesian water supplies which constitute an important economic resource in various parts of the State, and the potential oil and gas pools for which a diligent search has been made in several localities during the past few years.

In addition to the non-metallic deposits noted, attention should be called to a report on The Clays and Shales of Washington which was completed before April 1, 1921. This comprehensive study of one of Washington's most important and valuable resources was based on very extensive first hand investigation and the report presented for the first time a great mass of data which will be of immense value to the clay industries. According to the original plan this work was conducted under a joint agreement between the State Geological Survey, The Engineering Experiment Station of the University of Washington, and the United States Bureau of Mines. The companion report by Professor Hewitt Wilson of the University of Washington was published several years ago and its popularity is attested by the fact that the issue has been out of print for about two years.

The development of the clay industries in Washington in the five years which have elapsed since this report was prepared necessitates some revision of the report in order that it may be brought down to date for publication. The budget includes an amount sufficient to cover the cost of the revision and publication of this report.

In order that the geologic work be made to render full value for the time and effort put into it, the geologic survey program calls for moderate expenditures at first with somewhat larger requisitions in succeeding biennums. Because of the status and character of the proposed investigations it is recommended that two competent geologists in addition to the Super-

visor be employed for the field season with suitable arrangements for payment for their office and laboratory work upon completion of their reports. One of these men will devote his time to the study of metallic deposits and the other to non-metallics. For each geologist there will be need of an assistant who can relieve him of a large amount of detail. At least one additional car will be needed for the field work.

Inasmuch as it seems desirable to employ geologists on the summer basis, permitting them to return to their regular duties for the winter season, it is desirable to defer the selection of the precise areas for study until arrangements can be completed with the available men. Assistants for this work can readily be selected from the majors in Geology at the State College and University.

Topographic Mapping: The preparation of adequate maps takes rank among the first duties of a State to its citizens. No activity yields greater returns on the time and effort expended or produces results which are of direct benefit to so many groups of people. The history of engineering includes innumerable examples of major benefit accruing through the utilization of topographic maps. In almost any engineering project in which topography is a factor the expensive preliminary survey occupying months of time can be done in the office at nominal cost. Indeed the feasibility or impracticability of many projects can be determined from the inspection of topographic maps. This, then, is the phase of activity of the Division of Geology which is of outstanding importance at the present time and which should engage the serious attention of the State.

If any evidence of the value of topographic maps were needed it is found in the recent congressional enactment known as the Temple Bill (H. R. 4522 68th Congress). So vigorous and wide spread was the demand for the completion of topographic mapping of the several states that this important bill was passed unanimously. It provides for the completion of the topographic mapping of the United States in a period of about twenty years. In order that the State may benefit in this extension of topographic mapping, it is necessary that we enter into cooperative agreement with the Federal Survey by which the cost of such mapping is shared on a 50-50 basis. Inasmuch as the mapping of the State of Washington is less than half completed at the present time it is obviously necessary that cooperation be begun without further delay in order that the work may be completed under the provisions of the Temple Bill.

The following list of interests which will be served by the prompt completion of the topographic mapping of the State is impressive:

Irrigation projects	Military considerations
Water-power development	Aeronautics
Flood control and prevention	Oil prospecting
Drainage engineering	Geologic mapping
City water supplies	Mining operations
Reclamation Service	Forestry work
Canal building (location)	Soil mapping
Highway construction	Valuation of land
Railroad building	Land classification
Automobile travel	Educational use
Post-route mapping	City planning

Consideration of the above list explains and re-enforces the state-wide demand for the continuance of topographic mapping.

In most constructive work the finished product rarely even suggests the preliminary steps upon which the whole is conditioned. So in the construction of topographic maps the delineation of contours and streams and roadways fails to indicate the foundation work. Before the topographic features can be sketched there must be prepared a set of primary control lines and levels from which a net of triangulation and leveling stations can be made. This preliminary work must be carried to the areas to be mapped from points already in the controlling net. Obviously the most economic procedure is to continue mapping in areas adjacent to those already mapped. Indeed continuity of effort is the essential factor in the formulation of a program of topographic mapping.

The delay incident to the completion of the mapping of the whole State makes it necessary to consider the factor of immediate utilization as well as economy in mapping in determining which areas are to receive attention first. For the purposes of mining, lumbering, highway, drainage, reclamation, and other such operations it is desirable that mapping be completed in certain areas if this can be done with reasonable economy.

Reference to Plate 1 will show that most of the previous mapping has been done on two scales, first the 15 minute quadrangle covering 15 minutes of latitude and 15 minutes of longitude, an area of about 200 square miles and published on a scale of 1:62500 or approximately one mile to the inch, and second the 30 minute quadrangle including an area of about 800 square miles and published on a scale of 1:12500 or approximately two miles to the inch. For certain purposes the maps of larger scale are really to be preferred but since those of smaller scale will serve almost as well and can be prepared for approximately half the expense per square mile, with very few exceptions the mapping of the State can be advantageously prepared on the thirty-minute basis and it is therefore recommended that the mapping for the next biennium be of this type.

Taking into consideration all known factors and following consultations with representatives of the topographic branch of the United States Geological Survey the following tentative program for mapping has been prepared and is recommended. Completion of the partially finished Chewelah quadrangle followed by the topographic mapping of the areas listed below the order of precedence to be determined by the necessities of mapping:

Colville quadrangle
Eatonville quadrangle
Meskill quadrangle
Orient quadrangle
South Bend quadrangle
Crab Lake half quadrangle
Boyleston quadrangle

The completion of preliminary and final work on the quadrangles noted in the foregoing program will occupy about four years time, according to advance estimates. The total cost will be in the neighborhood of $98,500. The estimate for each factor is tentative, but is sufficiently accurate for present purposes. A detailed estimate correct to within about 10% will be prepared at an early date.

By entering into a cooperative agreement with the United States Geological Survey the State can cut this expense in half, making the total cost to the State about $49,250. On the basis of four years for completion of this piece of work this will necessitate appropriations of approximately

$24,625 for each biennium. If the mapping of the State be continued at this rate the whole area will be mapped in approximately 25 years. This will bring the major portion of the mapping to completion within a period contemplated by the provisions of the Temple Bill previously referred to.

Laboratory and Field Service: This phase of divisional activities should be continued and should be enlarged to permit a greater amount of field service. The budget submitted includes a small amount to permit this extension.

Collection of Mineral Statistics: The demands of this feature of the work of the Division are modest, little in addition to that usually expended being requested. Part of the expenses for this work may be charged to clerical help and in part may be presented under the head of Supplies, Materials and Services.

FINANCIAL STATEMENT.

From April 1st, 1925, to September 30th, 1926.

FUND	APRIL 1, 1925, TO MARCH 31, 1926			APRIL 1, 1926 TO SEPT. 30, 1926		
	Appropriat'n	Expended	Reverted	Appropriat'n	Expended	Balance
GENERAL FUND—						
General office	$5,410 00	$3,957 33	$1,452 67	$4,350 00	$1,760 65	$2,589 35
Forest protection	90,000 00	81,538 26	8,461 74	80,000 00	75,910 10	4,089 90
Hydraulics	22,500 00	21,219 52	1,280 48	.....	.....	.....
Geological survey	5,000 00	454 29	4,545 71	2,500 00	1,685 18	814 82
Topographic and hydrographic survey	10,000 00	5,000 00	5,000 00	.....	.....	.....
Reliefs	466 53	466 53	.....	.....	.....	.....
Hydrographic survey in co-op. with U. S. Govt.	.....	.....	.....	5,000 00	1,114 75	3,885 25
Provisions of act—hydraulics	.....	.....	.....	5,000 00	.....	5,000 00
State forest board	.....	.....	.....	6,000 00	.....	6,000 00
RECLAMATION REVOLVING FUND—						
Operations	25,120 00	12,331 84	12,788 16	250,000 00	4,279 04	245,720 96
Special investigation	5,000 00	4,292 64	707 36	.....	.....	.....
State land settlement	50,400 00	35,082 18	15,317 82	5,000 00	294 30	4,705 70
Land settlement adjustment board	10,000 00	1,788 83	8,211 17*	8,211 17	2,819 95	5,391 22
Columbia Basin survey	22,500 00	651 20	21,848 80	22,275 00	901 95	21,373 05
Contracts and bonds purchased	1,500,000 00	138,774 75	1,361,225 25	.....	.....	.....
State forest board	6,000 00	386 36	5,613 64	.....	.....	.....
Reliefs	25 51	25 51	.....	.....	.....	.....
Hydraulics	.....	.....	.....	20,000 00	9,923 96	10,076 04
Totals	$1,752,422 04	$305,969 24	$1,446,452 80	$408,336 17	$98,689 88	$309,646 29

* Did not revert to treasurer.