

Multiple Use Upon Municipal
Watersheds of the Northwest


by

Walter F. Sargent

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Sources of Municipal Water Supplies

Municipalities of Oregon and Washington obtain their water supplies from wells, springs, lakes, and streams. Throughout the area, the tendency among larger communities is to tap lakes and streams as the most desirable source of water. Seattle, Washington and Portland Oregon, the two largest cities in this area, both tap lakes and streams for their water supplies. Spokane, however, obtains its water from wells that are said to have a capacity of one hundred million gallons of water per day (9). Some of the municipalities obtain their water supplies from headwaters of various streams, while others get their water from the larger streams themselves. For example, Wenatchee, Washington gets water from the Columbia river. In Southern Oregon, a number of towns obtain their water directly from the Rogue River. Thus, a watershed may vary in size from a few hundred acres to several thousand acres.

Ownership of Watersheds From Which Municipalities Obtain their Water Supplies.

Watershed ownership is divided into government ownership, private ownership, municipal ownership, and combinations of the three. Government ownership includes watersheds on National Forest land and those Reserves set aside by Congress and the President as Watersheds. An example of the latter is the Bull Run Reserve which supplies Portland, Oregon with water. There are ten city watersheds in Oregon and three in Washington that are protected by the Forest

Service under cooperative agreement with the cities involved. (10)

There are but few municipalities which have ownership of their entire watershed. Much of the watershed ownership is entirely or partially in private hands.

Effect of Forest Cover on the Water Supply.

There seems to be little agreement among authorities as to the effects of forest in equalizing the flow of water. Engineers, foresters, and conservationists agree, however, that a vegetative cover is a means of retarding erosion, conserving soil, and lessening torrential run-off. (3) Scientists and others agree that, by the very nature of things, the forests are more favorable for the production of moisture in their own and in areas adjacent to them, than are those sections which have been cleared and are now either agricultural or barren.

The usual result of removing cover from the land is that the soil's retentive capacity for water is decreased, and the run-off becomes greater in wet periods and less in dry ones. Rapid run-off is likely to mean greater pollution as swiftly moving water carries more silt and other foreign materials. As most municipalities depend upon a maximum base flow the year around, the presence of some kind of forest cover is imperative. Forest cover increases the water of percolation which is cleaner and purer than surface water and is preferred by those whose duty it is to provide desirable water for towns and cities.

Multiple Use upon the Watershed.

Presence of people and industry upon the watershed area endangers the maintenance of watershed cover and also creates a sanitation problem. Logging and grazing, both directly remove a certain amount of vegetative cover, while all uses increase the fire danger upon the watershed. And fire, out of control, is quite capable of destroying all of the vegetative cover which is so important in maintenance of a water supply. The sanitation problem can be handled by sanitary facilities and chemical treatment of the water, but there is a more or less public feeling against drinking once polluted water even if it has been purified. Sanitary engineers tell us it is not only possible, but practicable to convert the sewage of a city into pure and safe drinking water.

Multiple use upon watershed areas owned by the government or by municipalities is usually practiced with the idea of still maintaining a pure and sufficient supply of water. In some cases, maintenance of a pure water supply is considered as the optimum use and no other use is allowed on the area. Such is the case on the Bull Run Reserve mentioned before and on the Haskings Creek watershed which is owned and controlled by the City of McMinnville, Oregon.

But, on the other hand, the private owner has no consciousness of an obligation to manage the lands so as to maintain or improve watershed conditions. In fact, other uses are often necessary to the economic life of

many private owners, making the problem of conflicting land uses especially difficult and serious.

Previous Studies.

The only study of multiple use on municipal watersheds in the Northwest which the writer has had reference to is a report by the Oregon State Planning Board entitled "Water Sources and Watershed Protection Problems of Oregon Municipalities." This report deals with water sources of Oregon municipalities and the difficulties which they have experienced in maintenance of a pure water supply.

Method of Procedure and Sources of Data.

Procedure followed in making this report was; first gathering the material, second-grouping the material and outlining the report, and third-making the final report.

All data was secured from library references, inter* views, and personal observation.

LOGGING ON THE WATERSHED

In the Northwest, logging is probably the most important operation affecting watersheds of communities wishing to maintain a sufficient supply of pure water. (1) Logging already has been done on a number of watersheds, and is spreading to other watershed areas.

Effects of Logging.

Logging alone, if neither preceded nor followed by fire, destroys a smaller proportion of the understudy of young trees and shrubby species than of the main stand. (2) Some areas, however, that were clear cut and logged

with high powered machinery have had much of the lesser vegetation destroyed and in some places the litter has been nearly destroyed.

On clear cut areas, there is no longer appreciable interception of precipitation by tree crowns, and little high shade to retard snow melt or prevent evaporation. There may be, however, some shading of the ground by slash which exerts some beneficial effect on evaporation from the soil. On the other hand, areas that are partially cut still have some interception and shade.

The time that must elapse before surface conditions cut over lands are restored by reforestation to approximately what they were before cutting varies widely with the forest types and degree of cutting. (2) In many forest types, logged over areas are very abundantly invaded within a season or two by herbaceous plants. These at least serve to check erosion and start to build the extremely important litter. If natural regeneration results in poor stocking, it is often necessary to resort to planting. In Western Oregon and Washington, the rapid growth of vegetation considerably shortens the period of ill effects due to logging.

The mere presence of the industry on the watershed increases the fire risk; while the slash created by logging increases the fire hazard. Then, there is always the danger of slash burning getting out of control and doing untold damage.

While many of the present logging methods do not seriously injure watershed values; when followed by repeated fires, the areas are denuded of the highly important brush and litter cover. Forest soil without this protection of the top soil becomes almost impermeable when rain muddies the surface and causes soil particles to stop up the interstices through which sub surface run-off normally percolates (7).

Logging operations and camps are often sources of pollution. Thus, if the water is untreated before consumption, it is a potentially dangerous source of disease. However, the statement is repeatedly made that all surface supplies are potentially dangerous and cannot be considered safe without protective features.

Present Practices and Examples.

High value of timber on watershed areas has made it desirable for some cities to log their watersheds. In acquiring municipal ownership of their watersheds, a high purchase price was often paid due to the value of the timber upon the area, and logging is necessary to reimburse the city for the high purchase price.

Also, it is the policy of the Forest Service to practice multiple use where practical, and they combine timber management with water production.

The city water department of Aberdeen, Washington has used selective logging on Fairview Hill for many years (13).

It is now harvesting its third of a series of crops there. The area was first logged for fine virgin western red cedar; later peeler logs were removed from the Douglas fir stand, and at present the city has a contract for logging on a selective basis of the commercial western hemlock upon the area.

The city water department of Seattle, Washington, has been contracting logging on its watershed for many years. Recently the city tried to have the contracts broken, but the attempt was unsuccessful; so logging is still being carried on. (6)

In an interview with the City Manager of Forest Grove, Oregon, the writer was informed that the city water department would probably selectively log their watershed sometime in the future.

Logging has usually been necessary to the economic life of the private owner. In cutting timber it has often been the owner's purpose to harvest the existing timber and dispose of the cut-over land as soon thereafter as possible. Too often, logging methods have been used that were extremely damaging to young growth. (2) Some municipalities are obtaining ownership by purchase of tax delinquent, cut-over lands from the county.

Hillsboro, Oregon, gets its water from a recently logged over, privately owned watershed. In the summer of

1940, the city suffered from a water shortage and was compelled to buy water from the neighboring city of Forest Grove. The private lands of the Eugene watershed are being logged at present date.

GRAZING ON THE WATERSHED

Grazing upon municipal watersheds occurs chiefly in Eastern Oregon and Central Washington. The western part of the area is practically worthless for grazing because of the low forage value of most of the species of shrubs and herbs. In the climax types, there are a preponderance of shrubs or at least woody plants over succulent species, and secondary vegetation in the uncut timber is largely unpalatable to livestock. (15)

The more recently logged-off lands carry the most abundant feed. (11) About ten years after logging, the brush becomes more or less dense, crowding out the other growth; thus making less desirable grazing conditions. Grazing with livestock tends to keep down the weed and brush growth, and thereby prolongs the grazing period on lands such as these to a considerable extent. On the more recently cut over areas, the feed is better and therefore has a higher carrying capacity than those where the brush has developed.

Where a single burn has occurred there is a high percentage of palatable plants, but with repeated burns, there is less palatable vegetation and more bracken. Successive burning tends to increase the population of deep rooted, brushy plants and ferns and to reduce the

opportunity for grazing; while if the area is given protection from subsequent fires, reforestation will ultimately take place on Douglas fir cut-over lands and crowd out the palatable forage. (11)

In the more open grown pine forests of Eastern Oregon and Central Washington, conditions are more suitable for grazing on forest land.

Effect of Grazing on the Watershed.

The maintenance of maximum vegetative cover and continuance of grazing are naturally antagonistic, and unless certain recognized principles of range and livestock management are put into practice, there is danger of impairing the value of the watershed. (14) On many forest areas, because of easily erodible soils, steep slopes, open tree cover, and semi-torrential rains, overgrazing has and can create an erosion problem. (8) Heavy grazing, which seriously depletes the vegetative cover, together with the concomitant trampling of livestock, will compact the soil and destroy vegetation and litter that normally would keep the top layer of soil mellow and open. Thus, the efficiency of the watershed in maintaining a permanent flow of water is greatly decreased.

The presence of grazing upon a watershed increases the fire risk to a certain extent by the presence of herders.

The polluting effect of grazing on the watershed has

been compared with that of wild game. Bacteria injurious to human beings are not generally carried by domestic livestock in numbers likely to cause disease. However, contamination which affects palatability will occur. Chemical treatment of the water supply will take care of the pollution problem.

Present Practices and Examples.

Grazing on municipal and government owned watershed land is held under strict control. Government owned watersheds of streams supplying water for municipal purposes may be closed to the grazing of any or all kinds of stock when necessary to prevent erosion, floods, or the diminution or contamination of the water supply. (12) The Dalles city watershed is on National Forest land. The city permits grazing on its watershed under agreement with the Dufur Cattlemen's Association. (1) This agreement is subject to acceptance by the United States Forest Service. By fences or by herders, whom the association pays, grazing is kept within prescribed areas.

Grazing on privately owned watershed areas is not under the strict control as above, and overgrazing, with its possible ill effects on the watershed, is a major problem. Private owners are too often not concerned with the aspects of injuring a municipal water supply. Grazing is their occupation and that is all they are concerned with.

Grazing is practiced upon the privately owned lands

of the Eugene watershed.

RECREATION ON THE WATERSHED

The casual nature of recreation makes the choice of it as a use on the watershed a difficult one. It can hardly be classed with uses such as logging or grazing, because of the intangible return values. While direct monetary returns may be gotten from logging or grazing, the returns from recreation may often be only the pleasure of the users, and no accurate method of measuring this has of yet been determined.

Effect of Recreation on the Watershed.

While recreation does not directly remove the vegetative cover, the presence of recreational users greatly increases the fire risk on the area; thus, increasing the chance of fire destroying the watershed cover with possible ill effects upon run-off and stream flow. On areas open to recreational users, with people going here, there, and everywhere, the danger of fire through carelessness is a major problem.

Recreation also creates a sanitation problem. Sanitary facilities can of course be provided at central points, but the recreational users are too often not near these places. Of course, danger of pollution can be minimized by chemical treatment of the water, but here again the question of palatibility enters.

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Present Practices and Examples.

I have not as yet found any reference dealing with actual practices of recreation on municipal or government owned areas. Such situations, if they do exist, are probably under strict regulation.

Regulation of recreation on privately owned watershed area is, at the present, unpractical. Even if private owners were willing to cooperate with the municipal water departments, there are no laws, at present, to keep persons from entering wild, unfenced, lands. (1) Under such a situation, an attempt to exclude people from the watershed would be highly impractical.

Some sort of recreational pursuit is practiced on most of our privately owned watershed lands.

Here again the Eugene watershed is an example. This watershed has been previously mentioned under logging and grazing.

OTHER USES ON THE WATERSHED

Some other uses that are not as important as the ones already mentioned, but, perhaps, should be discussed somewhat are habitation, roads, mining, and other water uses such as power development and irrigation.

Habitation.

Habitation occurs more often on privately owned watershed land than on municipal or government owned land. Many private areas are inhabited by farmers, herders,

woodsmen, and summer residents. Presence of these people and their domestic animals increases the danger of pollution, and also increases the fire risk on the area. Here, again, fire, out of control, may sweep over the area with all possible ill effects upon the maintenance of a pure and sufficient water supply. Thus, habitation upon a watershed area requires sanitary regulations, chemical treatment of the water, and added fire protection.

Two watersheds upon which there are habitations are the watersheds from which the towns of Eugene and Forest Grove secure their water supplies.

Roads

Roads occur upon almost all of the municipal watershed areas, but not all of them are open to public travel. Some of the roads on government and municipal owned lands are open only to administrative or protective forces. Roads on privately owned land are usually open to travelers, and frequently have a fair amount of travel, especially in the summer months.

Use of these roads creates an added fire risk upon the area during the dry months. A match or cigarette butt carelessly tossed out of a passing car might easily start a raging demon of destruction.

Travelers on these roads also create a minor sanitation problem, that could be compared with that created by other

uses of the area. In fact, probably many of the travelers would be recreational users, which group has been previously mentioned.

The mere presence of the roads upon the area would not create much of a problem, but all would depend upon the use of the roads.

Mining

Mining could hardly be considered as a desirable use of a watershed due to pollution and increased turbidity of the water. (4) The writer has no information of any municipal watershed where mining is actually being carried on.

Power development

Power development and irrigation are in direct conflict with the municipal water supply. However, the case might be on a large watershed that there was enough water for either of the two as well as for the municipal water supply. Here again, the writer has no information regarding any municipal watershed, where either power developments or irrigation projects are being carried on.

SUMMARY

Findings

Multiple use as practiced upon municipal watersheds in Oregon and Washington varies greatly, not only between types of ownership, but within each type as well. On some municipally owned watersheds, multiple use is practiced;

while on others, water production is made the only use, or in other words, the optimum use. Also strictness of regulation of multiple use varies between the different municipally owned watersheds on which it is practiced.

Multiple use is practiced on some government owned watersheds; while on others water production has been made the only use.

On the other hand, multiple use has been or is being practiced on practically all privately owned watershed lands. The only regulations of multiple use on private lands are various state regulations and the owner's desires. There is, at present, no method by which a municipality can regulate uses on private land except by agreement with the owners or by purchase of the area.

Multiple use on municipal watersheds creates three problems, (1) direct removal of too much of the forest cover, (2) increased fire danger, and (3) pollution of the water.

Yet, despite these problems created, multiple use has been practiced successfully on certain municipal watersheds without serious injury to the supply of water. Amount of forest cover directly removed can be controlled. Fire protection can be increased to meet the added fire danger, and sanitary facilities and chemical treatment of water can be used to combat the pollution of water.

Where multiple use has injured the supply of water is where multiple use has been carried on under no regulations; where too much of the forest cover has been removed either directly or by fires.

Conclusions

Due to the diversity of opinions and practices, research is needed to determine how the forest cover of the Pacific Northwest can be made most effective in watershed protection, and what uses of the forest can be combined with maintenance of satisfactory watershed conditions.

While the questions concerning multiple use upon municipal watersheds evolve many factors, which can only be ascertained by a study of each watershed; if a watershed can have other uses and at the same time furnish palatable water, those other uses should certainly be encouraged.

If part of the watersheds can by regulation practice multiple use upon the watershed and still have a sufficient, palatable water supply; there is no reason why the other watersheds could not do the same to a certain extent.

Uncontrolled multiple use should be stopped. Watershed lands now in private hands, that affect a community of interest should be acquired or controlled by a public agency. Where ever possible, municipalities should buy or gain control of their own watershed. Then multiple use

upon the area could be kept under control.

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BIBLIOGRAPHY

- (1) Oregon State Planning Board.
"Water Sources and Watershed Protection Problems
of Oregon Municipalities."
- (2) U.S.D.A. Misc. Pub. #397 July, 1940.
"Influences of Vegetation and Watershed Treatments
on Run-off, Silting and Stream Flow."
- (3) Raphael Zon.
"Forests and Water in the Light of Scientific In-
vestigation."
- (4) Richard Gaines Tyler.
"Water Resources of Washington."
U. of Wash. Eng. Exp. Sta. Bul.
- (5) C.L. Forsling.
"The Water Conservation Problem in Forestry."
Jr. of Forestry, Feb. 1933.
- (6) B.E. Hoffman.
"Seattle's Watershed Controversy."
Jr. of Forestry, May, 1932.
- (7) C.J. Kraebel - L.F. Kellogg.
"The Forest Guardians of our Watersheds."
Jr. of Forestry, Sept. 1938.

- (8) U.S.F.S.
"A National Plan for American Forestry."
- (9) King - Fullenwider
"The Pacific Northwest."
- (10) U.S.D.A. F.S. North Pacific Region.
"What's What in the National Forest of Oregon and Washington."
- (11) Harry Arthur Lingren.
"Report on the Feasibility of Grazing Livestock on the Cut-over Lands (timber) of Columbia and Clatsop Counties, Oregon."
- (12) U.S.D.A. F.S.
"The Use Book - Grazing."
- (13) West Coast Lumberman Jan. 1940.
"Port Orford Cedar Thrives on Graves Harbor."
- (14) U.S.D.A. Bul. 675.
"Range Preservation and its Relation to Erosion Control on Western Grazing Lands."
- (15) Jr. of Ag. Research Vol. 43 No. 5.
"Vegetative Changes and Grazing Use on Douglas Fir Cut-over Land."