RECENT MOVEMENTS IN OREGON TOWARDS CONSERVATION AND DEVELOPMENT OF NATURAL RESOURCES

by

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A THESIS

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U.S. Range Development Service

U.S. Fish and Wildlife Service

Oregon State Fish and Game Commissions

U.S. Biological Survey

U.S. Geological Survey

U.S. Forest Service

U.S. Bonneville Power Administration

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CHAPTER I

INTRODUCTION

Purpose of Investigation

In studying the recent movements in this state towards conservation and development of natural resources, I was primarily interested in determining what has been accomplished, what methods were used, what the results are to date, and what should be done in the future.

As a guide in organizing the scattered bits of data now available in each of the special fields concerned, I attempted to answer the following set of questions:

1. What is the relationship between conservation and development?
2. Why should they be parallel in any unified plan of action?
3. What are the causes and effects of conservation and development---economically and culturally?
4. What basic resources are available in this state? Where?
5. Which resources are being improperly handled, neglected, or overlooked?
6. What forces, both human and natural, are wasting our resources?
7. What is the role of planning in the past, present, and future of Oregon?
8. What function should general education have?
9. What agencies have been or are taking part in both planning and active work?
10. What new methods could be practically applied?
11. What is the function of business in relation to conservation?

Method and Scope of Investigation

My research covered all the major sections of this state and included observations on all of the natural resources included.

As a preparation for this survey, I supplemented my knowledge of the fields concerned by acquiring additional technical information pertinent to my understanding of the many problems involved.

Then I carefully organized my plan of investigation and objectives; and towards this end, reviewed all recent and current literature in the various fields concerned. At the same time, during the last few months I traveled about over the state, observing personally, the different situations found in all the major sections of the state, and studying in detail certain typical problems in a few selected sections. During these travels I supplemented my observations with illustrative photographs, some of which accompany this thesis.

Besides the field observations, I also gathered much current unpublished research data through my interviews with the best authorities and organizations participating in research in each of the fields.

Through the combination and correlation of all the data, I was then able to draw definite conclusions.

Previous Investigations

To the best of my knowledge no one within the state has previously treated this subject as a unit. All of the investigations have been fragmentary, since each subject treated under this topic was studied separately by authorities which were concerned only with that particular field of research. It has been only very recently that any planning or combination of data was undertaken. Some of this work has been started by agencies such as the Northwest Regional Council and the U.S. Bonneville Power Administration. However, for Oregon alone, there has been very little done along that line.

CHAPTER II

RELATIONSHIP BETWEEN CONSERVATION AND DEVELOPMENT

At various times I have been asked why I did not stick to just one field of investigation---either conservation or development, or perhaps the work being done in one specific section of the state. And some were unable to understand where I was such a close connection between the two, since the two phases of work in many practical applications seem to handicap one another.

In answering these questions I emphasized first, the fact that conservation measures do not always put a governor on free development. And in some instances they are part of a complex program concerned with development. This may be illustrated by the recent Willamette Valley Project which is not only a flood and erosion control measure, but is also to aid the development of irrigation and river navigation and perhaps some industrial development. Another instance might be cited in the work of the U.S. Range Development Service. In some parts of their work the conservation measures increase the productivity of the range to such an extent that it is more valuable than it was when first settled by the pioneers. In parts of the High Desert of Eastern Oregon I saw areas where overgrazing had caused

landscapes which closely resembled some of those found in the "Dust Bowl". To remedy this they imported seed of unusually hardy and drought resistant grasses to broadcast in these sore spots. As a result they now have better stands of grass there than ever before.

The reason I wanted to treat this whole subject as a unit was that I wanted to be able to draw some general conclusions; and this could not be done by taking a narrow field. It was necessary in this case to survey the whole field in order to obtain a good cross-section. Besides, I feel that conservation and development should go hand in hand as a safeguard to the well-being of our future. Unless precautions are taken at the first in development of a new resource, we can expect a repetition of the old stories of greedy exploitation and needless waste of our past generations. An example of this precaution might be found in the Klamath Basin Reclamation Project. The work included draining a large lake and putting the reclaimed land under irrigation, with water from another neighboring lake. Since this land is in a high semi-arid plateau region, it is susceptible to accumulation of saline deposits, especially, alkali. If no care had been taken the land could have been ruined within a period of a very few years. However, an elaborate drainage system was built up, and through modern flushing methods of irrigation the favorable land has been kept, through all of these years, in a free and sweet condition conducive to the

best agriculture. And also this method has made it possible to reclaim marginal alkali patches and transform them into some of the most productive land. In addition to this they have for years used scientific farming and soil conservation methods such as crop rotation, planting of legumes, sub-soiling, use of green-manure crops, and special methods for the combat of wind erosion during the long dormant periods between crop seasons.

In figure 1, is a good illustration of the futility of development without the proper accompanying conservation measures. This picture shows a break in the millrace along the Willamette River at Eugene, caused by the flood of the 1941-42 rainy season.

As this report progresses, it should become even more evident to the reader just how close the relationship is between conservation and development, and how vitally important it is to keep the delicate balance between the two movements in the future progress of our state.

CHAPTER III

ROLE AND NECESSITY OF STATE PLANNING

Since Oregon was, until very recently, classed as a frontier state, the problems of conservation and development remained comparatively simple. As far as development was concerned, there was no orderly method. The complete stock of resources of the state was not known. There was plenty of virgin land and resources for those who prospected or discovered by chance. And when some person found his toes stepped on by fellow-enterprisers, or his resources running low, all he had to do was move out a little further into the wide open spaces.

There seemed to be an endless supply of fertile soil, minerals, water, forests, range land, and wild life. Enterprising was comparatively simple, being carried on to the greatest extent by small enterests and crude equipment. Because of poor transportation, a position of isolation, and sparce settlement, there was only a limited market for raw materials; and even these were limited to only a few simple products.

There appeared to be no need for extensive planning or organized development projects. Things were allowed to proceed according to the law of supply and demand.

Conservation at that time (especially, preceding 1900), was in its infancy all over the nation; and in the West it

was hardly given a second thought. The problems were not then as serious. With such a small population and market and such an abundance of resources, there was not the strong tendency to over-work everything.

But, in a very short time all of these conditions reversed. We had a heavy influx of exploiters. In a short time big capital tied up everything in sight. In place of the humble prospector and his crude gold pans and sluice boxes, came huge dredges to eat up acres of good agricultural land and raise havoc with the landscape around some of our most beautiful streams in their mad search for those tiny yellow particles called gold. Not only was all suitable farm land settled, but, thanks to real-estate sharks, so was a lot of marginal land which was entirely unsuited to farming. The abandonment of these places, some marginal homesteads, and some older places which had suffered the fate of soil depletion and erosion, served as the forerunner of today's great conservation problem. Due to heavy increase in markets, especially, foreign, careless logging started. And similarly, the growth of the stock industry was responsible for the birth of overgrazing and other range problems. The invention of better preserving processes, and a fast-growing market encouraged bitterly competing fish companies to take all they could get as long as it lasted.

Thus, in the period of a few years in most cases,

new problems appeared by the dozens, and simple problems grew into complex ones. The big reason for this being that large-scale developments (including big capital, and complex machinery) got a head-start on conservation, and as a result, seriously upset nature's balance.

A difficult situation of this sort cannot be brought back to normal overnight. Therefore, we must have an organized long-time plan for the state as a whole. Even in places where it is possible to remedy cases of depletion, it will necessarily take a long time to repair the damage done. We have carelessly wasted and exploited resources which took nature a long time to build up; and so even with the artificial aid of conservation measures, we cannot expect phenomenally rapid results.

Furthermore, the whole success of a plan for the future depends upon the research scientists who are quietly and systematically finding answer to the many technical questions involved. Since the helpfulness and reliability of a scientific conclusion depends upon having inclusive data gathered over a sufficient length of time, we cannot safely hurry the scientist.

A good example of this might be found in the work on halibut conservation carried on by the International Fisheries Commission. Not knowing the habits of the halibut, a deep-water fish, they could make no effective suggestions or progress without knowing the life cycle of the fish. And

since a halibut lives about 25 years and does not spawn until at the age of 12 or 15 years, it naturally took several years of investigation and experiment. But, thanks to their patience and fine regulatory measures, the depletion has not only stopped, but the fish supply is gradually growing toward its former peak.

Another big reason for state planning in Oregon is to foster closer co-operation with National organizations and programs in an effort to speed up progress on conservation and development. An instance of backwardness might be cited in the work of geological surveying in Oregon. Until recently our progress was much slower than in many other states, and even to this day there are several parts of the state which are not covered by the U.S. Geological Survey Folios and Quadrangle Maps. This in itself is a serious handicap to profitable and desirable development of the resources of some of our marginal sections. It may, for example, slow down both the planning and the active work on a Federal project within the state, since the government men will have to go out in the field and start from scratch to get the information vital to their plans and methods. As far as private capital is concerned, it puts some of our sections in the same class with the unmapped sections of foreign countries. And unless there is indication of [illegible] fabulous wealth in our hidden resources, the companies

are not going to be willing to risk blind prospecting.

In naming our problems, we must not neglect the effect of our present world crisis. The consequent mushroom development of industry in our communities multiplies our problems many times, and makes the formerly existing ones more serious. The great demand for chemical and electro-metallurgical products has hastened the growth of heavy industrialization in the vicinity of our huge power projects of the Columbia River System. The demand for raw material to feed these big establishments has turned loose both private parties, and government and company field men on the trail of our more rare minerals; and existing prospects are rapidly being developed. Also, the growing demand for better steel and light metals has intensified our search for ferro-alloys and rare earths, and has caused the development of prospects which it formerly would not have paid to operate.

This heavy industrialization is bringing thousands of laborers into our state from many distant places, and is consequently giving rise to new cultural problems which will throw us into an overwhelming state of chaos if we do not resort to some careful planning.

It brings up such problems as over-crowded conditions in the industrial centers, deserted rural communities, racial conflict (such as that caused by the difference in background between the Portland Negro and the Eastern or Southern Negro), lack of farm labor, clash of sectional

customs, and general demoralization of our urban populace. Since many of our out-of-state laborers and service-men consider this a desirable place to settle after the emergency is over, we will naturally be faced with providing more work and opportunity. Without careful planning our state will likely suffer a period of economic upset.

Incidentally, we have, in recent years already had a taste of the problems connected with migrants. This is especially noted in the increased school enrollment and labor supply due to the steady infiltration of "Dustbowlers".

We must realize that the emergency is causing a development within our state which might never have taken place without this added stimulus, or which in ordinary times would have taken at least a couple of decades. But we must not forget that only careful planning can cushion us against the shock of the inevitable slump which will follow afterwards. We should not feel, though, that things will return to the way they were before. Our national progress, and the new scientific discoveries (such as the synthetic and plastic industries) will alter the national demands after the war. And so we can feel fairly sure that Oregon's new products, both raw materials, and manufactures, will have at least a fair demand. So in our planning one of the tasks will be to put this development on an organized and permanent basis.

In my observations, I have noted, among other things,

a serious relaxation in widespread, systematic, and inclusive planning, and in co-operation on conservation measures. Naturally, much of this is necessary for awhile, but there are a few ways in which we can be careful without holding up production.

One necessary relaxation of conservation measures is illustrated in the management of our Willamette National Forest. They are allowing the cutting of twice to three times as many tracts of national timber per year as they did before. Our forests and our farms will probably suffer more than anything else from this hectic period, but with some good planned action for our post-war period we should be able to quickly retain the balance between conservation and development.

Another vital spot in which state planning should function is the general education of the public on the problems of conservation and development. The average citizen should not only know the "musts" and "must nots", but should know, at least in general, why they are necessary. For example, too many farmers think of conservation in the terms of "a Federal agency that pays them to raise certain crops and otherwise conform to certain planting rules." With the support of an "educated" populace our state and Federal agencies could make much better progress, and our legislators would pass the progressive laws which we need so badly.

It should be one of the primary objectives of planning organizations to draw up organized campaigns for education and to supply, at all times, plenty of non-technical and interesting pamphlets for wide circulation among the people. And at the same time these organizations should with every opportunity, insert their educational material into the curricula for secondary schools throughout the state. And last but not least, they should make plenty of technical material available to college and university students.

CHAPTER IV

CONSERVATION AND DEVELOPMENT---ITS NATURAL LAWS

In discussing the problems of conservation and development we should first acquaint ourselves with the basic natural laws and man's effect upon them. Conservation and development are not only concerned with natural or physical laws and changes in the natural environment, but also with changes by man.

In nature, the physical changes appear to proceed in never-ending cycles. They may start with earthquakes, vulcanism, folding, faulting and general uplift, and magmatic segregation and other methods of primary mineral deposition. Then may come an erosion era, including such things as general weathering (including such as chemical disintegration and secondary deposition of minerals), carving of the earth's surface by water, glaciation, and other gradational means, ending in eventual peneplanation. This disrupts the natural balance in the earth's crust, so as an attempt to restore this balance diastrophism (crustal movements, etc.) again starts. This brings us back to the beginning of our cycle again.

During these processes we have the gradual segregation and concentration of minerals to form our valuable ore deposits. This may take millions of years in some cases. And then over shorter periods of time we have the development

of our various surface resources such as soils, scenic features, water resources, grazing land, and even wild life and forests (these come as result of evolution which proceeds from one geological era to another up to recent times and the present).

For convenience of comparison some authorities[1] divide our basic natural resources into just four groups: minerals; soils; water; and forests. The first classification used for these groups is according to age: minerals, oldest; soils, second; water resources, third; and forests, last. Minerals are unique from the other three in that they originate at great depths and are not dependent upon any of the other three. On the other hand, the others are interrelated in that each on effects each of the other two in their origin. Furthermore, minerals are theoretically the only ones not replaceable. However, we all realize that for all practical purposes the others are practically non-replaceable; because in the case of some it would take too long, and in the case of others we would be able to only partially replace them.

In figure 2, we see examples of natural change. It is a picture taken of Anna Creek Canyon, a short distance south of Crater Lake; and it not only shows typical water carving, but also evidences of wind erosion in the pinnacles. Figure 3

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[1]Charles R. Van Hise and Loomis Havemeyer, Conservation of Natural Resources (New York: Macmillan Company, 1930), pp. 17-21.

was taken along the coast between Florence and Newport, and it shows the typical effects of wave erosion. The main features are the stacks and resistant headlands.

Our physical or natural changes are indeed important to know about in our conservation and development work because our conservation measures are meant to check natural destruction, especially erosion, as well as destruction of our resources by the work of man. In the case of development of a resource, or doing any kind of construction work it is absolutely necessary to know about the agents of nature which bring about changes in the earth's crust. A good example of this is shown by the recent situation which has developed around Newport and vicinity. Erosional forces are causing serious slippage in the shale formation underlying this area, and as a result banks are sliding into the sea and huge cracks opening up to wreck houses and other property. This merely goes to show that a person should have some idea of what they are building on before they spend a lot of money. There are some cases, such as the above, where man isn't responsible for the action of nature; but at least he could make an effort to aboid such places for building.

The serious problems today, however, are the ones brought on either by direct or indirect actions of man--- actions which upset the natural processes. There are a good many things being done these days by engineers, like draining swamps, and damming rivers for flood control, dredging rivers,

and establishment of irrigation projects and hydroelectric power plants. But there is still too great a percentage of man's enterprises that are injurious.

Some of this destruction is unintentional, often because of ignorance of geological factors. Sometimes it is because a project is undertaken without having even consulted a competant technician. An illustration of such unsuspected destruction is seen at Bay Ocean, near Tillamook. When a jetty was put in near there but up the coast slightly above, it changed the shorewise current at Bay Ocean and started the washing away of the spit on which the town of Bay Ocean was located. In the course of a few years the paved roads and streets were buried, the spit practically cut in two in several different places, summer homes and resort buildings wrecked, and finally the whole town ruined. In fact, the threatened removal of this protective spit from the mouth of Tillamook Bay has been a serious hazard to the oyster industry.

In figure 4 is the forlorn remnant of a summer cottage at Bay Ocean, which was undermined by the altered current. Although there are some cases which are due to ignorance, there are also many cases of destruction which are entirely the fault of an enterpriser who doesn't care about the after effects. An instance of this might be illustrated by the work of gold dredging companies who indiscriminately go up a stream and transform a formerly beautiful landscape into a series of unsightly gravel piles.

Fig. 1
Break in the millrace
at Eugene

Fig. 2.
Pinnacles —
Anna Creek Canyon
near Crater Lake

Fig. 3
Stacks —
Near Newport

Fig. 4
Extreme wave
erosion — near
Bay Ocean

CHAPTER V

PHYSIOGRAPHIC PROVINCES OF OREGON

In order to get an organized idea of our natural resources I have make a brief survey by dividing the state into its physiographic provinces. In doing this it is easier to show what important resources are the keynote of each section. On the opposite page is a simple map showing the approximate locations of these provinces (Figure 5).

The Oregon Coast

Contrary to the northern coast structure, our Oregon Coast is recently emerged. There are a few local spots where there is some submergence, and the Columbia River is drowned for a good many miles; but in general, the coastline shows poor harbors, spits, off-shore bars, sand dunes, basalt headlands, wave-cut terraces, and very little coastal plain. The main industries are port activities (on a small scale), lumber and other wood products, fishing, resort centers for tourists, dairying, specialty crops such as cranberries, oyster growing, salmon canneries, and other minor fisheries.

Probably tourism is the fastest growing industry along the coast. The continuous well-paved highway full length of the coast, with good bridges over all the river mouths, together with the spectacular scenery is a big attraction to tourists. They like the beautifully carved headlands, the beaches and dunes, and the sand-blocked lakes which make fine fishing resorts.

Besides resorts there are very few towns because of the narrowness of the coastal plain and the prevelance of the alternating dunes and rocky headlands. About the only agriculture to be found is in the narrow valleys following up some of the rivers.

As far as minerals are concerned, there has been very little development, it being limited mainly to construction materials such as sand, sandstone, gravel, and crushed rock. However, there is a small supply of rather inferior grade coal near Marshfield. And recently (mostly in the last year) there has been investigation of the black sands off the shore a few miles along various parts of our southern coast. These former beach sands contain valuable minerals such as chromite, titanium (ilmenite), vanadium, gold, and platinum. A pilot plant has been built to process the sand and recover several of the minerals contained, and study methods for commercializing these deposits.

Figure 6, taken along the southern part of the Oregon Coast, illustrates the resistant basalt headland and erosional remnants so characteristic of our coast.

The Coast Range

The Coast Range of Oregon only runs down about as far as the Coquille River, since it here starts merging into a region of different origin, geological age, and general geomorphological structure. As we proceed south from here

we note the gradual changes indicating the Klamath Mountains.

The Coast Range is a broad, low up fold of dominantly Tertiary marine sediments, with some faulting and volcanic intrusions, but no metamorphics. It is an area of recent uplift, and thus, the rivers cutting transversely tend to show incised meanders in most places. However, in some places there are evidences of submergence due to recent local movements. An example of this is shown in Figure 7, which shows the drowned river mouth of the Siuslaw River.

This region is mostly unsettled, even where it reaches the ocean, the only signs of settlement being where some agriculture is carried on in the best of the narrow transverse valleys, and where there is a little lumbering. There is practically no mineralization in this region; and even though the gaps at various intervals permit transportation connections with the inland centers of population, there is practically no incentive for trade. The main function of these roads seems to be to provide routes for vacationers going to the coast.

In the south the Coast Range is connected with the Cascade Range by the Calapooya Mountains, which mark the southern boundary and separate it from the Umpqua Valley and the drainage system of the Klamath Mountains. About the only significant thing about the Oregon Coast Range is that it forms a definite barrier between the Coast area and the Willamette Valley.

The Willamette Valley

The Willamette Valley is part of the Willamette-Puget Trough which is a great structural depression. The Willamette Valley runs from the Columbia River to the Klamath Mountains of the South. It is made up of river alluvium and glacial outwash, underlain by easterly dipping Tertiary marine sediments which disappear under the Miocene lavas of the Cascades. The valley is wide and fertile, but there are numerous erratic boulders in evidence which were ice-rafted down from the north during the Pleistocene. Some other important geological features of the Willamette Valley are the monadnocks (hard basaltic buttes veneered by sediments), the Goshen Flora found in upper Oligocene terrestrial beds and consisting of fossilized tropical plants, and the braided and meandering nature of the Willamette River.

The diversity of underlying formations plus the river alluvium made up of Cascade volcanics has helped produce a great variety of soils. This, combined with favorable climate, has promoted highly diversified agriculture which is the keynote of its industry. The main industries are orchards, small fruits, and some dairying.[1] But in recent years due to many difficulties found in continuing to raise

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[1]Otis W. Freeman and Howard H. Martin, The Pacific Northwest (New York: John Wiley & Sons, 1942), pp. 51-53.

the same crops year after year, there has been a big increase in specialty crops. Some of these are vegetables (especially for canning), beans, mint, dill, flax, and flower bulbs and other nursery stock.

Due to the fact that the Willamette River is at a temporary base level, is constantly shifting its channels, and is in many cases flowing on the crest of its own alluvial ridge (with natural levees on either side) which makes it higher than some of the land on either side, there is an annual flood danger which keeps residents trembling in their boots during a good part of each rainy season. Its overflow and seepage tends to keep the adjoining close-knit soils in a constant soggy, sour state, which during the dry season encourages baking, cracking, and excessive loss of moisture.

The above situations have caused countless losses of valuable land, especially, through the shifting of channels during flood time. This may, in a few hours, cut to pieces or cover with gravel and debris an entire prosperous farm. Consequently, the Federal government has in the last few years initiated the Willamette Valley Project for the main purpose of building a series of seven dams high up on the main tributaries of the river. This action is meant to do away with the disastrous floods, permit the land to be kept in a more mellow condition, and provide irrigation during the dry summer months for land that is loamy and free enough to permit its use.

Figure 8 view overlooking Eugene. In the near background is Skinner's Butte, a basaltic dike which stands as an erosional remnant along side the Willamette River. When a person notes the flatness of the valley and the town site they can see some of the reasons why we had one of the worst floods in the history of the area this last winter (1942-43).

The minerals of this region are largely limited to a few construction and ceramic materials, the basaltic cores of certain buttes furnishing good quality crushed rock, the river gravel furnishing a constant source of good road material, and certain clays being of excellent quality. Near Willamina, towards the northern end of the valley there is an excellent limestone quarry, and at Hobart Butte, a short distance from Eugene, are found refractory clays which are, in places, believed to carry a good aluminum content. Test holes are now being dug to determine advisability of their development.

Cascade Range in Oregon

The Cascades of Oregon are really the high western margin of Central and Eastern Oregon's great lava plateau.. There is only a comparatively small drop in elevation in descent to the eastern plateau, but a big drop to the Willamette Valley; but to the valley the descent is gradual with long stream valleys and abrupt, steep north-south fault

Fig. 6
Basalt headland — near Newport

Fig. 7
Drowned River Mouth —
Siuslaw River

Fig. 8
Overlooking Eugene
Toward Skinner's Butte

scarps showing in many places such as near Klamath Falls. The summit of this range in Oregon from a distance has a plateau-like surface in many places and the ridges are rather uniform in height, which might indicate an early peneplanation before the uplift; but geologists today generally believe that this appearnace is of structural origin, rather than peneplanation. This uniform surface is make very scenic by the row of young volcanic peaks in all stages of glacial dissection. These, ofcourse, are enhanced by numerous streams and summit lakes. One of these lakes is shown in Figure 9, taken overlooking Odell Lake, a popular fishing resort on the new Willamette Highway. Figure 10 is a view of Anna Creek Canyon a short distance below Crater Lake. This shows the typical stream carving of the high Cascades one of the most beautiful features of the landscape.

The Cascades tie up with other mountain systems to the North in British Columbia and to the South in Northern California and Southern Oregon, but they are distinguished by the different character and origin of the rock. On both the northern and southern extremities the rocks are older and more granitic in texture.[1] The Oregon Cascades consist mainly of Tertiary basalt and andesite, with only a very little granodiorite exposed deep down in the canyons. In contrast, the Washington

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[1] Ibid., pp. 53-55.

Fig. 9

Typical lake of Cascades —
Odell Lake

Fig. 10

Example of stream
dissection in Cascades —
Anna Creek Canyon near
Crater Lake

Cascades contain some sediments and much more intrusive material such as granodiorite, and some metamorphics related to the Rockies. To the South as they merge with the Klamath Mountain system of Southern Oregon and Northern California, they also tend to have older rocks, more old sediments and metamorphics, and a different origin, one of peneplanation and eventual uplift. This highly mineralized section of Southern Oregon and Northern California really structurally belongs to a different age (the Klamath Mountains), and at this point the Cascades pinch off to a narrow rim of subsidiary fault-block ridges in the Klamath Falls area, and are accented only in isolated spots such as Mt. Pitt, Mt. Shasta, and Mt. Lassen.

One of the big resources of the Cascades is the scenic and recreational value. The line of snow-capped peaks, including such as Mt. Hood, Mt. Jefferson, Mt. Washington, the Three Sisters, Mt. Thielson, and Mt. Pitt, attract many tourists by their beauty, and recreational opportunities such as skiing and mountain climbing. The numerous crystal clear fishing streams and string of summit lakes also are a big attraction with their surrounding of timber.

However, probably the greatest attraction of the Cascades is Crater Lake, in the northwestern corner of Klamath County. It resides in the Cauldera of Mt. Mazama, which is believed to originally been the general size of Mt. Shasta. There is much argument among geologists as to what happened 5,000 to

10,000 years ago to the top of the mountain, the three theories being explosion, collapse, and a combination of the two.[1] The violent activity of this huge volcano in the past is illustrated in one instance by the layers and layers of pumice which surround it for many miles in all directions.

The mineral resources of the Cascades are of rather recent geological origin, and are thus somewhat limited; but they are gaining in importance. Included in the non-metallics are basalt and andesite, used for road metal, and pumice. Economically important metallics include gold and silver in quartz veins, lead, zinc, copper, and quicksilver.[2] These quicksilver deposits have recently become very important. There are deposits in several sections of Oregon; and as a matter of fact, California and Oregon produce practically all of our domestic supply of quicksilver in the United States. And the Bonanza Mine in Northern Douglas County was for awhile the largest producer of quicksilver in the country, just recently surrendering that title to the New Idrea Mine of Northern California by a small margin. Other localities for mercury (in the Cascades) are Clackamas, Black Butte, and Tiller. Gold and Silver districts center mostly around Quartzville, North Santiam, Blue River, and Bohemia.

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[1] Ibid., p. 55. [2] Ibid., p. 57.

The other mentioned menerals are found scattered around these same general districts, some of them even occurring in connection with the gold and silver as secondary minerals.

Among the other economically important resources of the Cascades we find lumber well up on the list. The heavily timbered slopes are very common all the way up the line on the western margin, furnishing much fir, cedar, and other kinds of lumber. On the eastern margin of the mountains we find some of the best stands of yellow pine in the West.

Besides, the mountains are full of meadows and timber grasses which furnish a great deal of summer range for our stock industry. The numerous streams furnish a good source of hydroelectric power, and numerous hot springs contribute to all the other features which make the Cascades popular for rssorts.

The Klamath Mountains

The southern tip of the Oregon Coast Range forms the northern boundary of the Klamath Mountains, and on the east they merge almost imperceptably with the Cascades all the way to the northern end of the Great Valley of California. Two transverse streams cut deep gorges all the way to the coast, the Rogue River in Oregon and the Klamath River, beginning in Oregon and cutting through the northwest corner of California.

These mountains are made up of a complex system of

subsidiary ranges formed from Mesozoic sediments tilted to a high angle, old metamorphics, the Siskiyou Batholith (a huge mass of granodiorite), and basic intrusions of peridotite and peroxenite, partly altered to serpentine.

The region was extensively peneplained and then uplifted and carved by streams, as shown by the accordant ridge tops which average around 4,000 to 5,000 feet with a few monadnocks running up to 7,000 to 8,000 feet. Since the rocks are generally very resistant, the canyon walls are very steep. In fact, the canyon of the Rogue, one of the most scenic places in the state, is over 2,000 feet deep and has neither highway or railroad through it; and in many places, especially in Curry County, the roads tend to follow the ridges; because the slopes into the canyons are just too steep, and many of the bottoms too narrow to have room for a good road. This is one of the most rugged and impenetrable parts of the state.[1]

An outstanding economic feature of the region is the broad valley of the Rogue in the vicinity of Medford and Grants Pass. This region, very fertile when under irrigation, is the pear center of the West; it also produces peaches, prunes, tomatoes, and other minor fruits and vegetables, as well as a few other minor crops, and feed for a few dairy herds in the upper tributary valleys. Irrigation is necessary because of the odd climatic conditions; it happens to be

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[1] Ibid., p. 47.

slightly subject to the California High, and is thus a transition zone of semi-arid character. Fortunately, they also have plenty of good streams for irrigation and for hydroelectricity.

The mountains all through this region are highly mineralized, displaying a great variety of minerals in varying quantities; but probably the most important as economic minerals are the deposits of gold (lode and placer), chromite, manganese, copper, and platinum. Other minor deposits include limestone, monumental granite, silica, clays, borax, coal, quicksilver, and nickel.[1] Figure 11 is a typical skyline view of the accordant ridges which make up the bulk of the Klamath Mountains. And in Figure 12 is one of the old gold operations near Jacksonville.

The Deschutes-Columbia Plateau

This section is the part of the Columbia Plateau which runs from the Cascades nearly to Pendleton at the foot of the Blue Mountains. The western part is drained by the Deschutes River and gradually slopes to an elevation of over 3,000 feet near Bend. The eastern part slopes upward in the same way towards the Blue Mountains. The northern and northeastern sections are humid and fertile enough to make good wheat land and so this is the main industry right

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[1]Lloyd W. Staples, Strategic and Critical Minerals (Portland: Oregon State Department of Geology and Mineral Industries, 1942), Mineral Localities Map, frontispiece.

Fig. 11

Accordant ridges —

South of Grants Pass

Fig. 12

An old gold mine —

Near Jacksonville

up to the fruit section of Hood River and The Dalles.

Most of the part between the Cascades and the deep canyon of the Deschutes is covered with transported gravel brought down from the mountains especially during the Pleistocene. Since the canyons of the Deschutes and Crooked Rivers are deep and narrow, there is little chance for agriculture along their bottoms.[1]

The southern part around Bend, Redmond, and Prineville is good agricultural land, but is high and frosty, and must be irrigated. They have, however, developed certain hardy crops in these sections and such things as potatoes and hay are grown very successfully in the river flood plains and the fertile pockets between the lava flows, cinder cones, tubes, caves, craters, etc. The adjacent and underlying porous volcanic formation is one drawback to farming in these so-called pockets. The drainage is so fast that the irrigation water seeps right down through the veneer of soil, soon leaching it of its fertility. In fact, it is not uncommon for a farmer to suddenly "lose" a head of irrigation water in the middle of a field, and upon investigating, find that a new hole has been uncovered, and his whole head of water is running endlessly into some voluminous set of underground caverns.

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[1] Freeman and Martin, op. cit., pp. 70-71.

As far as other resources are concerned, this region does not have much except a little scattered grazing; because the fertile parts merge towards the center and east into an area of desert basins and ridges.

The recency of the lava formations and the general structure of the region leave it with little chance for mineralization. Its only products are pumice, diatomite, and obsidian.

The Blue Mountains

These mountains are part of a Central Highland system composed of Blue Mountains, Wallowa Mountains, Snake River High Plateau, and Seven Devils Mountains across the Snake River in Idaho. The Blue Mountains are the most extensive among this group. They extend from near Prineville, in Central Oregon only about forty miles from the Cascades, to the columbia River on the North and the Baker and Grande Ronde Valleys which separate them from the Wallowas on the east. And on the south they extend deep into Central Oregon, coming very close to the northern edge of Harney County.

They are mostly made up of uplifted lava plateaus which have been faulted to form a series of horsts and grabens with the steepest scarps on the south and east. These original structural features of the uplifted plateau have been varied and accented in certain sections of the province by the remnant peaks such as in the Ochoco, their southwestern

subdivision which runs close to Prineville. These higher peaks are composed mainly of ancient crystalline rock and masses of granodiorite of which some were left as islands in a field of lava, and some of which have had the lava stripped off. On the southern and eastern margins, we find slightly more complex conditions such as in Elk Horn Ridge west of Baker, and in the Strawberry and Aldrich Ranges farther southwest. These areas are more rugged because of more extreme folding, faulting, and intrusions.[1]

These mountains are made up of formations ranging mostly through the Tertiary period; but there are occasional spots of rock going back as far as Carboniferous, Cretaceous, Jurassic, and Triassic. The sediments range from marine deposits to lake beds, volcanic ash, and other terrestrial material which is interbedded with occasional lava flows. Such a situation is found in the famous John Day Formation, made up of terrestrial Oligocene. It is a blending of volcanic ash and other minor sediments, and is one of our best sources of vertebrate fossils here in Oregon.

Many of the above indicated structural features and modes of origin are rather hard to recognize by the person passing through, since at all points the region is highly dissected. The deep canyons of the John Day and its tributaries are themselves widespread and complex enough to do much in

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[1] Ibid., p. 71.

complicating the topography.

Intermontane basins and broad valleys are characteristic of the Blue Mountains, so especially in the north, there is much wheat raising and some stock; and they even have orchards and other crops along some of the river bottoms. Farther to the south the canyons are deeper and narrower, but the long ridges tend to be rounded and only sparcely timbered, which provides much good grazing land, even on the subsidiary ridges and points branching down abruptly into the deeper canyons.

All through the more rugged and dissected parts there is much mineralization. The districts containing the most mines are: the Ochoco district of the West; the central to northeastern section, ranging up toward Baker; and the southeastern section around the headwaters of the John Day River. Most of the mining, especially in the early days, has been gold mining, including both quartz and lode mines. Other minerals so far have been mainly of secondary importance in connection with the gold prospects. However, with present economic situations as they are, there has been a recent tendency towards development of some of these other metals. One important exception to the above statements is the Horse Heaven and other nearby quicksilver operations in the Ochocos. There are a few minor minerals in this region, but so far, they have not become economically important.[1]

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[1]Staples, op. cit., p. 17, and frontispiece.

As far as other resources are concerned, there is not much else of importance except a little lumbering. Most of the timber is associated with margins of the Cascades; but there is a little in the Ochocos, and also some lumbering carried on at Burns, at the southern edge of the Blue Mountains. Figure 13, taken in the east central part of the Blue Mountains, near Ukiah, shows the more or less open prairie or grassland found on the long ridges of a lot of the Blue Mountains. Figure 14, taken near Canyon City, in the southern John Day country, shows the general topographic character of the gold mining districts of that region.

The Wallowa Mountains

Although these mountains are really part of the whole section called the Central Highlands, they are a little different in character and a little isolated from the Blue Mountains. They consist of a complex uplift of old crystalline rocks away from which dip the Tertiary lavas in all directions. Evidently, the lava circled around the original mountains, but never quite covered them. They are structurally similar to the Seven Devils Mountains across the Snake River in Idaho. These uplifts were evidently separated by faulting or down-folding in the region of the Snake River, the whole area between and on the other sides as well, being later covered with layers of lava. Then more faulting in the Snake River area probably caused the river

Fig. 13
Open Grassy Ridge —
Near Ukiah in the
Blue Mountains

Fig. 14
Near Canyon City gold
mining region —
Lower John Day Area

to become well-entrenched and gave it a good start toward building the deep canyon which now exists. For nearly 30 miles in one stretch, this canyon averages around 6,000 feet in depth. The part of the plateau left on either side of the river and between these two mountain masses is called the Snake River High Plateau.[1]

This region was evidently originally peneplaned and then uplifted to form a somewhat circular mass. The region was then highly dissected by a radial drainage system, and glaciation. Faulting, folding and both contact and regional metamorphism continued throughout the following periods, making the area more and more complex.

The rocks and formations are widely varied in both types and age. Generally, they can be said to include Triassic to Tertiary volcanics; old intrusives such as Jurassic and Cretaceous granodiorites and quartz diorites, fairly old acid and basic dikes, and also some dark Tertiary dikes; metamorphics such as schists, quartzites, and marble ranging through Jurassic and Cretaceous; sediments, both marine and terrestrial, of Lower and Upper Triassic; the Clover Creek Greenstone Formation, including a mixture of fine-grained metamorphosed igneous rocks, pyroclastics,

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[1]Freeman and Martin, op. cit., pp. 72- 73.

and sediments, which date back to Permian; Pleistocene Moraines and glacial outwash; and recent alluvium, derived mainly from glacial deposits.[1]

It is important to note that the complexity and wide range of geologic age mentioned about the rocks in the last paragraph, is the main thing controlling the natural resources available in this area. The rugged aspects of this section caused it to be neglected for a long time as far as surveying, prospecting, and settling the region were concerned. The topography alone makes it one of the most scenic and alpine-like sections of the West. Besides such features as Wallowa Lake and other glacial lakes, it displays three distinct types of skylines, including the serrated peaks of granodiorite, the rounded marble domes, and the stepped mountains with successive layers of lava flows on top of a granitoid base. In years to come this section should become one of Oregon's biggest attractions to tourists and vacationists.

Another big economic possibility is the minerals in this region. The geological indications are that this region is as favorable for occurrance of minerals as any known part of the state. Prospecting has been very slow and incomplete in this region; but as result of recent geological surveying and mineral development we already have mined quite a bit of

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[1]Warren D. Smith, John E. Allen, Lloyd W. Staples, and Wayne R. Lowell, Geology and Physiography of the Northern Wallowa Mountains (Portland: Oregon State Department of Geology and Mineral Industries, 1941), pp. 6-27.

gold and silver (both lode and placer), and have found marble, limestone, monumental stone, asbestos, antimony, tungsten, copper, chromite, molybdenum, cobalt, and a little fluorite.[1]

Tri-State Slopes

This is an area which includes the northeast corner of Oregon, southeast corner of Washington, and the adjacent uplifted block in Idaho (Craig Mountain and Camas Prairie). It is bordered on the south by the Wallowa-Seven Devils Mountains, on the west by the Blue Mountains of Oregon and the Central Plains of Washington, and on the east and northeast by the Rockies. The Oregon section is more specifically separated from the Wallowas by the northwest-southeast fault scarp and the narrow Wallowa Valley, which this scarp overlooks. The highest of the Oregon section averages from 4,000 to 5,000 feet elevation near the Snake River.

The Tri-State Slopes are in a youthful stage of dissection, with deep canyons eroded in the thick lava flows, sometimes exposing sediments and old crystalline rocks. The main streams in general flow in the direction of the slope, and the hills are mostly the elongated ridges

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[1]Staples, op. cit., pp. 4-19, and frontispiece.

(flat-topped) left between the canyons and narrow valleys. The top lava flow forms rimrocks for the canyons and the soil is mainly volcanic ash similar to the Palouse soil. The Oregon section is cut up with canyons 2,000 to 3,000 feet deep by the Imnaha and Grande Ronde Rivers and the minor tributaries of the Snake.

The steep, inaccessible canyons have made a serious problem of transportation across this area, as it is difficult to build roads any place except following along the tops of the ridges or along the bottom of the canyon.

As far as resources are concerned, the main thing is grazing on the open grasslands of the higher ridges. The timber is only in streaks and usually occupies the bottoms and sides of canyons. The open ridges in some places are also used for agriculture such as the raising of grain and stock feed.[1]

The Payette Section

This is the name applied to the western part of the Snake River downwarp. It is distinctive from the Snake River Plains to the east in that it is more highly dissected and contains recent sediments. It has deeper and more uniform soil, lower elevation, longer growing season, and can thus raise more crops. Incidentally, farming of the diversified

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[1]Freeman and Martin, op. cit., pp. 68-69.

irrigated type is the main industry of the region. Also, some feed crops are raised to support livestock raised in surrounding arid grazing areas.

A good part of this region is in Idaho, but it also extends across the river into the central portion of Oregon that borders the Snake River. This is a region of recent reclamation and irrigation projects, especially on the Oregon side; and with its wealth of good soil, irrigation water, and favorable climate, it should have a prosperous future. However, this progress is naturally slow because of its isolation from the rest of Oregon, as far as means of transportation, communication, markets, and general contact are concerned. Probably the best developed section, which has established a market, is the area around Nyssa. This is the seat of one of the new soil conservation experiment projects established recently by the U.S. Soil Conservation Service.

The Idaho section is a region of old lake beds with only occasional spots of lava, while the Oregon part is composed mainly of lava flows dissected by the Malheur and Lower Owyhee Rivers. This gives a little difference to the soil character on the two sides of the Snake River, but they raise the same general crops with about the same results.[1]

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[1] Ibid., p. 73.

Owyhee Plateaus

In this section is included parts of Southeastern Oregon, Southwestern Idaho, and Northern Nevada. It consists of a series of high warped plateaus drained by the Owyhee River and its tributaries. The part in Idaho being the highest, that section is called the Owyhee Mountains. Here erosion has exposed ancient crystalline mineral-bearing rock which is surrounded by the ends of layers of tilted lava (tilted away from the mountains). In this area the acid lavas predominate; but in the western section (the Oregon part) all of this as well as the deep-seated crystalline rock, has been covered by basaltic lava flows. For this reason, the Oregon side has practically no mineralization, except in the Red Ledge copper prospect, while the Idaho side produces plenty of minerals.

The big development of the Oregon section is in the vicinity of the Owyhee Dam. The climate and soil are very good, and water supply excellent, but the market is poor. They are able to raise a variety of crops which have a local demand, or feed crops needed by the nearby stock men. A little hay is raised even on some of the cattle ranches by dryland methods. The big industry of this area is the stock industry. Only a small spring in a canyon is enough for a small ranch.[1]

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[1] Ibid., p. 75.

Transition Section

This region acts as a transition between several of the provinces. It lies in Central Oregon between the Deschutes-Columbia Plateau on the west, and northwest, the Blue Mountains on the north, Payette Section and Owyhee Plateaus on the east, and Basin and Range Province on the south. It is a high desert basin containing lava, volcanic ash, lake beds, and detritus of various mixtures. The eastern part, called the Harney Basin, could be applied to the whole area. The western part is called locally the High Desert or Great Sandy Desert. Its uniform flatness and desolation (with hardly enough vegetation to hide a jack rabbit) makes it a lonesome place to cross.

It is not absolutely flat all over, though. In the edge of Harney Basin surrounding the central shallow lakes and playas are alluvial plains and a small area of lava beds, cinder cones, and other volcanics; and toward the edge it is somewhat dissected. The center has interior drainage running to Harney and Malheur Lakes; but the southern part is a little different, showing a few minor fault scarps which represents the transformation between the basalt covered Columbia Plateau and the fault scarped region to the south called the Basin and Range Province.

This area is not all quite so desolate as one might think. In fact, it supports a fair amount of grass in some

places and it is consequently used a great deal as stock range.[1]

Figure 15, taken in the northeastern part of the area, looking across a great flat basin far to the southwest. The picture shows one of the better parts of the region, where there is a little grass in between the dwarfed sagebrush.

Basin and Range Province

There is no definite line dividing the Basin and Range Province from the Snake River Plain to the north of it in Idaho and the Columbia Plateau on its northern margin in Oregon. In some cases water parting has to be used to distinguish them.

This section is characterized by north-south fault block mountains with basins and grabens in between. The area is dry and has mostly interior drainage, including shallow lakes and playas. Some of the larger and better known are Goose Lake, Warner Lake, Summer Lake, and Abert Lake.

Among the more important fault block mountains of that section are Winter Ridge west of Summer Lake, Hart Mountain east of Warner Lake, Abert Rim west of Abert Lake, and Steens Mountains which attains an elevation of 9,000 to 10,000 feet. Farther west is mainly a lava rimrock country.

The main exception to the rule of interior drainage

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[1] Ibid., pp. 74-75.

is the Klamath region which lies partly in California and is drained to the California coast by Klamath River. This area has some of the most recent fault block mountains and one of the most recent grabens (contains Upper Klamath Lake) in the United States. Especially on the west side of the lake this fault scarp continues for miles very steeply with hardly any alluvium and slide material between it and the lake, and with no gullies cutting it. A few small dips in the top of the ridge show that some gullies were beheaded and left hanging by this recent movement.[1] This region is dry like the rest of the Basin and Range Province and is 4100 feet in elevation; so it should really be considered a part of the Basin and Range Province in spite of the fact that it has exterior drainage and a plentiful water supply because of its proximity to the Cascades.

It is a region of basins and fault block ridges of varying ages and has some of the most recent lava flows in the country on its southern border across the line in the California Modoc Lava Beds (now a National Monument under the U.S. Park Service).

As far as resources are concerned, this region is endowed with some of the best in Oregon. Foremost among these is the soil, which ranges from fluffy, black, peat-like soil in the lake bottoms to a fertile sandy loam (the

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[1]A. K. Lobeck, Geomorphology (New York and London: McGraw-Hill Book Company, Inc., 1939), pp. 552-553.

original beach of some of these lakes, or in some cases merely alluvium from the surrounding hills).

Probably the most remarkable resource of this region is its water supply, Upper Klamath Lake. This recieves a great deal of the snow water of the Crater Lake Watershed. In that region of the Cascades, which is covered with a porous pumice covering, there is very little run-off, most of the water from the heavy snows sinking into the pumice and finding its way to the open lava formations below. Naturally this huge store of underground water has a perfect outlet in the springs and small rivers which rise from these newly faulted scarps. The U.S. Department of Interior ranks this watershed as the most even throughout the year and the most likely to remain a good supply of anywhere in the nation.

The reclamation project in the Klamath region has built up one of the most prosperous farming districts in the state, and by scientific farming the people have overcome to a great extent the frost hazard and short growing season and are producing more diverse crops all the time. However, the one big crop is potatoes, which rank among the tops in the western markets. They also raise a great deal of feed such as alfalfa to support the stock raising in the marginal sections and the great Fort Klamath meadow region surrounding Upper Klamath Lake. The lush meadows of this region produce beef cattle successfully under intensive methods. Another important crop type is grains, especially in peat bottoms where the yield is extremely high, and in the marginal dry-

land areas where nothing else will survive the arid conditions. A new industry in the valley recently has been the raising of seed crops such as clover, vetch, flax, alfalfa, and vegetable seeds. This has grown to be a very profitable side industry for practically every farmer in the region, and they are able, in spite of the frost, to get large yields of seed.

The Klamath vicinity is by far the most prosperous and settled section of the Basin and Range Province; and it ranks as a good population center, since it is on the main north-south transportation routes and is a big lumber center. Its timber, however, comes to a great extent from the Cascades, only a small amount now coming from the Basin Section.

As far as the rest of the Basin and Range Province is concerned, its resources are a bit more scattered and not as important. However, there are isolated sections of considerable activity. For example, Lakeview, in Lake County is an important lumber center; and there is some good pine timber being cut east of the Cascades and north of the Klamath Falls area, in the eastern part of the Klamath Indian Reservation and its northern fringe towards Silver Lake and Summer Lake.

The most important resource of the Basin from the Klamath Falls area northeast and east to its farthest extremes is its wealth of grazing land. This region is

spotted with small ranch sites as well as larger ones, where there is a local water supply for stock and possibly a little grass hay. Surrounding these spots is a big area of open range---predominantly scattered sagebrush with good quality bunch grass; and at higher levels, say around 4,000 feet, a few scattered Junipers. On the higher ridges where there is elevation enough to draw quite heavy snow fall, there is usually an open stand of pine.

As far as recreation and tourism is concerned, there are many things to be said about the Basin and Range Province. Some of the better sections such as the Klamath region, the Lakeview region, Summer Lake and Silver Lake, Abert Lake, Hart Mountain, Steens Mountain, and other various scarps and lakes, provide attractive and unusual scenery in their angular, concave, and flowing lines. Many people enjoy the majesty, freshness, and peacefulness of these wide-open-spaces once in awhile. However, since the scattered stock ranches and sparce population does not contribute enough to support a railroad or good trunk highway connected with other important points, the area is unknown even to many of our residents who have lived in other sections of Oregon all of their lives; and the area is definitely not on the "must" list of tourist guides and travel folios.

However, one thing for which the Basin and Range Province is becoming noted is its wild life. Around the margins, such as in the Klamath region we find good fishing streams and

lakes, and lakes capable of supporting plenty of ducks and geese for the hunter. But in certain sections all over the area there is a big supply of mule deer, which attracts hunters from all directions in ever-increasing numbers. Also, we might note that it contains the largest herd of antelope left in the United States, some of them being in the Hart Mountain Antelope Preserve which was established to prevent their extermination.

As far as minerals are concerned in this area, most of the area is covered with a mixture of fairly young volcanics and sediments; and the structure and degree of dissection is not enough to uncover or cause much mineralization. The main metallic is quicksilver, the best mines being in Southern Malheur County. Among other deposits are the borates of Southern Harney County, and the soda, salt, and other salines of Lake County (Alkali Lake, especially, is rich, and a large deposit). And in certain sections we have pumice and diatomite.

Figures 16 and 17 are two scenes taken at Abert Lake, which are typical of the Basin and Range topography. Figure 16 shows a section of the high, rugged, steep fault scarp, Abert Rim, which overlooks the lake for miles on the west side. Figure 17 is a view looking southeast, over a portion of the lake, showing the shallow body of water which varies in area from season to season. The lake is fed by a remarkable and continuous line of springs which seep out of the talus at the base of the rim. These fault-line springs are as characteristic throughout the province as are the artesian wells.

Fig. 15
Characteristic Transition topography —
Southern part of Harney Basin

Fig. 16
Fault Scarp —
Part of Abert Rim

Fig. 17
Typical Basin-Range topography —
Overlooking Abert Lake

CHAPTER VI

CONSERVATION AND DEVELOPMENT---RECENT WORK UNDERTAKEN

Minerals

General Scope of Work Being Done. In Oregon most of the progress in mineral industry has been done just recently. During the early days of Oregon's settlement and until the last few years, mining in Oregon has been mainly for gold, with a little quicksilver development in the later years of this period. People not only didn't recognize or know that the other metallics existed in commercial quantities; but they were not interested because of a lack of demand and market, cheapness of the ore, high transportation costs, lack of milling centers, and lack of the huge amount of capital necessary for development of low-grade ore by modern large-scale methods. Another handicap to prospecting and development was the fact that much of Oregon had not been geologically surveyed or mapped; consequently, there were base maps available for the field man to turn to.

Oregon is now co-operating with the U.S. Government in surveying and mapping these outlying areas. It might also be mentioned that for several years during the 1920's and early 1930's there was not even a state department dealing with mineral resources and industries. The present agency, State Department of Geology and Mineral Industries, was established just in the last few years; and it employs a competant staff which carries on much needed field work in

likely localities, investigates prospects, and publishes reports on all developments. This is a big step forward in development of our mineral resources. They also publish bulletins such as "Field Identification of Minerals for Oregon Prospectors" and "Strategic and Critical Minerals", both of which are guides for the prospector. The department also makes assays, mineral identifications, and qualitative tests, some of which are free to Oregon citizens. A recent and important addition to the department in Portland is their spectrograph, which is one of three only in the Pacific Northwest, the other two being installed in the Charlton Laboratories in Portland and the other in the Laucks Laboratories in Seattle. This devise, if correctly operated by a properly trained person, is absolutely reliable for mineral analysis even when the mineral is present in very minute quantities.[1]

Many of Oregon's mineral deposits are not as extensive, and as easily mined as in some sections of the country because our rocks are on the average, younger, less complex in structure, less metamorphosed, and in much of the state are covered with layers of Tertiary lava. In spite of this, recent investigations a re constantly bringing to light more types of minerals, and more deposits scattered over the state that are economically feasable to develop. With the recent

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[1]Staples, op. cit., p. 27.

scientific discoveries on complicated forms of alloys, the rarer minerals are in a much greater demand, especially with the stimulation of wartime need. This should hasten our progress in Oregon and bring about some development which will not necessarily slide back when the war is over.

An example of the old regime of simple lode and placer mining for gold is represented by the picture (Figure 18) of a typical gold operation located near Gold Hill between Medford and Grants Pass. In the wake of these operations we now have the birth of large, new, modern plants of a complex nature. An example of one of these new plants is found at the Bonanza Mine in Northern Douglas County.

Bonanza Mine. This should be mentioned as my first example of recent development because it is the best example we have within the state. This mine, started around five years ago, is by far the largest producer of mercury in the state, and for awhile, ranked as the largest producer in the nation. It is now only slightly excelled in bulk of output by the New Idrea Mine of Northern California.

It was not stumbled upon by the same haphazard methods used by some of the gold prospectors. The main vein was discovered by a well-trained field geologist who drilled test holes in likely places. He paid careful attention to structure, staying along the main line of faulting found in that section. And he watched the outcrops of altered types of surface rock that are apt to be found in connection with

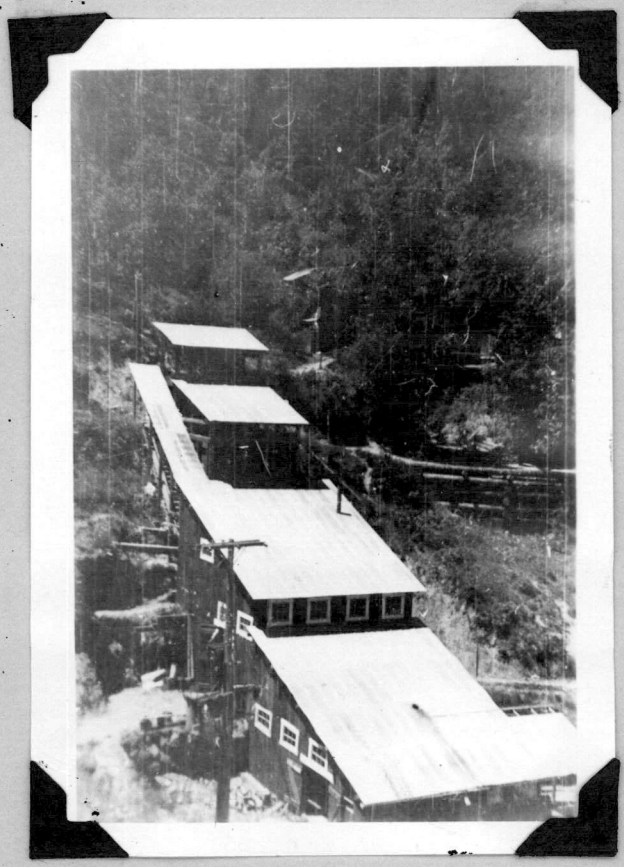

Fig. 18

An old gold mine —
Between Medford
and Grants Pass

cinnabar deposits, and any other pertinent structural features. At the point of discovery there was no surface indication, only structural possibilites.

The mine shafts are well-built, well-drained and well-ventilated and furnished with hydraulic drills and ore cars for the miners. The plant itself is built on as high a standard as any similar mine in the country. The sorting devises, furnaces, retorts, and other machinery are of the highest quality and efficiently arranged. This mine can really be considered as a big contributor to our mercury supply. Mercury is a strategic mineral, and most of our domestic supply is now produced in Oregon and California.

Black Sand Development. There are "black" sands to be seen at different places throughout our state, but the most valuable ones are the beach sands of our southern coast. In one place in particular the Cretaceous sands which were originally beach sands but are now back a short distance from the coast have been investigated more thoroughly just recently. Due to restrictions as well as lack of time and staff during this emergency, no official report has yet been published on this investigation and several other recent investigations over the state, on different mineral deposits. However, I gained some information on this as well as some of the other developments from Mr. Allen (State Department of Geology and Mineral Industries, and some of the other authorities.

The main value of the sand is in its chromite, for which it would be processed primarily. The sand has long been known to contain considerable quantities of gold and platinum, but only recently have they considered the high percentage of chromic oxide. In processing this sand, they will attempt to also recover significant quantities of titanium (ilmenite), platimum, and zirconium (zircon).[1] According to the last report which I received, a pilot plant had been completed and the process proving to be a success.

Aluminous Clay. Hobart Butte in the southern part of Lane County has for some time been known to have good refractory clay deposits, but the most recent work there is the investigation now being carried out. They are drilling test holes in an effort to discover clays sufficiently rich in aluminum to be used in the new process now being worked on to extract aluminum from clays.

Nickel. Two deposits of garnierite, a secondary nickel ore, are known to occur in Oregon---one in Josephine County and one in Southern Douglas County at Nickel Mountain near Riddle. The latter is being investigated, but work has about come to a stop, because the company formerly interested in developing it gave it up for the time being.

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[1] Ibid., p. 24.

Soils

General Scope of Development in Oregon. This would refer mainly to the projects which make available for agriculture more tracts of land. This is done mostly be reclamation. In dryer sections of our state, mainly through the central and eastern portions, this reclamation is accomplished mostly by establishing irrigation projects and clearing the surrounding land of sagebrush or whatever other vegetation it may support. In some semi-arid sections, especially in basins or former playas, it is necessary to first of all put in a drainage system and wash away the alkali or other salt deposits which may be present. The drainage system is necessary in these cases not only to carry the excess water from this "flushing" type of irrigation, but also to hold down the water table which would be artificially raised by irrigation, and thus be sure that excess subbing will not constantly cause sourness and sogginess of the land and possibly cause the surface deposition of more alkali.

In the more humid regions reclamation projects often consist mainly of draining swamps or swails and clearing away timber or brush.

General Scope of Conservation in Oregon. Development of new tracts of land will follow naturally the establishment of dams and similar government projects; but conservation is a more serious problem because it not only will help prevent

early deterioration of soils in the new tracts, but it will also prevent further depletion in areas that have been used for years.

This work is supervised by the U.S. Soil Conservation Service and the problems dealing with range deterioration are also worked with by the U.S. Range Development Service.

Examples of problems with which they are working are: depletion of soil fertility (through overcropping, insufficient rotation, leaching, failure to replace humus and nitrogen, burning of stubble, etc.); the marring and removal of top soil (through gully, sheet, finger, and wind erosion; the covering of top soil with gravel and other damaging alluvium from floods, erosion, and run-off; lowering of water tables through deepening of gullies; and controlling of stream cutting.[1]

Because of the serious neglect which has taken place in the past years, the chief work of soil conservation is now to bring the present "sore spots" of our land under control. However, the aim for the future (which is by far the most important one) is to stabilize practices and condition our lands so that soil erosion will not develop.

Type Examples of Recent Development. A good example of a development which was completed in 1942 was an addition to the Klamath Reclamation Project. This project, to which I

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[1]Soil Conservation Service, Soil and Water Conservation in the Pacific Northwest (Washington: United States Government Printing Office, 1937), pp. 12-50.

made reference earlier in this paper, was started in 1914. The land concerned lies partially in Oregon and partially in California, since the line runs arbitrarily through the center of the richest basin of the lot. Structurally and economically, this entire basin should belong to the state of Oregon. The original project included draining Tule Lake and putting it under irrigation with water from the nearby Upper Klamath Lake in Oregon. As years went by, supplementary developments have been added to this project in Oregon. By building new canals and drainage ditches several small valleys around the fringe have in the last few years been reclaimed; and even some of the higher land around the foothills has been made successfully productive by both organized and individual pumping projects. The source of water in these cases comes from nearby gravity canals.

However, aside from these continuous small developments, is the one which I now wish to discuss. It was the outgrowth of serious damage done to both privately owned homesteads and government lease-land in the Tule Lake Basin. The drainage system of the entire basin emptied and was pumped into the "sump" (the remains of Tule Lake), and with the added burden of particularly heavy snow and rainy seasons in that section, they had serious floods every year. The land was diked off, but in recent years with more irrigation water used due to additional land and more specialization, the drainage water increased greatly in volume. The farmers all over the

project were indignant because government ditch-riders put rules on irrigation which threatened to injure their land and seriously curtail yields. These rules were merely a temporary effort to hold down the amount of drainage water which would flow into the over-filled sump, but they practically caused a riot in that district.

Out of all this trouble came the construction of a large diversion tunnel through a narrow ridge which lies between Tule Lake Basin and the Lower Klamath Lake Bed, most of which is dry. The water was then to be pumped out of the Tule Lake "sump" to the dry basin on the other side. This project served not only to destroy the flood menace, but also released to agriculture many thousands of acres of the best peat soil in the valley. And in lowering the water table in the southern part of the basin, it made possible a greater variety of crops and more intensive cultivation. And the land to be covered with water in the Lower Klamath Lake Bed was mostly unfit for use anyway because fires had invaded and burned to great depths much of the peat formation.

Conservation. Probably one of the classic examples of erosion control is found in the Blue Mountains Section. These open side hills suffered severely from both sheet and gully erosion. And probably it was brought on mostly by the practice of "clean summer-fallowing" every other year. Since most of this region was endowed with sufficient rainfall, it was not a moisture conservation measure. It was started by farmers

primarily because graining their land year after year without replacing anything or giving it a rest had used up the humus and general fertility to such an extent that their yields became very low. Naturally, the already humus-deficient soil, left exposed to erosion with a fine mulch on top, suffered greatly from both wind and water erosion; and the run-off, instead of sinking in, ran into the gullies, deepening them and lowering the water table, and taking much top soil. Thus, in regions where they should have had enough moisture, they not only lacked the needed moisture reserve, but lost much of their top soil as well.

In remedying these conditions they have done some of the following: planted spring wheat instead of winter wheat (because winter wheat does not protect enough against erosion anyway, and the spring wheat can be planted after the land has lain all winter with stubble left on or with a cloddy, trashy surface); rotating with peas or other legumes instead of summer-fallowing; and after harvesting the peas in the Fall, chiseling the land in a contour manner around the sidehills.[1]

Sand Dune Control Along the Coast. Along the Oregon as well as the Washington coasts, high tides sweep up much sand onto the beaches. Since the prevailing winds are landward, dunes are formed which roll ever inward, enveloping trees and other vegetation, property, or anyting else that happens to

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[1] Ibid., pp. 12-37.

be in the path.

The earliest control measures were started near Warrenton in Clatsop County, Oregon. Near there the problem was more serious since the Columbia emptied a constant supply of sand into the Pacific nearby to be washed up and redeposited by the ocean currents. The early settlers noted that for miles inland the grass and brush land was underlain by sand dunes which had finally been seeded down by nature. They realized that it wouldn't take much to put these dunes on the move again, so they passed local laws to prohibit or at least control grazing in these areas; but in later years the laws were forgotten about and much of the land again was added to the area of drifting dunes.

The first step in this control is to build a fence parellel to the coast and as close as possible. As soon as this is covered with sand, making an artificial dune, some dune grass is planted; and thus as it grows and is alternately covered by more sand, the dune grows to a height of 20 or 30 feet. Then the landward side of the dune is planted to the dune grass, and also the surface of the shifting dunes farther inland. The artificial dune breaks the wind, and the grass gradually controls the sand to where different types of permanent vegetation can be planted.[1]

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[1]U.S. Soil Conservation Service, Controlling Coastal Sand Dunes in the Pacific Northwest (Washington: United States Government Printing Office, 1942), pp. 2-46.

General Measures Used for Various Other Conditions.

In controlling range erosion the following measures are used: control of amount of livestock put on the range; holding the stock off the range late enough so that the grass is past the young shoot stage (by building drift fences between summer and winter ranges); by constructing supplementary watering places and putting salt away from the water to prevent heavy grazing in a few spots; outlawing all close grazing; contour furrowing of hillsides; and replanting overgrazed areas grown up to weeds or seriously eroded.

Forest erosion is usually not a serious problem, except in the case of fires or destructive logging and grazing practices; so the main thing to do in these instances is prevent fires, control grazing, and practice careful logging.

As far as general soil conservation is concerned, we might mention the following measures: rotating with legumes or plowing under green manure crops; mixing stubble or other trash into the soil; planting fields unsuited to further cultivation to permanent forage crops; using of nurse crops when planting delicate and slow-growing crops such as alfalfa; planting of cover crops to avoid winter erosion; planting trees for wind breaks; use of careful cultivation methods; healing of gullies by means of trash, whisker dams, and grass planting.[1]

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[1] U.S. Soil Conservation Service, op. cit., pp. 12-58.

Forests

Value Received From Our Forests. Before discussing forest management it is well to make a survey of the direct and indirect values of our forests. As far as direct values are concerned, we should realize that the lumber industry is considered as close to the largest in Oregon. Most of this commercial development is carried on in the western part of our state. But we must not stop with the direct economic value, because many of our indirect values are just as important to the state in the long run. Much of the timber even in commercial areas is unfit for lumber, or possibly inaccessible. And in high mountains or deep canyons in other sections of the state we have important stands of timber which are either inaccessible or of a non-commercial variety. Among the indirect values of these stands are: protection from ersion; helping snow and rain water to soak in rather than running off; providing a home for countless species of wild life; providing camping and picnic grounds and scenery for countless vacationists; and providing grazing land for much of our stock industry.

Figure 19 is a scene taken in the high Cascades near Huckleberry Mountain. This picture shows an attractive group of non-commercial trees which are not only a tourist attraction, but a help to the watershed.

Methods Used in Forest Management. In discussing our forest management it is hardly necessary to treat development

measures separately from conservation measures, because the two are so closely related in forest work. Another thing that is quite obvious is the fact that our forest resources, unlike some of our others, have been extensively developed from early times. Our main problem now is to conserve them and balance up the ratio between the annual growth and the annual cut. One thing which is, however, distinctly a new development and a necessary one, is the work of research laboratories on utilization of forest products. We should, for the sake of our national economy, make use of all waste products from the lumber industry that we can. Already we see some of this being done in the redwood section of Southwestern Oregon. Here they use the thick slabs of rewood bark for various fibre products ranging from insulation to wool substitutes.

Among some of the most effective work being done is the passing of regulations to insure clean and careful loggong. This prevents carelessness which breaks and mutilates the young trees, and gouges the landscape to such an extent that serious erosion sets in. It also prevents the leaving of slashing, which would increase the fire hazard. However, there are too many privately owned tracts which are not sufficiently regulated and are not only in danger of destruction but are dangerous to the neighboring tracts.

In the National Forests cutting is limited to a certain amount for each year, and a logging company must leave so many

seed trees in a logged off area, and must stagger their operations, leaving strips uncut at given intervals.

Other work of the U.S. Forest Service includes the maintenance of lookouts and firestations, control of grazing in the National Forests, work and research on insect and disease control, maintenance of public camp grounds, forest roads, ranger stations, and guide service, and preserving of natural forest beauty especially along highways and other tourist routes.

A problem which has not yet been solved is the lack of co-operation among private timber owners to establish sustained yield units. The present system of taxation is run on the basis of time, and consequently, owners are anxious to cut their timber as soon as possible to keep from paying so much tax. When the tax law is revamped so that the total tax on an acre of timber is based on the value of that timber at maturity, rather than the length of time that the owner has held it, we can expect to obtain co-operation among private owners for the establishment of sustained yield tracts. The taxes should be paid all at once when the owner cuts his tract. In this way, a small owner wouldn't have the problem of paying taxes on land (timber) when he isn't cutting any and thus not having any income off it.[1]

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[1]Freeman and Martin, op. cit., pp. 295-296.

Grazing Land

Value to Our State Economy. The livestock business is probably of special interest to Oregon because it utilizes the thousands of acres of "too" lands---lands too wet, too dry, too frosty, too rough, too rocky, too mountainous, or too far from markets to be of value for farming. A large proportion of our mountains and the major part of Eastern Oregon falls under the above classification, so it is little wonder that the livestock industry is so important here. Among other things, this livestock industry also stimulates and supports certain farming sections which raise fattening and wintering feeds such as alfalfa and other types of hay, grains, corn, ensilage, mangles and beets, and waste products such as sugar beet tops and refinery residue.

Problems of Our Range Management. Stories from our early settlers invariably tell of the beautiful stands of bunchgrass which covered much of the open range; but today we find that much of the bunchgrass has been killed out and replaced by annual weeds and inferior grass or new stands of sagebrush. And still other areas have been so seriously treated that they are actually a serious erosion problem. Deep gullies have been made deeper, thus lowering the water table, and making the surrounding area incapable of supporting as good a stand. Most of this has been due to overgrazing, or other careless range practices.

Among the things that are being done to conserve what good range is left and bring back to production some of the other are: proper stocking; proper seasonal use; proper distribution of livestock; and reseeding of the badly depleted areas. This work is supervised by the closely co-operating Range Development Service and the Soil Conservation Service. In the section of this paper on Soils I treated in more detail the range practices mentioned above.

Figures 20 and 21 a re two scenes taken from the Basin and Range Province. They represent two entirely different types of grazing land. The first is taken in the vicinity of Abert Lake and represents the typical dry open range of Eastern Oregon. The other was taken looking across the meadowlands of the Fort Klamath region, north of Upper Klamath Lake. In the case of the latter region, the area is divided into smaller cattle ranches and there is not the same problem as in the other type of range, since there is plenty of moisture from the lake and from artesian springs to support a heavy sod.

Wild Life

General Problems. In talking of wild life, our main problems deal with conservation measures. Since the wild life of our state has been constantly exploited since the time of the early fur traders, this has been long recognized by both our state and national governments as a big problem.

Fig. 19

Non-commercial timber—
Huckleberry Mt., west
of Crater Lake.

Fig. 20

Typical meadowland—
Fort Klamath Valley

Fig. 21

Open range land—
In vicinity of
Abert Lake

This is an important resource to our state, as it not only includes fish and game for our sportsmen and tourists, but it also includes the commercial fish of our rivers and immediate coast.

Problems and Solutions in Commercial Fishing. The Oregon Coast is fortunately bordered by a broad continental shelf, and is touched by the right balance of warm and cold currents to support a great deal of the fish life and the marine plants and animals upon which they feed. The most important commercial fish are salmon and halibut, but we also use herring and pilchard. Industries that have recently become more important are oysters, clams, crab, shrimp, and the new albacore tuna.

The greatest problems have arisen in connection with salmon and halibut, both of which have been seriously depleted in recent years.

The best example of successful conservation measures is seen in what the International Halibut Commission did. Their first big project was to study, over a period of several years, the life cycle of the halibut, and then make regulations for their successful conservation and gradual increase. This has been very sucessful. They are now doing the same thing with salmon, and are also getting good results. Also, another big enterprise is being carried on by the U.S. Government in overcoming the handicaps of the Bonneville and Grande Coulee Dams to the salmon spawning. Much of the data and the results

will not be available until the experimental period has been longer, but at present they are doing things such as catching the mature salmon at Grande Coulee Dam, artificially spawning them, and transplanting the young fish in the headwaters of tributaries coming into the river below the dam. At Bonneville which is not so high, they can solve the problem merely by fish ladders.

In our general conservation and restoration program they are: carrying on scientific research in regard to the life cycles; putting quantity limits on catch; closing seasons part of the year or for several years in some sections; establishing refuge or nursery zones closed to fishing; restricting size and age of catch; restricting type of gear; passing laws against river and coast pollution; increasing the young stock by hatcheries; and securing the co-operation of the fishing industry and the public by a program of education.

Game and Sport Fishing. The wild life of Oregon is so varied that a great number of regulations are necessary. Some of the types represented are: game birds such as ducks, geese, quail, pheasants, grouse, ptarmigan, sage-hens, and doves; fresh-water fish such as various kinds of trout and bass; and big game, including black tail and mule deer, native and Montana elk, and antelope.

These wild animals are kept with a comparatively even

population by establishing of open and closed seasons and other game laws, establishing of hatcheries and preserves, and keeping the amount of predatory animals down to a minimum.

Examples of the success of game conservation are seen in the way in which the mule deer and Montana elk increased in the last few years. The mule deer of Southern and Eastern Oregon have constantly increased and spread to new areas in spite of more hunters. The Montana elk was introduced into Northeastern Oregon about 30 years ago, being brought from the vicinity of Jackson Hole, Wyoming. These bands grew so fast that they have been able to have an open hunting season on them of nearly a month every year for the past eight years, and in some sections they have even opened the season on the cow elk. The elk herds were becoming so plentiful that they did much damage to the property of nearby ranches, such as tearing up orchards, eating up entire haystacks, and damaging cattle sheds and corrals.

Another place where our wild life is conserved is in the National Parks, where killing is prohibited. Figure 22 is a snapshot taken near Crater Lake of one of the gentle park bears. This particular bear smelled huckleberries in the car and was determined to obtain them.

Scenic and Recreational Resources

The conservation of our scenery and recreational features is tied up very closely with water, forest, and wild life conservation, since these resources are the integral part of

our vacationland.

The tourist traffic to Oregon has grown to such an extent in the last few years that much is being done to conserve and develop the features which are of interest to the traveller.

Some of the work being done is establishing of ranger stations and intelligent and courteous guides for the vacationer. Many resorts are built, especially around lakes and along the coast. Another aid has been the building of better roads and highways, and the retaining of the natural beauty of the forest along these routes. Public camp grounds are available in most forests, and there have even been certain sections designated as primitive areas, not to be marred by commercialization.

The main work left to be done in this state is in the more remote sections of Eastern and Northeastern Oregon, where many of the scenic and recreational features are practically unknown to the general public, and not even well- connected with civilization by roads.

Figures 23, 24, 25, 26, 27, and 28 illustrate types of scenery in various sections of Oregon. They include: a surf fisherman taking a rock bass off his hook near Brookings on the coast; storm-lashed waves and rocky sentinels near Newport; a view of Odell Lake in the Cascades; sagebrush and rimrock in the lower John Day region; and the high escarpment overlooking Abert Lake. There are enough types of topography and recreation to please every taste among tourists.[1]

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[1]Freeman and Martin, op. cit., pp. 298-323.

Fig. 22
Fishing resort of the Cascades—
Odell Lake

Fig. 23
High Fault Scarp—
Part of Abert Rim

Fig. 24
Open Range & Rimrock—
Lower John Day Region

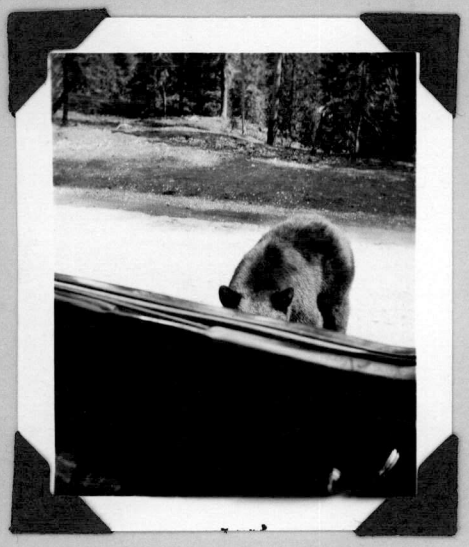

Fig. 25
Park bear —
Near Crater Lake

Fig. 26
Storm waves —
Agate Beach

Fig. 27
Surf fishing —
Near Brookings

Fig. 28
Erosional Remnants —
Near Newport

CHAPTER VII

IMPORTANT AGENCIES WORKING ON OREGON RESOURCE PROBLEMS

Throughout Oregon there are certain organizations working effectively towards the betterment of our methods of conservation and utilization of our natural resources. Below is a list of the more important ones:

Agriculture, State College of, Oregon State College, Corvallis, Oregon

Army Engineers, U.S. War Department, North Pacific Division, Offices in Portland, Oregon

Biological Survey, Bureau of, U.S. Department of Interior Regional Director, Portland

Bonneville Power Administration, U.S. Department of Interior, Adminitrator, Portland

Business Research, Bureau of
University of Oregon, Eugene, Oregon

Engineering Experiment Station
Oregon State College, Corvallis

Entomology and Plant Quarantine, Bureau of,
U.S. Department of Agriculture, Portland

Fisheries, Bureau of, U.S. Department of Interior
Portland

Fisheries, International Halibut Commission
University of Washington, Seattle

Forestry, School of, Oregon State College
Corvallis

Junior Forest Council of the Douglas Fir Region
Seattle

Forest Service, Division of Research, U.S. Department of Agriculture, Portland

Forest Service, Division of Education and Information,
U.S. Department of Agriculture, Portland

Geology and Mineral Industries, Oregon State Department of
Portland

Geological Survey, U.S. Department of Interior
Portland

Keep Oregon Green Association
Portland

Mines, U.S. Bureau of, Northwest Experiment Station
University of Washington, Seattle

Northwest Regional Council
Portland

Pacific Northwest Regional Planning Commission
Consultant, Portland

Park Service, National
Supervisor, Portland

Plant Industry, Bureau of, Division of Forest Pathology,
U.S. Department of Agriculture, Portland

Reclamation, Bureau of, U.S. Department of Interior
Branch Office, Portland

Roadside Council, Oregon
Portland

Soil Conservation Service, U.S. Department of Agriculture
Portland

Weather Bureau, U.S. Department of Agriculture
Seattle

Wild Life Association, Oregon
Portland

CHAPTER VIII

SUMMARY

Stumbling Blocks to Conservation

After starting this project, it didn't take me long to realize that there were a lot of forces retarding the progress of conservation work. In every field of research covered I found the same general types of barriers.

Most of the difficulties lie in the fact that the general public is not educated up to the needs for conservation. However, besides these, there are always a few unscrupulous people among our enterprisers who will deliberately fight against these measures because they may lose a little money. In the past certain lumbermen's organizations have been bad along this line; in fact right now I might mention a specific instance of difficulty caused by suspicion. Lately there has been a cry for co-operation among private timber owners in order to maintain sustained yield tracts. And lately several of these owners went together and tried to get income tax exemptions for money put in a sinking fund now to be used after the war towards improving the timber acreage and putting it on a sustained yield basis with excess labor which will be in abundance then. But, due to past experience with greedy lumbermen, the Government has to maintain a suspicious attitude and refuse the permission. There is also a tendency among lumbermen to distrust National control, and vote for state control instead. This is, in part, a suspicion based on the

fact that the large interests and associations can get a better representation in the state legislature than they could in Congress and can also lobby more effectively here at home.

The lumbermen aren't the only ones who have caused trouble. Ever since we started commercial fishing on a large scale basis, there has been trouble with lack of co-operation from the fisheries. Other trouble is met when trying to get over anti-pollution measures concerning the Willamette River. These efforts are now in the bottle-neck of selfish manufacturing interests in that region, and all these years that it has been talked about have brought no definite results, at least in many of the places. Also, a typical recent squabble was the one over Bonneville Power. Portland capital, as well as some other in that general vicinity, tried to get the Government to turn the power completely over to private interests. Situations like the above can be cited in every branch of our work towards conservation.

Conclusions

In making this survey my main object has been to obtain a reliable cross-section of the work being done with Oregon resources very recently, and interpret the results of that work in such a manner that I may apply it in making recommendations for the future of our state.

The material which I have offered in this paper on our various resources and their conservation and development is not meant to be absolutely inclusive within each of the subdivisions. It is meant only to represent all of the general types of conservation, development, and methods of solving these problems, used recently in Oregon. I feel that a brief, non-technical paper of this sort is necessary as a means of organizing in simple form the mass of material and information which is to be had on the various subjects; and I needed a well-organized resume of these activities in order to see the subject as a unit, interpret the results of the activities, and have a solid foundation for recommendations for the future.

In general, the results of our most recent work within the state have been good. It has been just lately that many of the enterprises have been started. Geological surveying and development of industrial minerals has been slower within the state than most anything; but with the establishing of the new State Department of Geology and Mineral Industries, and the effect of the present crisis, we should have no trouble in continuing their development. As far as conservation of our minerals is concerned, that will not be a problem to us for some time if we are sensible in our developments.

Our soils, forests, water resources, and grazing lands offer the greatest conservation problems. We will have to

make this a continuous and well-planned effort which we can never relax if we wish to reach the natural balance again and maintain it.

As far as wild life and recreational features are concerned, we have accomplished a great deal in the last few years; and if we continue our present system with a few modifications as new problems arise, we should have little trouble keeping them up to a high standard.

The big problem for the near future is to find the best method in which to educate the general public as to the extent and nature of our natural resources, the problems involved in their conservation and proper utilization, and the necessity for careful planning. This rapid development, especially industrial, and the heavy influx of people from other sections of the country with different traditions and standards of living, is going to be one of our biggest cultural and economic problems in the future. These new developments cause such things as overcrowded industrial cities, growth of slum sections and shack towns, lowering of the morale and living standards in many districts, and racial conflicts.

After the war there will be a lull in industry, and too many people in Oregon for the amount of work available. Most of these shipped-in workers and service men stationed in this area have the idea that they would like to stay here permanently and in that case we will have to adjust our economic structure to provide opportunity and work for all the extras besides our local people returning from other places.

During my travels and interviews while working on this project, I noticed more than anything else the wild pace of our production and the resultant relaxation of planning and conservation measures. Much of this is necessary for maximum efficiency, but we should at least keep a few things in mind in regard to the future; and as soon as the situation relaxes we will have to organize immediately with state planning if we expect to avoid a complete economic break-down.

Recommendations

The first and most important thing to do is to set up a state planning organization which is adequately backed and prepared to handle all phases of planning. There has been a new state planning board set up just recently, and they will probably do very good work on post-war planning; but they don't have as much money to work with as they need, and they aren't really organized on a permanent basis with a sufficient staff to handle all phases of detailed planning in the future after the immediate post-war period. The organization should co-operate with active organizations and research scientists, as well as maintaining an adequately trained personnel for their own staff. Their primary aim should be to study the problems concerning our natural resources in Oregon and suggest the best plans for removal of these problems. It should also plan for the cultural betterment of the state and should have

a separate office of education. This office should keep enough literature in circulation to enlighten the general public and secure their interest in the natural resource problems.

Another big help would be to introduce into the curriculum of our secondary schools, a course on Natural Resources. This course should be a required one; the texts used should be kept up-to-date and periodicals and recent reference material should be used in teaching it. Highschool teachers should be required to take certain prescribed courses in college in order to be certified to teach Natural Resources. The course should cover an entire year, and it should take up in order the following topics; essentials of physiography and geological laws and their effect upon the origin of natural resources; natural cycles and man's effect upon them in utilizing the resources; conservation and development of natural resources in our national economy; a resume of Oregon's resources; the best methods in conservation and proper utilization of resources; and the necessity for constant research and planning.

If the above school program were carried out, and in addition, there was plenty of interesting literature at all educational levels circulated among the people, we should have no trouble bringing to their minds our natural resource problems. With the public well-informed, and behind their legislators on these matters, we could expect progressive laws

such as we will not be able to obtain in any other way.

With sensible development of our resources, careful conservation and planning, and further education, we should gradually draw nearer to our ultimate goal---banishing the symptoms of want in a land of plenty, and insuring ourselves that we and our descendants will have plenty in the years to come.

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