Eugene Water & Electric Board

DRINKING WATER PROTECTION PLAN

Technical Report

AUGUST 2000

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SOURCE PROTECTION MONITORING

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August 2000

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Issue

Monitoring and assessments are the foundation for sound water quality management. Several types of monitoring schemes exist that may address certain objectives but ignore others. *Baseline or Trend* monitoring, provides data and information on existing conditions for measuring overall watershed health. This type of sampling scheme is the backbone for the *McKenzie Watershed Council's* (MWC) Water Quality Monitoring Program. Although the program has also recently focused on *high flow storm events*, a piece of the monitoring puzzle is missing.

When one considers source protection in direct relation to potable water and its production, a comprehensive monitoring program that could pinpoint adverse trends does not exist. The *MWC's* program is very helpful in surveying overall river health. A system is needed that could provide detailed information for trends caused by individual resource uses, activities, or projects. *Impact monitoring* should be used to decide whether a source or use has negative impacts. It would provide the missing element to qualify and quantify sources that may effect McKenzie River water quality in relation to potable water treatment.

Sampling and analyzing sources with the highest risks in conjunction with sound management, can easily result in reducing public and private costs when it comes to expensive technologies for water treatment. Depending on the contaminant, it can be much safer and cost effective to reduce or eliminate a contamination risk. Making potable water treatment more complex is an expensive endeavor. Construction costs could run into the millions for enhanced coagulation (the use of granular activated carbon) or an air stripping process.

Source monitoring should lead to partnerships with other agencies. They could develop management and process control changes and make decisions that could alleviate pollution sources. The scale and scope of effort for a monitoring program can drive other agencies and stakeholder's respect. A small scale monitoring program may not involve major polluters. A solid and substantial program indicates Eugene Water & Electric Board's (EWEB) commitment and concern to all stakeholders. An effective monitoring program may also be a means to maximize public confidence.

A *Source Water Quality Monitoring Program*, to be effective and efficient, must be integrated with other existing monitoring programs. It must integrate with the *McKenzie Watershed Council's (MWC)* program as well as Springfield's groundwater protection planning. It must also coordinate with the *Cedar Creek Monitoring* volunteers. The city of Springfield's Storm Water Monitoring Program is not yet developed. It is one of the most important pieces for integrating with EWEB's plan. The USGS, USFS, BLM, ODOT, and education outreach programs will also be part of the overlay and will be discussed later in the text.

The monitoring plan needs to maximize opportunities that include major players in the watershed to develop and implement monitoring systems. This should include fish, wildlife, and biodiversity-enhancing activities. A good agenda will initiate voluntary monitoring programs. It should offer support and technical expertise to other agencies planning monitoring programs.

There is a need for providing a quality database that may be used as a tool for *retrospective* water resource policies. This applies to not repeating past deleterious events. *Prospective* water resource policies could benefit as well. A strong program could enable us to make better land use decisions.

Background & Discussion

The following text lists the ten *Risk Categories* ranked by the Source Protection Planing Team. The first subject, *Storm Sewer Outfalls*, is considered the highest risk. Subsequent risks are in descending priority. Each risk is given a brief description along with a discussion of the important issues. *Analysis* and *monitoring needs* are the second and third part of each *Risk* section. Reference may be made to MWC's Mckenzie Basin Ambient Monitoring Network Map on page 19, Table I - Risk & Monitoring Needs on page 20, and Table II - Monitoring Recommendations on page 21.

Storm Sewer Outfalls

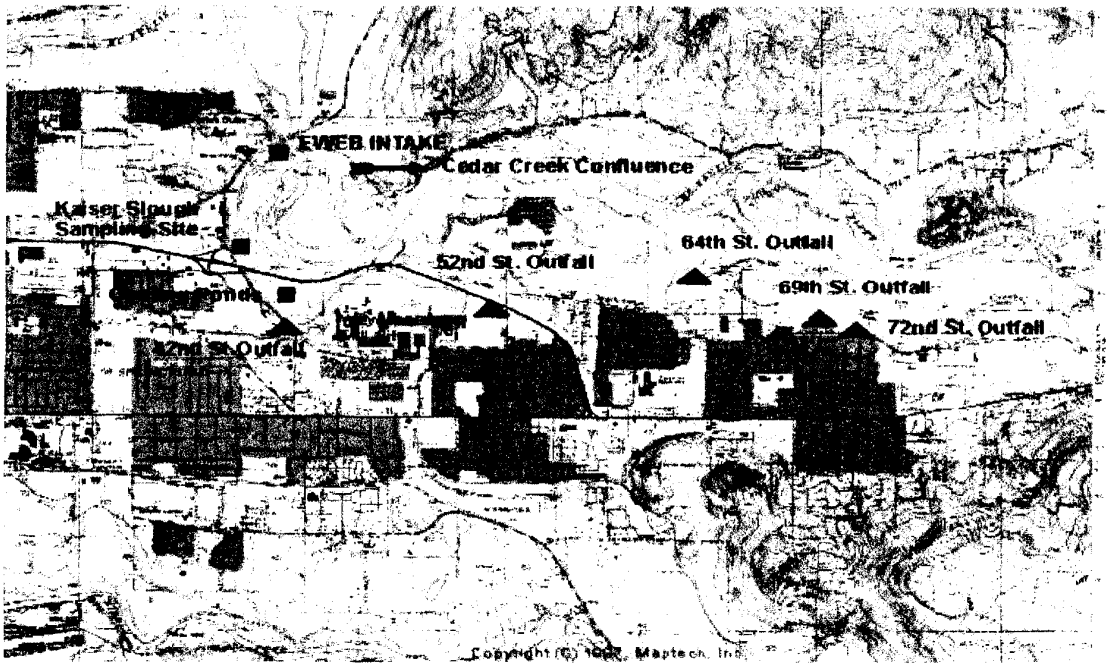
Five storm sewer outfalls make their way into the McKenzie River immediately upstream of the Hayden Bridge Intake. Three of them empty into the South Fork of Cedar Creek, a tributary of the lower basin. This represents much of East Springfield's storm water, which includes urbanized residential and industrial runoff. These point sources have the potential to carry gas, oil, and grease products, as well as heavy metals, pesticides, herbicides, and other toxic chemicals. Human and animal-borne pathogens are other likely constituents.

Another outfall located on 42nd Street near the Weyerhaeuser site drains a large area on both sides of Main Street from about 41st Street to about 47th Street. It normally flows into *Irving Slough* during the drier months, which ends in the *Soil Conservation Canal* and eventually drains into the Willamette River. However, during the rainy season, it can overflow a small dike and go into the *Kaiser Slough*, which also receives discharges from the *Weyerhaeuser Cooling Pond System*. These sinuous backwaters enter the McKenzie River about one quarter mile above the Hayden Bridge Intake.

The fifth outfall is near I-105 and 52nd Street. It delivers storm water runoff from an area approximately between 48Th and 58Th Streets into the *McKenzie Slough*. This slough branches off from the McKenzie and is the source of process and non-process water for Weyerhaeuser's Paper Mill. The non-process cooling water travels through the *Cooling Pond System* which is separate from the slough. The *McKenzie Slough* flows around the perimeter of the cooling ponds. This portion is called the *Fish Bypass Channel*. Both the *Cooling Pond System* and the *McKenzie Slough* flow into the *Kaiser Slough*.

The channel system is complex. A simpler description might be that the *52nd Street Outfall* empties into the *Kaiser Slough*. However, the complexities need to be understood when one chooses monitoring sites so that the sources may be distinguished. There is potential for contamination from three sources, the storm water runoff from the 41st Street to 47th Street area and the 48th and 58th Street area, and from the cooling ponds. The Weyerhaeuser facility is discussed in the section concerning Industrial and Commercial Facilities.

FIGURE 1
SPRINGFIELD STORM SEWER OUTFALLS



The Weyerhaeuser Company facility on 42nd Street has a storm sewer system as well. It consists of five outfalls. The outfalls are connected to the *Cooling Pond System.* During the drier months or if a spill should occur at any time of the year, a valve directs some of the storm flow to their waste water treatment system. This allows potentially hazardous runoff to be treated, then enter the process water effluent which discharges to the McKenzie River downstream of EWEB's Hayden Bridge intake. During the rainy season the storm sewer flow goes to the Irving Slough and/or into the Kaiser Slough. One of the five outfalls (at 52nd Street near I-105) also receives urban runoff from the eastern portion of the city. Upstream, a ditch runs along the eastern boundary of the Weyerhaeuser facility. Storm runoff and seepage from the site could enter this system. This system also flows into the McKenzie Slough, which, as noted above, is the source for the company's water.

Weyerhaeuser has a monitoring program similar in design to larger metropolitan storm sewer programs. The environmental staff performs visual inspections monthly and monitors during storm events twice a year. Analysis is performed for Total Suspended Solids, pH, Oil and Grease, and the metals zinc, copper, and lead.

Analysis - The City of Springfield is beginning to develop a monitoring program and expects to implement it sometime this year. Presently, there is a very good opportunity for EWEB to collaborate with them and assist in designing a program that fits the needs for both municipalities. An integration of the programs could save money and labor.

The Cedar Creek Monitoring Program is a citizen volunteer group managed by the McKenzie Watershed Council. Of the ten sites they monitor, three of them are storm sewers. They measure E. coli, turbidity, Dissolved Oxygen (DO), temperature, and conductivity. Their goal is to sample monthly. Other programs the Cedar Creek Group is involved in are habitat enhancement for fish and wildlife and macro-invertebrate surveys. They will be an excellent group with which to collaborate.

The local schools are involved in many of these activities. Springfield and Thurston schools are doing some water quality monitoring with other sources. Future opportunities are numerous. EWEB and Springfield Utility Board sponsor grant money for some programs and equipment. The teachers involved are research oriented and eager to find new meaningful learning opportunities for their students.

Water quality issues for drinking water are much different from "standard" storm sewer monitoring. The latter must at least conform to Department of Environmental Quality requirements and standard monitoring protocol consists of a type of screening analysis. The minimum constituents measured are pH, Total Suspended Solids, Oil and Grease, and the metals lead, copper, and zinc. The outfalls may only be monitored twice a year with at least sixty days between samples. Potable water monitoring needs are much more complex especially if screening shows significant measured amounts for any of the aforementioned parameters. Greater frequency is also necessary.

The Tualatin River Basin Watershed Management Plan has a very good monitoring program. They abide by the *Municipal Separate Storm Sewer System* (MS4) requirements and their monitoring protocol is more in-depth. Besides the screening parameters, they measure BODs, CODs, DO, conductivity, and nutrients. Those include total and ortho-phosphate, ammonia, nitrate, and total Kjehldahl nitrogen. They also analyze for cadmium and chloride which they measure because it is indicative of septic systems. They recommend measuring Total Solids which is the sum of suspended solids (TSS), and total dissolved solids (TDS). This is because of the toxic effects from dissolved forms of metals in watersheds. In addition they offer the advice that there is an "art" to sampling for Oil and Grease. It may require in-line composite sampling apparatuses to approach the volume of this material that enters aquatic ecosystems.

Eugene's Stormwater Monitoring Program is complex. Frequencies vary: monthly, bimonthly, year-round, seasonal, annual, and "as needed." Sample types vary according to the activity being monitored. Some sampling protocols are continuous for pH, DO, temperature, and conductivity. Others may be grab or composite samples. There are "clean" techniques for metal sampling, and some sites require photographs for physical assessment. Methods include *Biomonitoring*, which is the assessment of aquatic invertebrate communities, while others employ automated monitoring.

Bioassays or other toxicity tests may be conducted where water quality problems indicate toxicity associated with the discharge. Routine monitoring, at least monthly, includes the following parameters: pH, conductivity, DO, Temp., BOD, Total Phosphorus, Total Kjehldahl Nitrogen, Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Hardness, Total Calcium, Total Magnesium, and the four metals, Total and Dissolved copper, cadmium, lead, and zinc.

Monitoring needs - Potable water monitoring requires much more in-depth analysis than simple storm water screening, as the scopes are different. A viable approach might be to initially perform screening-type monitoring to all five sewer outfalls at a regular frequency. Monthly sampling may be a good idea until something is detected, then focus on the problem with more in-depth parameters such as nutrients, inorganics, Synthetic Organic Chemicals (SOCs), and Volatile Organic Chemicals (VOCs), analysis. Individual tests should be added or deleted depending upon the nature of the detection. Frequency of sampling should be reduced to conform to the seasonality of the source and when there is no detection. Approximately six samples per year would be collected from each outfall. Monitoring during storm events is essential, especially in the beginning. Colloids and suspended particles (turbidity) are the "vehicles" for contamination entering the McKenzie River. A sampling frequency of two or three times a year would be necessary in a fledgling program

Another issue of interest is differentiation between animal and human pathogens. An analysis comparing ratios could have value in management options and public outreach programs. Virus Differentiation and Fecal Coliform versus Fecal Streptococcus have been suggested as a method for determining whether the contamination is animal or human. Chloride analysis would also have some value, as it can be used to identify failed septic systems.

Urbanized Contamination

Residential, commercial, and light industrial development is accelerating, and the conversion of forest and farm land is particularly noticeable in the lower basin. Urbanization is occurring in the Walterville and Camp Creek area. East Springfield and the Thurston area are undergoing rapid growth. Runoff from paved surfaces, construction sites, and road building have the potential to contribute to nonpoint and point source pollution.

Initial development leads to increased sediment loads in the watershed. Urbanized runoff also includes nutrients, pathogens, metals, petroleum products, toxic chemicals, and increased biochemical oxygen demand (BOD). Not only does this result in the complexity and expense of treating potable water but it has deleterious results for fish, wildlife, and the whoe ecosystem.

Light industry has similar potential for watershed contamination. Hazardous material use and transport increases the risks of accidental spills and can have more serious consequences for potable water. Leaking underground storage tanks (USTs) is another important consideration.

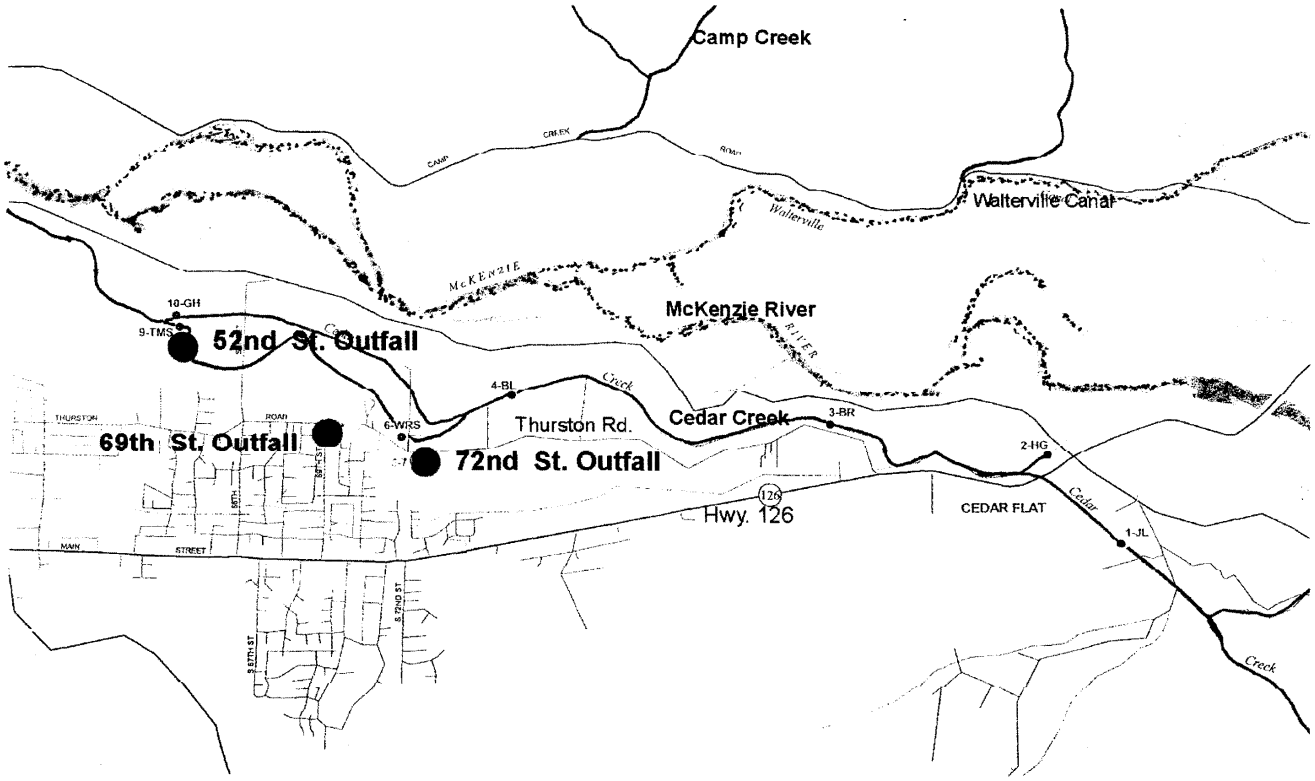
The Cedar Creek sub-basin is an eight-mile tributary to the McKenzie River that has its confluence one and a half miles above Hayden Bridge. Part of this area is within the Springfield Urban Growth Boundary. Therefore, urban growth is an issue. Land uses include crop production, orchards, and the raising livestock. Sheep, horses, llamas, and cattle are among the animals raised in this area. Much of East Springfield's storm water (three main outfalls) empties into the South Fork of Cedar Creek. Besides private wells, this sub-basin provides groundwater for Springfield Utility Board's (SUB) municipal wells.

Analysis - Urbanization can be associated with both point and nonpoint pollution. Storm sewer outfalls, ditches and culverts, road runoff, temperature increases, septic system failure, and seepage all contribute to *source* degradation. This category has many similarities with monitoring considerations for Storm Sewer Outfalls. They have all the same potential contaminants and for convenience's sake could be considered the same when considering monitoring parameters.

Non point sources require more careful consideration when locating monitoring sites. Some integration opportunities exist with the MWC's monitoring program. Their monitoring site at Hendricks Bridge would be a good location to provide baseline data regarding concerns about Cedar Creek and the Camp Creek area as well. Coordination with the Cedar Creek group would be of benefit to everyone. Source Protection monitoring should expand and go into more detail than their current program. Some screening of the Camp Creek sub-basin needs to be conducted considering the growth and land uses activities that have occurred in that area.

Monitoring needs - *Impact monitoring* is needed to monitor both point and non-point sources. We need sampling sites above suspected risks on the main stem of the river and at the suspected source. These may be small creeks and culverts. Two or three monitoring targets would be adequate for initial assessment. The parameters should be more generalized initially and go into more detail when significant detects occur. Analyzing for nutrients, inorganics, DO, BOD, TOC, and Fecal Coliform might be a good start. Fecal Coliform and Fecal Streptococcus comparisons would be very valuable as a management tool in this sub-basin.

FIGURE 2
CEDAR CREEK and SPRINGFIELD'S STORM SEWER



Haz-Mat Transportation

Hazardous material transport might be the most difficult risk to deal with when designing monitoring needs. The Oregon Department of Transportation (ODOT) records indicate a variety of hazardous materials passing over roads through the McKenzie watershed. Gasoline and diesel are the most common. Cargo material information is sporadic and limited. Therefore, an opportunity exists for better data collection, resulting in better management.

Analysis - A spill of a hazardous chemical that reaches the river could have catastrophic effects for potable water treatment. A spill incident would most likely involve petroleum products. Depending on the nature and volume released, the treatment plant might have to shut down. The contaminant could very well be untreatable for the current treatment facility. This might lead to water rationing. A monitoring scheme would have to be initiated for that particular contaminant, and continue until the risk was no longer present. One approach would be to follow the "plume" down the river to track its *Time of Travel* (TOT). Samples would have to be collected at the filtration plant's intake. A close estimate could be made by using the modified USGS Travel Time Graph from the GEM Report. This graph should be posted in a convenient location at Hayden Bridge and the Environmental Department Office.

New technology has given us some very reliable and rugged, yet sophisticated monitoring instrumentation. Many treatment plants around the world are using remote instrumentation for "early warning" detection. It is possible to monitor for fuels, phenols, hydrocarbons, and oils in storm water.

The city of New Orleans has eight grab sampling sites above their intake using gas chromatography for VOC analysis. However, that is an extreme situation.

Monitoring needs - Potential contaminants from this risk category could include SOCs, VOCs, inorganics, heavy metals, oil and grease, and nutrients. There may be a need for contamination monitoring at the intake, or better yet, further upstream if the instrumentation could be protected from vandals.

Industrial and Commercial Facilities

A variety of commercial and industrial business are located in the East Springfield and Thurston area. They include auto service stations, repair shops, logging and construction companies, a particleboard plant that used to belong to Weyerhaeuser, sand and gravel operations, print shops, school bus shops, medical facilities, and dry cleaners. These represent potential point and nonpoint sources of pollution mainly through storm sewer runoff. Some possible contaminants include gasoline and its additives, oil and grease, SOCs, VOCs, inorganics, temperature increases, and heavy metals. Among the metals are arsenic, barium, cadmium, copper, lead, mercury, and zinc.

Leaking USTs have potential for groundwater and surface water contamination. Deteriorating tanks, improper installations, and failed tanks may greatly influence water quality. Spills and overfills could put surface waters immediately at risk.

The Weyerhaeuser Corporation has a pulp and paper mill immediately upstream of the Hayden Bridge intake. Their facilities include a cardboard container recycling facility, log decks, chip piles, pulping operations, and two paper machines, a twelve million gallons per day process wastewater treatment system, and a truck shop. Process wastewater is discharged through an in-stream diffuser downstream of the EWEB intake. The wastewater facility was expanded and improved in 1995 and leachate risks have been reduced.

The pulp mill's *non-process cooling water* (along with the process water) is pumped from the McKenzie Slough and is discharged into a series of two cooling ponds that discharge into Kaiser Slough. This flow is about eight million gallons a day. Much of this water is used to maintain proper temperatures for batch digesters. There is a risk for contamination in this process. If there is a leak, shutdown, or system failure, process chemicals could, and have, entered the cooling water. Potential contaminants are various and complex. They include mixtures called *black liquor and white liquor* that contain many chemicals and compounds including caustic soda, methanol, various acids, tannins, and turpentine and related compounds.

The potential for higher temperatures from Kaiser Slough could have an impact on higher concentrations of *Disinfection Bi-Products* (*DBPs*) when considering potable water treatment. Flows from the cooling ponds *and McKenzie Slough* combine ahead of the discharge into the McKenzie River, which reduces thermal impacts.

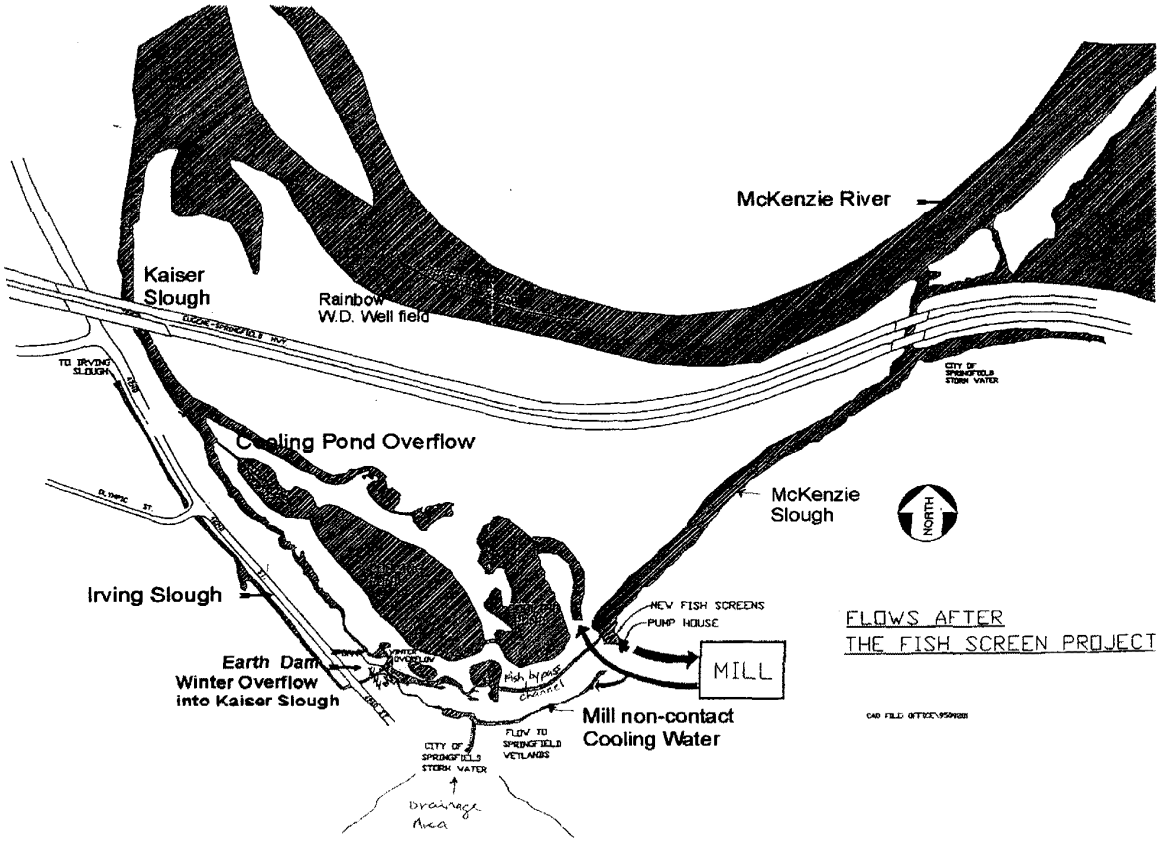
Stormwater and wash-down water from the plant site, including runoff from the parking and truck shop areas, discharges to the Kaiser Slough during the rainy seasons. Further consideration and facts were discussed in the previous *Storm Sewer* section.

Another important issue relates to *pentachlorophenol* (*PCP*) ground water contamination. A thorough discussion may seem necessary but is so involved that it goes beyond the scope of this text. However, a brief discussion is warranted. In 1994, Weyerhaeuser found the chemical in four shallow wells they used for ground water monitoring. The chemical originated from contaminated soil around the old sawmill where they sprayed freshly milled lumber with *PCP* solution to prevent the growth of fungus and keep the appearance 'fresh' for marketability. Approximately one-thousand cubic yards of contaminated soil was removed from the site. Over time, sixty-nine monitoring wells have been drilled. The wells vary in that they are deep, shallow, and intermediate in depth. Away from the source, contamination has mostly been found in intermediate and deep wells. A near by well field operated by Springfield Utility Board (SUB) and Rainbow Water District is at risk of becoming contaminated and is monitored every two weeks by Weyerhaeuser. A model has been developed that describes a PCP plume moving toward the well field to the northwest of the mill. This is upstream of EWEB's intake. The model predicts PCP will reach the public well field at a maximum concentration of 5 micrograms per liter. A *Granular Activated Carbon Treatment System* has been constructed by Weyerhaeuser to treat the water. If and when contamination is detected, a decision will be made to treat and use for consumption, or to shut the wells off and use other sources. The plume appears to be moving at 170 to 330 feet per year. Concentrations are predicted to be as high as five parts per billion into the river. Conservative modeling indicates further dilution if it mixes with the river and that will bring it well below *Maximum Contaminant Levels* (MCLs).

The MCL for pentachlorophenol is 1 ppb. Minimum detection levels are 0.08 ppb. The concentration in the surface water is predicted to be, considering low river flows or "worst case scenario," below detection levels. Using this blueprint, the concentration would be about 0.0004 ppb. Computer modeling shows that PCP in the groundwater will measure in the non-detect range by the year 2011.

Analysis - EWEB's Hayden Bridge staff has been monitoring the Kaiser Slough monthly since February 1995 for SOCs and VOCs. This site encompasses Weyerhaeuser's Non-Process Cooling Water, the 42nd Street Storm Sewer Outfall (during rainy periods), the 52nd St. Outfall, and the drainage ditch along Weyerhaeuser's eastern boundary. There have been detectable levels of benzene and barium. This sampling site does not allow for any differentiation or identification of particular pollution sources.

FIGURE 3
WEYHAEUSER COOLING PONDS
(for non-contact cooling water)



It could work well for screening purposes but other monitoring parameters need to be added to give monitoring more value. VOC and SOC analysis, if augmented with more diverse parameters, could result in more meaningful analysis. An example would be to add parameters for conductivity, pH, DO, BOD, TOCs, and metals.

Monitoring for SOCs cannot be ignored when considering the penta plume. We need to maintain close communication with Springfield Utility Board, Rainbow Water District, and Weyerhaeuser regarding the PCP monitoring and the results.

Monitoring needs - For the penta plume issue, we should initiate *Baseline* monitoring within a year. In addition, consideration should be given for a "third" opinion. For example, securing the services of a hydrologist to advise EWEB on the depth of the *plume* if it reaches the river may be more cost effective than a misdirected monitoring plan. Hiring a consultant with EWEB and their consumers in mind may give a different perspective.

For non-process cooling water and storm sewers, another set of parameters is necessary. They may be complex. Point and non-point sources need to be considered for the two storm sewer outfalls in this area. They are the 42nd St. and the 52nd Street outfalls. The parameters that will be considered first are from a screening approach: BOD, OD, COD, TOC, conductivity, pH, metals, and inorganics. When significant detections occur, more detailed analysis needs to be performed. This should include SOCs because of the *PCP* issue. Similar to the *Stormwater Monitoring Needs*, but maybe more important in these locations, metal analysis needs more scrutiny. Dissolved forms of metals contaminate watersheds. Analysis for *Total Recoverable Metals* may be more apropos. Nutrients and chloride concentration should at least be initially monitored. Chloride can be an indicator of failing leach fields. Initial monitoring of Fecal Coliform versus Fecal Streptococcus may be of value for the storm sewers. Consideration should be given to the seasons and what is observed in the field.

Road Vegetation Management

The *Integrated Pest Management* (IPM) system might be one of the best developments reducing risks in the watershed. The total amount of herbicides used has decreased due to improved application methods and the *Integrated Vegetation Management* (IVM) program. This was initiated in recognition that fewer chemicals were needed to achieve effective management of roadside vegetation.

Lane County Public Works Department uses IVM in their program for roadside spraying. They stress that chemicals are used only on request or on an as needed basis. Plots of blackberries and alders are cut, sprayed, then planted with low growing grasses and mowed during the growing season.

The Oregon Department of Agriculture (ODA) issues and monitors statewide pesticide-use permits for commercial applicators. For some of the past years, no herbicide spraying has occurred within the Willamette National Forest above McKenzie Bridge.

Analysis - Herbicide is applied in the spring to gravel shoulders in an eight-foot-wide strip along highways and major roads. Chemicals used have been Oust and Roundup (glyphosate in petroleum base). Spot spraying is done with Weedone, Garlon and Krenite. Fall spot spraying of blackberries occurs along the highways. The county uses Rodeo (glyphosate in water-base), Garlon 3A on broadleafs and alders, Telar for horsetails, and Oust. Glyphosates are subject to metabolism and break down in soils and water.

The greatest risks involve situations where spraying occurs followed by a rain storm. This would allow the greatest possibility for much of the applied chemical to enter the watershed. IPM practices are intended to avoid these situations. Thus, the risk is reduced but not eliminated.

Monitoring needs - Potential runoff from roadside streams and ditches will find its way into the river. These pollutants include sediments (turbidity), petroleum products and by-products, metals, inorganics, and herbicides (SOCs & VOCs).

Because of the IPM and IVM programs and the resulting reduction of herbicide use, the risks are much lower. Applications are seasonal, monitoring is not as high a priority as are the first four risk categories. It should become a priority if there is an 'outbreak' of some particular pest resulting in spray applications. If one were to monitor, it might occur immediately after application, especially if followed by a rainstorm. Storm event monitoring should apply to this risk. A good monitoring site would be Hendricks Bridge.

EWEB needs to maintain good communication with the Forest Service, BLM, ODOT, and Lane County Public Works and encourage them to continue to manage vegetation without herbicides.

Agricultural Activities

Agricultural lands are concentrated around the Walterville and Camp Creek area, the lower portion of the watershed. Commercial crop production includes filbert orchards, Christmas and holly trees, corn, wheat, pumpkins, peppermint, and blueberry farms. Seed crops and nurseries are also present. Small cattle operations have been identified, as well as sheep, goat, and horse raising. Hobby farms are common.

Analysis - According to the county extension agency, many different chemicals are used for the various crops grown in the watershed area. The greatest concern would be for atrazine (used for corn and very soluble), lorsban (very soluble), and 2,4-D (moderately soluble). Utilization of *Integrated Pest Management* techniques allows farmers to use fewer herbicides and pesticides than was practiced in the past.

About 1,000 acres of filbert orchards are found along the McKenzie River. They are concentrated between Hendricks Bridge and a few miles above the town of Vida. Since irrigation is not needed for these orchards, minimal movement of pesticides through the soils occurs. Filberts require slightly more nitrogen than the other crops grown in the area, and fertilizer applications are approximately 250 lbs./acre.

Monitoring needs - Non-point source pollutants typically include sediments (turbidity), nutrients (eutrophication), pathogens, pesticides, and oxygen-depleting organics. Others pollutants could include oil and grease, and VOCs. The McKenzie Watershed Council's monitoring program appears to be covering this activity very well. *Impact monitoring* has not yet been employed and may not until *trend* monitoring results show an indication for need. The MWC Storm Event Monitoring Program is addressing the sediment issue and metal analysis is included in the parameters for the Coburg Road sampling site.

Forest Practices

The Willamette National Forest covers more than half the watershed, mostly in the upper portion. The BLM manages about a third of the remainder. Private forest operations include Weyerhaeuser (the largest), Giustina Resources, Giustina Land & Timber, Rosboro Lumber, and others. The H.J. Andrews Experimental Forest located above Blue River Reservoir and comprises about 15,000 acres.

This research station focuses on activities concerned with applied forestry and forest and stream ecosystems. They monitor many important environmental variables. One such example was a research project concerning nutrient uptake in stream communities. The study involved nitrogen addition continuously over a period of time, then stream productivity was monitored and assessed. Projects like these have great value for watershed ecology.

Analysis - Clearcutting, road building, and slash burning can increase surface soil erosion. Under certain climate conditions, clearcuts may increase snow accumulation and melt. This can generate increases in peak flows during small to moderate storm events. This can also affect stream temperatures. More rapid snow runoff in some watersheds results in lower stream flows during the drier seasons. This fact may be more applicable to smaller streams and creeks in parts of the McKenzie Watershed than the river as a whole.

Weyerhaeuser uses urea fertilizer on a seven to eight year rotation. They own land on both sides of the river and both receive fertilizer applications on advanced growth in one year out of seven or eight. According to Weyerhaeuser's foresters, herbicide use affects less than 5% of their holding in any given year. Glyphosate and Oust are mainly used.

In cooperation with state agencies (ODFW, ODF) and other organizations (Pacific Rivers Council, McKenzie Landowners Association), Weyerhaeuser has completed watershed analyses on their ownership in the McKenzie basin. These analyses found that surface erosion and sediment delivery to streams is rarely observed associated with harvest operations. This is primarily due to improved cable yarding techniques on steep ground, discontinued use of hot broadcast burns, and organic matter retention to maintain soil productivity. The watershed analyses did identify forest roads as a source of fine sediment, particularly when there is active truck traffic. Prescriptions that improve road construction (especially drainage) and maintenance were developed and are being implemented to reduce those sources of fine sediment.

Their analyses also evaluated the potential for timber harvest to increase peak flows due to increased accumulation and accelerated melting of snow in forest openings. The hydrologic modeling showed, under current harvest management scenarios, increases in peak flow in small

streams would not increase more that 10-15% relative to unharvested conditions. This increase is possible in smaller flood events (2-5 year recurrence interval) and becomes negligible in larger floods (>25 year event).

Forest management activities are regulated under the Forest Practices Act. The act utilizes Best Management Practices (BMPs) to guide activities and protect other resources such as water quality. BMPs are regularly updated as new information becomes available from research and monitoring efforts.

The Oregon Department of Forestry, in cooperation with forest landowners and environmental organizations, is currently reviewing stream protection rules to decide if and how they may need updated to provide protection for recently listed salmon species.

Potential contamination from forestry practices should include sediments (turbidity), nutrients, temperature increases, SOCs, VOCs, and oil and grease.

The Forest Service and the BLM have not used herbicides or pesticides since the 1980's. Bt (Bacillus-bacteria) was used to combat a caterpillar infestation, but the bacteria are not pathogenic to humans and other animals.

Monitoring needs - The Source Protection Program will be most effective if EWEB continues to work with other agencies and companies to ensure that proper watershed analysis and forest practices are adequately addressed. The McKenzie Watershed Council's monitoring program appears to be covering this activity very well. MWC's Storm Event Monitoring program is also very useful. The team involved with sampling and reviewing data represents government agencies and private landowners such as Weyerhaeuser's environmental research personnel.

Recreation

More than forty-three recreational facilities exist on the watershed. This includes Forest Service campgrounds, county, state and municipal parks, lodges, resorts, cabins, golf courses, and winter recreation snowparks. Recreational activities are camping, hiking, skiing, rafting, kayaking, fishing, hunting, biking, and sightseeing. There are two golf courses in the watershed.

Analysis - Potential contamination from these activities includes petroleum products, solvents, paints, oils and grease, and untreated or partially treated human waste (nutrients and pathogenic microorganisms). Sedimentation (turbidity) can also be an issue. Streambank erosion may be caused by boaters and anglers. Soil erosion caused by off trail hiking and other activities can increase the sediment load of the watershed.

Both golf courses use herbicides, pesticides, fungicides, and fertilizer. One operation applies two slow-release applications of fertilizer per year, both using about 90 lbs./acre, and the other course uses 100 to 150 lbs./acre. That is much less than what is used for filbert production. Combined, both golf courses total less than 120 acres of maintained turf, so there is much lower potential for nutrient loading in the watershed from this activity than agriculture. Irrigation practices are water intensive so nutrient loading in the river cannot be overlooked as

a risk. However, the slow release-type of fertilizer may help reduce the non-point pollution issue.

Tokatee Golf Course uses insecticides once every five years for cutworms. Fungicides are used twice a year. Both Tokatee and McKenzie Golf Courses use Roundup as a herbicide. Total herbicide use for both courses are estimated at 20 gallons per year.

Recent landscaping at Belnap Hot Springs Resort and future projects of a similar nature could have an impact on watershed health. Changes in riparian habitats should involve communication with all stake holders before projects begin. More information is needed to better understand this issue.

Monitoring needs - Educational efforts aimed at recreational users and golf course landscape managers would likely be the most effective means for reducing impacts from recreational activities. Educational signs could provide information concerning Potable Water Source Protection and/or McKenzie Watershed Council programs at trailheads and boat ramps. EWEB needs to be active in programs that provide and maintain *restrooms and portable outhouses*. They may need to become more involved with other agencies' programs relating to recreational activities and monitoring.

The MWC's monitoring program is covering this risk with their monitoring sites. Among the parameters they are measuring are: COD, BOD, DO, coliform and fecal coliform bacteria, ammonia, ortho-phosphate, total phosphate, nitrate, nitrite, and Kjehldahl nitrogen.

Fish Hatcheries

The Oregon Department of Fish and Wildlife (ODFW) operates two fish hatcheries in the watershed area. The McKenzie Salmon Hatchery is near the town of Leaburg. They raise Chinook salmon from an egg stage to a smolt stage. Outdoor ponds are used for rearing and then the smolts are released in the river. The Leaburg Canal is their main gravity feed source. Another auxiliary source comes from Cogswell Creek. It flows into Leaburg Canal and provides the hatchery with a backup supply and when the canal is down for maintenance. Discharge from the fish ponds and stormwater runoff goes to the river from a settling pond and through an underground "smolt release line."

The Leaburg Trout Hatchery is at Leaburg Dam. They raise mainly Rainbow Trout with the purpose of releasing hatchery stock in local waters for angling. The water supply is from the reservoir created by Leaburg Dam.

Both locations have fuel storage tanks. The salmon hatchery has a 1000-gallon above ground storage tank used for 600 gallons of diesel and 400 gallons of gasoline. This system has double containment. Leaburg Trout Hatchery has two above-ground tanks containing 500 gallons of gasoline and 1,000 gallons of heating oil. Both tanks are filled according to seasonal needs.

Formalin was formerly used as a parasiticide for external treatment for the microorganisms Costia, Trichodina, and the fungus Saprolegnia. Leaburg Hatchery uses between 1,600 and 2,200 gallons of the formaldehyde and methanol mixture per year. Both hatcheries now keep a minimum supply on hand (maybe 1 or 2 barrels), because they have switched to a different treatment.

They are now using a less toxic chemical for treating ectoparasites. Technical-grade Hydrogen Peroxide (H_2O_2) has replaced formalin treatment. It is purchased and applied in the 35% concentration and fed in a concentration of about 200 parts per million. This is still a strong oxidant and involves special handling precautions, but potential impacts on the watershed have been reduced. Chronic effects are not similar to that of formalin. In the effluent mixing-zone, oxidation must have an effect on the micro and macro invertebrate profiles. The stabilizing agents may be of interest though the dilution makes them somewhat insignificant. Tin (5-10 ppb) and phosphate (PO4, 25-50 ppb) are the agents according to the supplier. Another chemical, "malachite green," is no longer used for controlling parasites.

Analysis - The hatcheries' discharge monitoring parameters are for Suspended Solids, and Total Dissolved Solids only. DEQ dropped the pH monitoring requirement. There are no limits set for hydrogen peroxide at this time. Leaburg Hatchery and the McKenzie Hatchery both have *settling pond systems* for solids. This is designed particularly for raceway and pond cleaning. A significant amount of debris is removed during this process and such a system is effective in allowing the supernatant, only, to flow back into the river.

Monitoring needs - There is a possible need for nutrient monitoring for the fish hatcheries. The Leaburg Hatchery carries the largest biomass for most of the year. Perhaps, if monitored, it would be preferred. BOD is another parameter one would want to look into.

EWEB needs to maintain good working relationships and communication with these operations. Inter-department communication within is important too.

Dams and Powerhouses

Seven dams have been constructed on the McKenzie River for hydroelectric and flood control purposes. Going down the river from Koosah Falls the uppermost dam is Carmen (River mile 84.2). From there, the river is diverted to Smith Reservoir. A spillway allows seasonal overflow from snowmelt and winter storms to overflow into the old channel between the reservoir and Tamolitch Falls. Underground diversions go from Carmen to Smith to Trailbridge Reservoir (RM 78.5). Hydroelectric power is produced at the Carmen-Smith project, Leaburg, and Cougar Dam which is on the south fork of the McKenzie River.

Blue River is a flood control reservoir that is a few miles below but on the north side. Leaburg Dam (RM 39) diverts part of the river flow into Leaburg Canal. It is returned to the mainstream six miles downstream at Leaburg Powerhouse. Walterville Canal withdraws flow at River Mile 28.5 and returns it below the Walterville Powerhouse at RM 20.9. The withdrawal and return flows of EWEB's two canals represent about 50 percent of the river flow, 2,000 cfs.

Leaburg and Carmen-Smith Powerhouses have above-ground storage tanks (ASTs) used for gasoline and diesel fuels. Leaburg has a 500-gallon diesel tank and a 1,000 gallon gasoline tank. The latter powerhouse has two 500 gallon tanks for fuels. The Army Corps of Engineers also have fuel storage tanks. Their two 500-gallon tanks are the new Convault-type systems with leak sensors and containment and are used for gasoline and diesel fuel. Cougar has an additional 750-gallon diesel tank for standby power generation. Blue River Reservoir has a stand-by power generator for closing the effluent gates. It also holds 500 gallons.

Electrical transformers can pose another potential risk. Containment structures exist at all the Army Corps and EWEB facilities and are of sufficient design to make this issue one of low concern. The staff at the Cougar Powerhouse is looking to improve their vault with a float system to drain water off the bottom so that it will always have full containment capabilities.

Analysis - Dams and Powerhouses have a combined fuel storage potential of about 5,250 gallons of gasoline and diesel fuel. Although containment facilities are present at each facility, some risk may be associated with accidental spills and overfilling. Leaking transformer oil risks have been reduced immensely by containment vaults and structures. It is important that they are inspected at regular intervals to ensure they will perform properly if needed.

These facilities commonly store and use solvents, paints, and oils in addition to fuels. Fifty-five gallon drums of solvents and oils are stored in areas designed to contain leaks. They need to be monitored regularly to make sure they will function properly as well. Small amounts of fertilizers, herbicides, and other garden products are present at EWEB's facilities. Risks associated with this may be similar to the private residential category.

Grease (as a lubricant) is another product commonly used at all facilities. From an environmental standpoint, a "green" grease is more desirable if it is a good product and its use should be encouraged.

The discovery and subsequent removal of contaminated soil from the Cougar powerhouse construction site demonstrates the potential risks of construction activities in the watershed. Even when these activities occurred more than thirty years ago, the risks remain. New construction is planned for modifying the ACOE's Cougar Reservoir facility. New structures will probably be built for thermoregulation in the South Fork of the McKenzie. The purpose is to improve Spring Chinook migration and egg survival rates. Risks to drinking water involve the construction process and its potential impact on turbidity. The project could start as soon as the summer of 2000.

That means the draw-down for the reservoir could begin in the spring of 2001. The emptying of the reservoir and a concurrent wet spring could cause effluent and river turbidities to be abnormally high. This could result in considerable expense for potable water treatment with their coagulation process. The silt from the reservoir could also cause a *taste and odor* (T&O) problem.

The temperature enhancing project, when complete could have a seasonal taste and odor impact as well. Spring temperature stratification begins occurring in April. When the epilimnion, (upper level), reaches about 14 degrees centigrade, a filamentous blue-green algal population reaches its highest density. This is normally mid to late May. Anabaena circinalis, the most prevalent species, at this time begins to produce millions of specialized reproductive cells called akinetes. A short time later, major die-off occurs. Since the filaments migrate vertically according to the cloud cover, they will be found most concentrated in the upper 15 meters and their population densities' often reach the tens-of millions per liter concentration.

The object of the ACOE project is to use the warmer surface water for release instead of from near the bottom. Potential impacts of concern to potable water are taste and odor and *Disinfection Byproducts* (DBPs). Powdered Activated Carbon (PAC) treatment may not be effective enough to eliminate the taste and odor. This was the situation experienced when the Corps was testing one of their "Fish Horns" (a surface release apparatus) a few years previous.

Monitoring needs - Potential contaminants from dams and powerhouses include SOCs such as fuels and solvents. VOCs are also of concern as well as oils and grease. Anthropogenically (from humans) caused temperature increases are also of concern because of the potential increases for taste and odor problems and DBPs.

Seasonal monitoring of the algal populations in Cougar and Blue River Reservoirs should continue if surface release projects are planned. TOC, nutrients, DO, temperatures, and chlorophyll a analysis would be needed. The T&O compounds geosmin and MIB could also be assessed.

FIGURE 4
McKENZIE BASIN AMBIENT MONITORING NETWORK

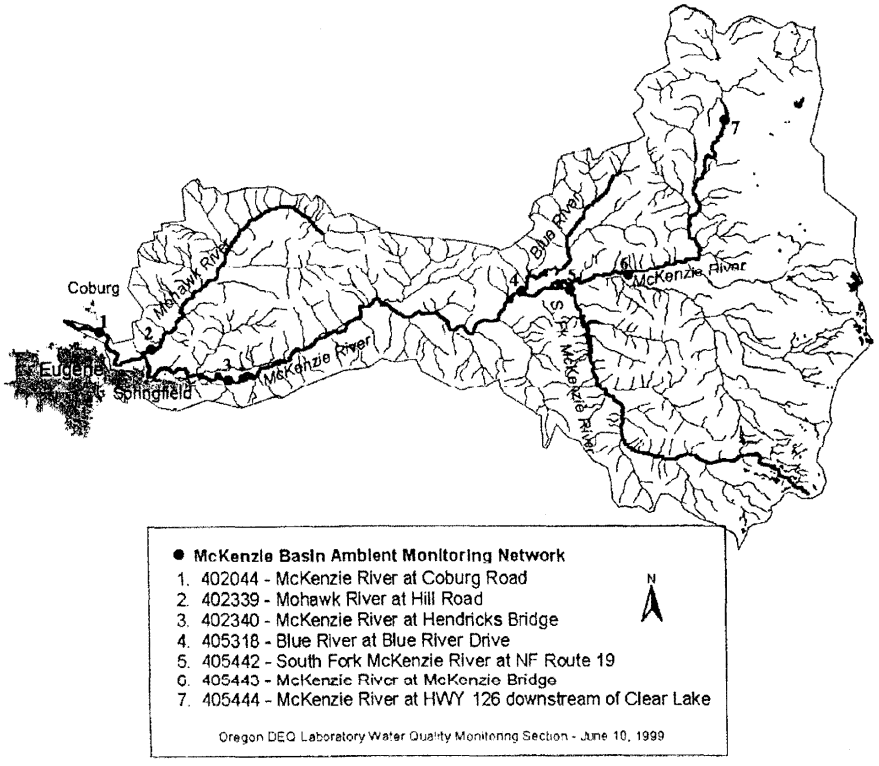


TABLE 1
RISK MONITORING NEEDS

Risk Category	Potential Contamination										Current Monitoring Programs
	Nutrients	Oils & Grease	SOCs	VOCs	Inorganics	Metals	Microbes	Sediments	Temp	Taste & Oder	
Storm Sewer Outfalls	X	X	X	X	X	X	X	X	X	X	MWC (Cedar Creek Monitoring Program) Spfd. Schools, City of Spfd.
Urbanized Contamination	X	X	X	X	X	X	X	X	X	X	MWC monitoring sites @ Coburg Rd. and Hendricks Bridge
Haz-Mat Transportation	X	X	X	X	X	X				X	
Industrial & Commercial Facilities		X	X	X	X	X			X	X	Hayden Br. samples Kaiser Slough each month; SOC's, VOC's
Road Vegetation Management			X	X	X						IPM Programs
Agricultural Activities	X	X	X	X	X	X	X	X		X	MWC; nutrients, Storm events (3X/yr.) bact. & turbidity
Forest Practices	X	X	X	X				X	X	X	MWC & Storm event monitor., F.S. & BLM have not used herb., pest. since 80's
Recreation (& golf courses)	X	X	X	X	X			X			MWC sampling @ Six pertinent sites
Fish Hatcheries	X		X	X							NPDES permit requires SS, &TDS
Dams & Powerhouses		X	X	X					X	X	NPDES permit; pH, Cougar & B.R. reserv.; nutrients, DO, temps, algae (T&O)

MWC - McKenzie Watershed Council's water quality monitoring program has seven sites and samples nine times through the year. Among the parameters sampled are E.coli., fecal E.coli., nutrients, Chlorophyll A, COD, BOD, Conductivity turbidity, DO, & temperature.

CCMP - Cedar Creek Monitoring Program is a citizen volunteer group managed by the McKenzie Watershed Council. They have a goal of monitoring ten sites monthly. The parameters are E.coli , turbidity, DO, temperature, & conductivity.

Nutrients - Phosphorus, Nitrates, Ammonia, and other nitrogen compounds

SOCs - Synthetic Organic Chemicals like pentachlorophenol, 2, 4, D. compounds, atrazine, etc

VOCs - Volatile Organic Compounds like benzene, styrene, chloroform, etc.

Inorganics - Chemicals such as cyanide and stat

Metals - Within the class of inorganics, includes barium, chromium, mercury, & Cadmium

Microbes - Coliform bacteria, E.coli., fecal coliform, fecal streptococcus, Giardia, Cryptosporidium, etc.

TOCs - Total organic Carbon

TABLE 2
MONITORING RECOMMENDATIONS

RISK CATEGORY	SOURCE MONITORING NEEDS (GAPS)	RECOMMENDATIONS FOR MONITORING (parameters)
STORM SEWER OUTFALLS	metals, inorganics, nutrients, TOCs, BOD, pH, SOCs, VOCs, temperature, conductivity, Fecal Coliform vs. Fecal Streptococcus	1) Integrate & coordinate w/ Spfd's monitoring program 2) Perform monthly "Screening"-type monitoring for first year for each outfall (5), or until significant hits occur then "zero" in using more specific analysis. (ie; *more s[ecific metals, SOCs, inorganics, perhaps VOCs)* 3) *Routine* monitoring parameters will be Total and Dissolved Cu, Pb, Cd, and Zn, pH, conductivity, DO, temp., BOD, T. Phosphorous, T.K. nitrogen, T. Solids, TOC, turbidity, and Chloride. Animal vs. human pathogens also. 4) Goal of using Composite Sampling Devices @ outfalls w/ most chronic problems.
URBANIZED CONTAMINATION	metals, inorganics, nutrients, TOCs BOD, pH, SOCs, VOCs, temperature, conductivity, Fecal Coliform vs. Fecal Streptococcus	1) Integrate with Cedar Creek Monitoring Program. 2) A "screening" site below confluence of N. & S. Forks near Lively Pool using same same screening parameters used for Storm Sewer Outfalls. 3) Baseline monitoring site at Hendricks Bridge and integrate with their parameters. 4) Monitor Camp Creek quarterly using Screening Approach
HAZARDOUS MATERIAL TRANSPORTATION	1) Monitor when & where it occurs; presence/absence for specific substances. 2) Monitoring instrumentation for gas, oil, & grease @ Intake	1) *Monitor when & where it occurs; presence/absence for specific substances.* 2) Monitoring instrumentation for gas, oil, and grease @ Intake
INDUSTRIAL AND COMMERCIAL FACILITIES	point and non-point stormwater runoff, BOD, DO, TOCs, conductivity, pH, metals, inorganics (SOCs, and VOCs are already being monitored)	1) Drop VOC parameter from present monitoring program. 2) Add an ambient site for background data. 3) Add BOD, DO, TOCs, conductivity, pH, metals, and inorganics. 4) Consider instrument installed @ Intake for monitoring Gas & Oil products
ROAD VEGETATION MANAGEMENT	EWEB should monitor scope & effectiveness of programs, Storm Event Monitoring for TOCs, SOCs, VOCs @ MWCs ambient monitoring site	Storm Event Monitoring coordination with McKenzie Watershed Council. Add nutrients, metals, BOD, TOCs, and SOCs to one site for screening purposes during several storm events to decide if regular monitoring is needed. Screening- type monitoring combined with Agricultural Activities. Use one site for several events in a given year, with a frequency of every three years
AGRICULTURAL ACTIVITIES	Storm Event Monitoring for metals, inorganics, nutrients, BOD, turbidity, TOCs, conductivity, and SOCs	Storm Event Monitoring coordination with McKenzie Watershed Council. Add nutrients, metals, BOD, TOCs, and SOCs to one site for screening purposes during several storm events to decide if regular monitoring is needed. Screening- type monitoring combined with Road Vegetation Management. Use one site for several events in a given year, with a frequency of every three years.
FOREST PRACTICES	A compilation of turbidity data from Hayden Bridge. This may enable one to study trends.	A compilation of turbidity data from Hayden Bridge. This may enable one to study trends.
RECREATION (and Golf Courses)	Monitor scope and effectiveness of other agencies programs. More microbe monitoring during season. TOCs, SOCs VOCs	Fecal coliform monitoring at two or three fixed sites downstream of heavy use
FISH HATCHERIES	Nutrients & BOD	Maintain good working relationships and communication with both hatchery managers and personnel
DAMS and POWERHOUSES	Monitor scope and effectiveness of in-house and ACOEs preventive management. Reservoir sampling for algae populations; potential taste and odor monitoring. Add parameters TOC, MIB, and geosmin	1) Monitor scope and effectiveness of in-house and ACOEs preventive management. 2) Continue reservoir sampling two or three times per season for algae populations; potential taste and odor monitoring. 3) Add parameters TOC, MIB, and geosmin. 4) Consider monitoring Walterville Pond tail-race with same parameters.

Conclusions & Recommendations

General Monitoring Recommendations

1) Integrating monitoring and sampling sites with the city of Springfield will be very important. Overlaying with the Cedar Creek program, McKenzie Watershed Council (MWC), Education Outreach, and the Department of Environmental Quality (DEQ) and their existing programs are also essential. Also, it should be a priority to coordinate with Willamette National Forest, BLM, ACOE, and ODFW water monitoring programs. Collaboration with others should allow more comprehensive monitoring while saving duplication, analysis costs, and labor.

2) Coordinate and consult with DEQ concerning monitoring design. Integration with their *Oregon Water Quality Index* (OWQI) parameters and our monitoring sites may be of value for comparisons to the *index*. The DEQ has a "network of ambient water quality monitoring sites." The OWQI parameters are temperature, dissolved oxygen (mg/l and % saturation), BOD, pH, total solids, ammonia, nitrate, total phosphorous, and fecal coliform. There may be some overlap of needs if we have common sampling sites.

3) The DEQ is developing and will implement *Total Maximum Daily Load (TMDL)* requirements for the Willamette River and its sub-basins. The purpose (stated very briefly), is to protect our rivers for beneficial uses. Uses affecting public health and salmonid fish rearing and spawning are the most sensitive issues. EWEB's monitoring program needs to integrate with theirs. The DEQ wants to take advantage of "work in progress and contributions from other parties to the data assembly and modeling work required."

4) Initiate and maintain good working relationships and communication with all stakeholding agencies and groups associated with the "Risk Categories" identified within the McKenzie River Watershed. This goal should particularly pertain to the Forest Service, BLM, ODFW, and private timber companies. The department of Agriculture, ACOE, Andrews Forest Research Station, and state and county roadside vegetation management programs are very important too. The objective is that communication regarding the *beneficial uses* of the McKenzie Watershed involves the *potable water source* for most of Lane County's citizens. A valid assumption is that effective management can be the most cost effective means for reducing and controlling risks to this resource. Monitoring contaminants from some risk categories may or may not be as effective when considering the elusive nature of measuring the necessary parameters.

5) Encourage "Storm Event Monitoring" performed by MWC and associated agencies and industries. It has value in assessing long and short term trends and impacts on potable water treatment. This may be a very effective monitoring tool for assessing risks associated with "*Agricultural Activities*" and "*Road Vegetation Management.*" The reasoning is that temporal-type monitoring may not be effective enough to identify the extent of pollution from these activities. Storm events drive sediments (turbidity) into the watershed. These particles are associated chemically and physically with contaminants. This creates the greatest potential for toxic materials to be flushed into our drinking water source.

6) We need to maintain flexibility with monitoring methods regarding sampling sites and parameters measured. It may take several years before showing some consistency and continuity. Initial sampling will involve simpler, less expensive "screening" parameters. When significant "hits" occur, monitoring parameters and sampling sites may change. The analysis may become more complex in that the goal is to allow identification of the contaminants and find the source.

7) Evaluate options for analysis and other techniques to differentiate between animal and human water-born pathogens. There is much interest in the value this information could provide for public education and land use management practices, particularly for storm sewer systems.

Specific Monitoring Recommendations

Specific site locations, parameters, and frequencies for each *Risk Category* will be discussed in this section. The categories will be listed by priority. This text should be used in conjunction with Tables II & III.

The estimated costs do not include labor that might involve as much as 30 hours per week, when considering data storage, analysis, and sample collection. "Estimated Costs" do not reflect instrumentation for analysis. Initial costs depend upon location of the laboratory. If Hayden Bridge is to be partially utilized, the expense could be much lower.

Storm Sewer Outfalls

1) *Impact monitoring* needs to be performed monthly using *screening*-type parameters at all five storm sewer outfalls in east Springfield. The target should be to sample at least two or three times a year during storm events. The parameters analyzed should initially be Total and Dissolved metals (copper, lead, zinc, and cadmium), pH, conductivity, DO, temperature, BOD, total phosphorous, total Kjehldahl nitrogen, total solids, TOC, turbidity, chloride, oil and grease, and fecal coliform.

2) Consideration will be given to new and innovative methods. Fecal streptococcus versus Fecal coliform analysis may be feasible. Other comparisons could be more effective.

3) When appropriate, automated composite-type sampling devices need to be installed for monitoring the outfalls or systems with the *most chronic or key* problems. These devices should provide at least DO, temperature, pH, and conductivity. They should also allow composite samples to be collected for any other parameter analyzed in a lab.

4) When significant detections occur, modify the testing parameters to pinpoint the source, particularly if this could be used as a tool for land use management practices. An example is if Kjehldahl nitrogen is high, one may want to break it down into more specific analysis. Nitrate, nitrite, and ammonia analysis would be appropriate. If TOCs are high, one should consider SOC and/or VOC analysis.

5) Analysis for inorganics, VOCs, and SOCs should be performed on any of the outfalls if indications or suspicions show that they may be contributors to that type of pollution.

6) When appropriate, *follow-up sampling* should be conducted at key locations to identify the source of the pollutant. This should be performed when samples from the storm sewer outfalls indicate that water quality problems are occurring in the basin.

Estimated Costs

1) $26,000 - Analyses costs only. Instruments such as composite samplers are not part of the cost estimate. The City of Springfield will have their own monitoring program and hopefully include some composite-type monitoring devices. This figure covers all monitoring recommended. It is assumed that Springfield will cover a good portion of the parameters recommended in their program and our program will overlay with theirs. Our interest involves greater sampling frequency than may be required by the city.

2) Differentiation of animal vs. human pathogens: $5,000 to $10,000 (rough estimate). EWEB's interest in this should not be greater than ~50% of total.

Urbanized Contamination

1) A sampling site should be set up for monitoring the impact of the Cedar Creek sub-basin. Screening-type parameters need to be used initially for monthly monitoring coordinated with the same times the volunteer monitoring is occurring. The best site would be to start below the confluence of the north and south forks. This would be near the Lively Swimming Pool. A *baseline* monitoring site should be located at Hendricks Bridge integrating with the MWC's parameters. These would be the same screening parameters as those used for monitoring storm sewers. They include Total and Dissolved metals (copper, lead, zinc, and cadmium), pH, conductivity, DO, temperature, BOD, total phosphorous, total Kjehldahl nitrogen, total solids, TOC, turbidity, chloride, oil and grease, and fecal coliform. Fecal streptococcus and coliform comparison analysis can also be considered. A similar *animal versus human pathogens* research needs to be considered.

2) Monitoring the Camp Creek sub-basin with one sampling site just above the confluence would be important. This sub-basin, though smaller than Cedar Creek, warrants screening due to the developmental, agricultural, and forest activities prevalent in the area. The parameters should be the same as those used for Cedar Creek. Quarterly sampling may be sufficient for starters. Monthly sampling would be better for a year or two, until what is occurring in the watershed is better understood. *Baseline* data could be coordinated with the Hendricks Bridge site.

Estimated Costs

The costs have been integrated with *Storm Sewer Outfalls*.

Hazardous Material Transportation

1) *If, when, and where?* It has happened in the past, and we have to expect that it will again. Sampling will depend upon the nature of the product and the volume spilled. Location where it occurs is essential. Monitoring when appropriate, should at least take place at the EWEB Intake. Tracking hazardous chemical spills in the river by collecting samples for analysis should occur if practical. Use of the *TOT* Table will be a valuable resource for decision making.

2) *Total Organic Carbon* analysis instrumentation for the Hayden Bridge raw water (untreated) line could provide great value for many types of spills. It would be a good tool for *trend* monitoring as well.

3) Consideration should be given to monitoring instrumentation for *gas, oil, and grease products.*

Estimated Costs

1) $16,000 to $18,000 for in-line monitoring instrumentation for gas, oil, and grease at EWEB intake.

2) A TOC analyzer is presently in the budget and the Hayden Bridge staff is in the process of selecting a unit.

Industrial and Commercial Facilities

1) *Add the parameters* BOD, DO, TOCs, conductivity, pH, metals (Cd, Cu, Zn, and Pb), and inorganics to the already existing Kaiser Slough sampling site. The Hayden Bridge staff should continue to sample monthly.

2) *Initiate a baseline sampling* site upstream of the Kaiser Slough/McKenzie River confluence and sample coincidingly with the Kaiser Slough site. Consider the Hendricks Bridge location for this site.

3) Install an in-line conductivity meter to monitor water entering the Raw Water Intake at Hayden Bridge. Potential contaminants from the Kaiser Slough are very likely to be associated with those that will produce relatively high conductivities. An option might be to allow the pumps to shut down when "alarm measurements" occur. This could prevent contaminated water from entering the Hayden Bridge Plant.

4) *Installation of a TOC monitoring device* at the EWEB Intake or in the Raw Water line to give continuous monitoring would be very valuable for this risk category.

5) Have a spare set of sample bottles and coolers available in case there is a significant "hit" of *TOC* so an opportunity exists to perform analysis on such parameters as SOC, VOC, inorganics, and metals.

6) Set up a *standard operating procedures log book* for the Hayden Bridge operator to bench test the raw water each time a relatively high TOC reading is verified. The parameters should be pH, conductivity, temperature, DO, and chlorine demand. Other related operational changes observed such as coagulation and *Streaming Current Monitor* reactions should be noted too.

7) *Install an in-line Dissolved Oxygen monitoring device at the H.B. Intake.* Raw water entering the plant passes through multistage vertical turbine pumps. The velocity, head, and varying pressures do not allow accurate and consistent laboratory analysis for dissolved oxygen. In addition, the raw water must pass through a sample pump to reach the lab. The titrations taken for analysis may presently range from 86% to 104% saturation within half an hour. If these measurements were "real," it could have serious implications regarding contamination. One cannot accurately measure DO of water having passed through these pumps. Dissolved oxygen is a very important parameter for raw water quality. It deserves a much higher priority than it is presently receiving.

Estimated Costs

1) $24,000/yr. or $1,900/mo. for additional parameters and adding a background site to the Kaiser Slough sampling site.

2) The TOC, DO, and Conductivity analyzers are already budgeted and in the process of being selected by the Hayden Bridge staff.

Road Vegetation Management

1) More research and investigation is needed regarding non-point source pollution. The Agricultural Water Quality Management Program is addressing non-point source pollution associated with Agricultural lands and activities. EWEB needs to be involved from the ground floor with this program to make sure our potable water interests are addressed.

2) Encourage, assist, and help coordinate with the MWC's Storm Event Monitoring Program.

3) Consider adding additional parameters to one or two of the present MWC sites that may address the potential risks associated with how land resources are being used. This could be nutrients, metals, BOD, TOC, and SOCs. Considering the expense of analysis, cost sharing may be a possibility. It could be of value to monitor at least the first big fall storm event for these parameters.

4) Considering the potential hazards to sampling personnel, the expense involved, and the difficulty of coordinating the number of people needed to effectively collect the samples, we might fall back to a frequency of every three years for storm event monitoring.

Estimated Costs

Storm event monitoring, three times per year, for metals, inorganics, nutrients, BOD, turbidity, TOCs, conductivity, VOCs, and SOCs: ($5,000/3) = $1,700.

Agricultural Activities

1) Because of the similarity of monitoring parameters and potential risks, the recommendations for this category are the same as that given for Road Vegetation Management.

2) Coordination of significant Storm Event Monitoring Sites must be considered for value. Hendricks Bridge seems to always be the best site. Most of these parameters are being measured by DEQ at Coburg Road already. The exceptions are TOC, and SOCs. We should consider adding them at that site for storm event monitoring.

Estimated Costs

This depends upon our commitment to storm event monitoring.

Forest Activities

1) Storm Event Monitoring and the MWCs watershed monitoring program appear to cover most of the issues for this Risk Category. There are seven sampling sites. Please refer to the map page 19.

2) Turbidity data has been collected hourly since about 1950 by EWEB's Hayden Bridge staff. A compilation of this data by someone, (perhaps a project for a graduate student), could be valuable. Possible trends could be analyzed.

Estimated Costs

This depends upon our commitment to storm event monitoring.

Recreation

1) Consideration should be given to monitoring for Fecal coliform at two or three strategic locations relative to high impact areas. The recreational seasons should be considered and reflect in the sampling sites chosen. Research before choosing sites will be necessary and should be coordinated with Willamette National Forest Recreation specialists. Baseline data is currently being collected by the DEQ/MWC. Refer to the *McKenzie Ambient Monitoring Network* map on page 19.

2) The issues involving golf courses could be considered with the scope of the Storm Event Monitoring Program. The impact does not appear to have the same potential impact as the *Agricultural Activities* category.

Estimated Costs

1) Fecal Coliform monitoring at three sites, six times per year; $900.

Fish Hatcheries

1) Nutrients and BOD are two parameters that could be considered for monitoring the two fish hatchery effluents. This could coincide seasonally with greater frequencies during the time facilities have heavier biomasses. It may not be the greatest priority, but it might be coordinated with hatchery managers. A possible scenario could be to sample biweekly at the Leaburg Hatchery from spring through the summer until the biomass was significantly reduced.

Estimated Costs

1) Nutrients and BOD, twelve samples collected from each hatchery per year; $3,900.

Dams and Powerhouses

1) The Hayden Bridge staff should continue monitoring Cougar and Blue River Reservoirs for cyanobacteria biomasses during the spring and early summer. Enough data has been collected to understand the basic dynamics of the blooms but continued monitoring is important because of the construction projects and the expected surface releases. Two or three times from early May to mid June would suffice.

2) The parameters TOC, MIB, and geosmin need to be added to the above monitoring plan to better understand the taste and odor potential from these sources.

3) Consideration should be given to similar monitoring for Walterville Pond. This pond is used for *Peak Demand* power generation at the Walterville Power Plant during the summer. This shallow pond, when dumped quickly, may cause a 'slug' of algae-thick water to enter the river and thus cause T&O problems for potable water. Consistent management could eliminate this problem if a smaller pump could be purchased to keep the water turned over on a continual basis.

Estimated Costs

1) Cougar and Blue River T&O monitoring (estimated analysis costs, excluding EWEB staff labor): $1,100.

2) Walterville Pond monitoring, eight times per year: $2,640.

Data Storage

1) Monitoring data needs to be entered in a database that has potential to link with the systems used be the Oregon Department of Environmental Quality. (*STORET or ACCESS*)

2) It is not a requirement to make public the data collected with the *Source Protection Monitoring Plan.* However, it may be a good idea in that public awareness can be an important element in watershed protection. We should consider using EWEB's website to inform the public of (at least), the nature and basic concepts of the monitoring plan. Giving the public access to the data may lend strength to the program. EWEB should keep their options open on this and defer this decision until a later date.

3) It would be ideal to use the GIS program, *ArcExplorer,* for the data collected. Data could be accessed by simply clicking on the various *sample sites* to retrieve the monitoring information.

Quality Assurance

1) It is of upmost importance that sample collection, storage, and shipping be performed by a trained and well-qualified person. Data integrity has to be maintained. It is no coincidence that sample collection is often performed by the sample analyst. The data needs to be credible and lack bias, therefore the analyst must be certified.

2) Data, in order to have accreditation with the DEQ, will most likely have to be performed by a laboratory that is certified by the National Environmental Laboratory Accreditation Conference (NELAC). This is the authority for establishing standards, testing for proficiency, and certifying labs. Among other things, this involves high standards for record keeping, instrumentation calibration, and using prescribed methodology. Currently, only drinking water is regulated in the state of Oregon by NELAC. However, in the future environmental samples may be regulated as well.

3) It would not only be convenient, but efficient to use the Hayden Bridge Laboratory for the analyses it could provide. The lab and its personnel are both certified and this may give some analysis a much quicker turn-around time.

APPENDIX

Table III - Source Protection Monitoring Budget

Table IV - Sampling Frequencies at Hayden Bridge

TABLE 3
SOURCE PROTECTION MONITORING BUDGET

RISK CATEGORY	MONITORING RECOMMENDATIONS	ANNUAL LAB COST ESTIMATES
Storm Sewer Outfalls	1) Five sampling sites w/ monthly monitoring for;total and dissovled Cu, Pb, Zn, Cd, conductivity, pH, DO, temp., BOD,TOD, T. phosphorous, T.K. nitrogen,T. Solids, turbidity, and Chloride. 2) Consideration given to analysis differing animal vs. huma pathogens	1) $26,000 (some of which will be shared with the City of Springfield) 2) Rough estimate; $5,000 to $10,000 (of which EWEB should not be more than 40% (?) contributor.)
Urbanized Contamination	Integrated with Storm Sewer Outfalls	integrated with Storm Sewer Outfalls
Hazardous Materia Transportation	In-line monitoring instrumentation at EWEB Intake for gas, oil, and grease	For initial purchase ($16,000)
Industrial and Commercial Facilities	1) Add BOD, DO, TOC, conductivity, pH, metals, inroganice to existing monitoring ; Add a *Background* site for monitoring Kaiser Slough 3) Install an in-line conductivity probe @ EWEB Intake 4) In-line TOC analyzer for Raw Water	1 & 2) Additional parameters plus *background monitoring* site; $1,900/mo. or ~$24,000/yr. 3) Initial purchase of a conductivity meter for the intake $6,000 4.) $22,000
Road Vegetation Management	Storm event monitoring for metals, Inorganics, nutrients, BOD, turbidity, TOCs, conductivity, VOCs and SOCs (3x's every three years)	($5,000.00/3) = $1700.00
Agricultural Activities	Storm Event Monitoring for metals, Inorganics, nutrients, BOD, turbidity, TOCs, conductivity, VOCs, and SOCs (3x's every three years)	included in above category
Forest Practices	Compilation of turbidity data	
Recreation	Fecal Coliform monitoring and three sites (6x's/yr.)	$900.00
Fish Hatcheries	Nutrients and BOD (12x's for each hatchery)	$3.900.00
Dams and Powerhouses	1) Continue monitoring algal densities in May and June at Cougar and Blue River Reservoir (3x's/yr.) 2) Walterville Pond Monitoring (8x's/yr.)	1) $1,100.00 2) $2,640.00

Total annual budget; $70,240
(excludes instrumentation costs)

TABLE 4
SAMPLING FREQUENCIES for HAYDEN BRIDGE

Parameters	Required Monitoring Frequencies	Performed Monitoring Frequencies	Costs per Test	Annual Expense
Finished Water (lab)				
Phase II & Secondaries	every 3 years	quarterly	$1,400	$5,600
Nitrate (NO3)	quarterly	quarterly	$30	$120
TTHM'S (Trihalogenated Methanes)	quarterly	quarterly	$60	$240
Haloacetic Acids (will be required)	quarterly	quarterly	$100	$400
Asbestos (will be required)	every 3 years	annually	$300	$300
Radionuclides	every 4 years	every two years	$700	$350
Coliform	120/month	~250/month	performed in house	
Giradia & Cryptosporidia	not required	~quarterly	$350	$1,400
Enteric Viruses	not required	~annually	$1,500	$1,500
Raw Water (at intake)				
Phase II & Secondaries	not required	monthly	$1,400	$16,800
Enteric Viruses (raw water)	not required	~annually	$1,500	$1,500
Kaiser Slough (SOC's & VOC's)	not required	monthly	$800	$9,600
Total Organic Carbon (TOC's)	not required	bi-weekly	$30	$720
Taste and Odor (Geosmin and MIB)	not required	Sp/Su Fall seasons	$200	$1,600
Dioxin	every nine years	every three years	$800	$267

annual budget : ~$60,000

DRINKING WATER PROTECTION PLAN

EFFECTIVE PARTNERSHIPS

Laurie Power
Environmental Manager
Eugene Water & Electric Board
August 2000

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EFFECTIVE PARTNERSHIPS

EFFECTIVE PARTNERSHIPS

Issue

EWEB has the responsibility to provide safe and reliable water to its customers. However, meeting this goal is becoming more challenging when many potential threats to clean water are the result of diverse sources within a watershed, and useful solutions are often beyond the control of EWEB. Partnering with local community members is an effective means to accommodate various activities while protecting water quality.

Background

By the time McKenzie River water reaches EWEB's intake at Hayden Bridge, it has passed through lands that have been put to various uses by property owners and managers. Because our water source passes through forested areas, we must contend with logging, erosion, and timber management. The McKenzie also travels through rural and agricultural areas where we may deal with septic systems, agricultural run-off and erosion, and urban areas, where we need to address storm water drainage, run-off from pavement, and increasing development. These activities are regulated and managed by various jurisdictions. Except for our hydroelectric projects, EWEB has virtually no direct control or authority to prevent or reduce any of the risks posed by these activities.

Because of our high interest in water quality and recognition of the piecemeal approach to managing the McKenzie's water resources, EWEB co-founded the McKenzie Watershed Council in 1993. EWEB has been an active member since, leading the effort to establish an ambient monitoring program for the McKenzie to track water quality trends over time. EWEB helped design the Council's storm event monitoring program and supported the special Cedar Creek monitoring program. Results from these monitoring efforts indicate that the McKenzie generally has exceptionally good water quality. There are a few concerns, notably in the Cedar Creek sub-basin which takes in the storm sewer discharges from east Springfield.

In addition to long-term support of the Watershed Council, EWEB has participated in watershed assessments for sub-basins in the McKenzie under the jurisdiction of the Forest Service, Bureau of Land Management, and Weyerhaeuser Company. We have reviewed landscape management projects, timber sales, and water quality management programs developed by the Blue River and McKenzie Ranger Districts of the Forest Service. We helped out in highway cleanup projects, planted trees to restore riparian function, and co-authored brochures for homeowners on the value of riparian areas.

Discussion

EWEB recognizes the importance of "cross-program" coordination where our goal of safe and reliable drinking water is coordinated with local watershed management initiatives that foster pollution control and prevention and aquatic ecosystem restoration and protection. There are several new or ongoing initiatives in the watershed that can directly impact the water quality of the McKenzie River by addressing the potential risk categories identified by EWEB. The timing and level of EWEB's participation in these initiatives depends on several factors, including the intensity of the threat to our source water, alignment with our Environmental Policy, and potential effectiveness of the initiative.

Cross-Program Coordination Opportunities

1) Continue to participate on the McKenzie Watershed Council and support Council activities to protect the watershed.

   Risk Category - all

   Analysis - EWEB was a founding partner of the McKenzie Watershed Council, established in 1993 to foster better stewardship of McKenzie River watershed resources. The Council serves as an invaluable forum for information exchange, joint decision-making on common issues, and coordination of watershed protection and restoration activities. EWEB financially supports the council's annual work program, in particular water quality monitoring programs and community education.

2) Support the City of Springfield's efforts to develop and implement a storm water management program.

   Risk Category - Storm sewer outfalls; contamination from urbanized areas

   Analysis - EPA issued a final rule on December 6, 1999 regulating storm water discharges from small municipalities. This rule applies to Springfield. The rule imposes six minimum measures: public education and outreach, public involvement, illicit discharge detection and elimination, construction site runoff control, post construction storm water management, pollution prevention, and good housekeeping requirements for municipal operations. Springfield will begin development of a comprehensive water resources management plan, including storm water, in 2000.

3) Support adoption and implementation of SUB's drinking water protection overlay district.

   Risk Category - Commercial and Industrial facilities

Analysis - The proposed overlay district is a key strategy for the Springfield Drinking Water Protection Plan, adopted by the city and SUB and Rainbow in 1999. It was certified by DEQ in December. The City is now able to restrict or prohibit new commercial or industrial operations that reside within the districts from using hazardous materials that are potential groundwater contaminants. The City can set standards for the storage, handling and production of haz mat within the districts, as well as review new or expanded haz mat uses.

4) Work with Lane County, ODOT, SUB and others to develop a detailed analysis of the potential risks posed by hazardous material transport and an action plan.

Risk Category - hazardous materials transport

Analysis - The Environmental Risk Assessment completed by GEM Consulting for EWEB in 1995 and updated in 1999 recommended that a detailed analysis of the potential risks posed by hazardous material transport be completed before alternative routes or other management options be considered. Details regarding hazardous material shipments, accidents, population distributions would be developed as part of such an analysis. There are other recommendations in the report for determining time of travel from various points on the McKenzie to the intake, response and communication networks, response procedures, and training that need to be pursued.

5) Work with Lane County to assure adoption of a Rural Comprehensive Plan for the McKenzie Watershed that protects drinking water quality.

Risk Category - Agricultural activities, contamination from urbanized areas, storm sewer outfalls

Analysis - In April 2000, Lane County proposed land use policies and zoning changes for the McKenzie Watershed. The policies contain general prohibitions on the use of dangerous chemicals or processes that may adversely affect the quality of the air, ground, or water of the McKenzie watershed. They further require onsite facilities to minimize the effects of storm water pollution and sedimentation from site development.

6) Donate funds to a Land Trust to protect water quality in the McKenzie basin.

Risk Category - Agricultural activities, forest activities, contamination from urbanized areas, recreation

Analysis - EWEB is committed to awarding a grant to an eligible land trust organization to purchase property and/or easements in the McKenzie watershed to protect water quality for drinking water purposes.

7) Support development and implementation of an Agricultural Water Quality Management Area Plan and rules for the McKenzie watershed.

Risk Category - agricultural activities

Analysis - SB 1010 requires development of water quality management plans for areas designated by DEQ under the 303(d) rules. Plans are to prevent and control water pollution from agricultural activities and soil erosion. Voluntary adoption of BMPs will be encouraged through education, demo projects, and technical assistance. Enforcement will be pursued only when reasonable attempts at voluntary solutions have failed.

Parts of the McKenzie River Basin have been designated for temperature under the 303(d) rules. A Local Advisory Committee has been appointed by the Oregon Department of Agriculture to draft the plan for the McKenzie (and Coast and Middle Forks of the Willamette) and began meeting in late April. The plan is due in one year.

8) Monitor Oregon Department of Transportation's and Lane County's practices for routine road maintenance. Continue IPM practices for EWEB's facilities in the McKenzie watershed.

Risk Category - Roadside vegetation management

Analysis - ODOT's practices for routine road maintenance have been proposed for approval by the National Marine Fisheries Service (NMFS) as protective of salmon and salmon habitat under their 4(d) rules proposed in December, 1999. These rules will be final in June, 2000. ODOT's program includes its Maintenance of Water Quality and Habitat Guide dated June 1999 and a number of supporting policies and practices, including a strong training program, accountability mechanisms, closing working relationships with ODFW, and several ongoing research projects. The practices include surface and shoulder work, ditch, bridge, and culvert maintenance, snow and ice removal, emergency maintenance, mowing, brush control and other vegetation management. ODOT's IPM practices for applying herbicides have not been proposed for approval by NMFS. Lane County uses an Integrated Vegetation Management Program for its roadside spraying program. Herbicides have been applied as requested by property owners or as needed in the judgment of the county. The County is revamping their IVM program in response to the federal 4(d) rule, reviewing ODOT's practices as a potential model.

9) Track changes in Oregon's Forest Practices Act and regulations as developed in response to requirements of the Endangered Species Act.

Risk Category - forest practices

Analysis - The Forest Practices Act is intended to ensure the growing and harvesting of Oregon's forests while protecting the forest's soil, air, water, fish and wildlife resources. The Act was amended in 1996. It is likely that further changes may be forthcoming in response to the 4(d) rules of the National Marine Fisheries Service to protect fish species listed under the Endangered Species Act.

10) Work with the McKenzie and Blue River Forest Service Districts to decommission substandard roads. Help with development of water quality management plans.

Risk category - forest practices

Analysis - Many roads on the Willamette National Forest do not meet current standards for safety and environmental protection. Many of these roads have not been properly maintained for a variety of reasons. Poorly designed or maintained roads promote erosion and landslides, degrading riparian and wetland habitat through sedimentation and changes in streamflow and water temperature, with associated reductions in water quality, and fish habitat and production. With public input, the Forest Service is developing strategies to aggressively decommission nonbeneficial or unauthorized roads.

Several stream reaches have been listed by the state Department of Environmental Quality as water quality limited for temperature. The Districts have been preparing water quality management plans to bring these streams back into compliance with water quality temperature standards.

11) Continue to participate in the McKenzie River Cooperative Maintenance Partnership to provide routine maintenance of river access sites on the McKenzie River.

Risk Category - recreation

Analysis - EWEB is a founding partner of the McKenzie River Cooperative Maintenance Partnership, established in 1993 to provide routine maintenance of McKenzie River access sites as a means of enhancing the recreational experience and protecting the water quality of the McKenzie River. The partnership is composed of public agencies and private entities, with financial support provided by EWEB, Lane County, Oregon Department of Fish & Wildlife, Oregon Parks and Recreation Department and the Federal Bureau of Land Management. EWEB provides the largest annual contribution in the amount of $12,700. Coordination of the program is provided by Lane County.

12) Monitor the fish hatcheries operated by the Oregon Department of Fish and Wildlife.

Risk Category - fish hatcheries

Analysis -The Oregon Department of Fish and Wildlife operates two fish hatcheries on the McKenzie River. The Leaburg hatchery, located at milepost 24, raises rainbow trout and the McKenzie hatchery, located at milepost 22, raises Chinook salmon. Both are permitted by the Department of Environmental Quality to discharge certain regulated wastes into the McKenzie. The NPDES permit requires specific compliance conditions regarding pollution abatement, and includes monitoring, reporting, and record keeping requirements.

13) Conduct environmental audits of the hydro generation facilities managed by EWEB; work with the Corps of Engineers to assure regulatory compliance and pollution prevention practices are in place at Cougar power house and reservoir.

Risk Category - dams, powerhouses, and reservoirs

Analysis - Since 1991 EWEB has been conducting environmental audits of its operations and facilities. These audits include site visit, inventory of materials and practices, regulatory review, development of an environmental operations manual, and training; all audits conclude with a legal opinion from our environmental attorney that states that compliance can be assured if the practices specified in the operations manual are followed.

EWEB has been invited to participate on the Environmental Task Team to advise the ACOE on minimizing the effects of the drawdown of Cougar Reservoir during construction of temperature control facilities.

Recommendations

Staff recommends strengthening existing partnerships and development of new ones that will effectively maintain and improve the drinking water quality of the McKenzie River. EWEB currently enjoys positive working relationships with several partners on the McKenzie Watershed Council where common interests have drawn us together on joint projects, for example, the ambient and storm event monitoring programs. Opportunities exist for EWEB to coordinate our drinking water goals with local watershed management initiatives, including assisting in program development and monitoring, technical assistance, financial support, lobbying, intergovernmental agreements, leadership on the watershed council, and public education.

DRINKING WATER PROTECTION PLAN

REGULATORY ANALYSIS

Mark M. Wall
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August 2000

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REGULATORY ANALYSIS

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REGULATORY ANALYSIS

Issue

The Eugene Water & Electric Board (EWEB) has little to no regulatory authority over activities, other than its own, within the McKenzie River watershed. However, multiple federal, state and local authorities do have existing and proposed rules, regulations and programs that can protect water quality. EWEB can support existing protective requirements, and positively affect proposed protections for the McKenzie River.

Regulatory Analysis Summary

Federal, state and local (city and county) governmental bodies have varied levels of jurisdiction within the watershed. Most agencies have a primary focus other than water quality, and typically fall into one of two categories:

1) Control or managing the use of resources, which include forestry, agriculture, urbanization, and recreation. The foci of these activities tend toward providing best management practices for the activities which allow for resource use or extraction and that minimize environmental impact.

2) Protection of the environment, species, or regions, which focuses primarily on fish and wildlife and their habitat or on specific habitats (e.g., wetlands or scenic river designations). The foci of these regulations tend toward protecting the species and its habitat from activities within the watershed.

Few, if any, of the protective measures are focused on protecting drinking water quality. However, in general, measures that protect water quality and related habitat have a secondary effect of protecting drinking water quality. Although there may be some minor exemptions (refer to the monitoring program analysis), the focus of the rules and regulation review was to find regulations, programs, and agencies that have a primary or secondary focus on protecting water quality.

The U.S. Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (DEQ), and the state and federal fish and wildlife agencies have primary focuses of protecting water quality. These agencies tend to protect water quality with regulations and programs that provide buffers to water systems and/or restrictions on activities.

The state and federal resource agencies (e.g., agriculture and forestry) tend to focus on best management practices.

Lane County and some of the fisheries agencies (e.g., ODFW recreational and commercial fishing requirements) have interests in both protective and management measures.

Many of the agencies have programs and grant funding for riparian and habitat restoration (e.g., ODFW's) Wetland Joint Ventures Project. Finding and following up on all of these possibilities should be conducted during the implementation of this plan.

EWEB should continue to monitor and research all of the following rules and regulations. The assessment of rules and regulations is divided into two categories:

1) Support Regulatory Efforts: these are rules or regulations in the process of being created that EWEB has an opportunity to affect to promote protection of water quality, and possibly specifically address drinking water quality.

2) Track Changes in Regulations: these are existing rules and/or regulations that should be monitored for changes or amendments.

The following table cross references the regulation's applicability of policies to the 10 risk categories (from highest to lowest) identified by EWEB.

Table 1
Regulation's Applicability to Risk Categories

Regulation or Policy	Storm Sewer Outfalls	Urbanized Contamination	Haz Mat Transportation	Com/Industry Facilities	Road Veg Management	Agricultural Activities	Forestry	Recreation	Fish Hatcheries	Dams & Powerhouses
Clean Water Act (NPDES Permits)		X		X					X	X
Three Basin Rule		X		X					X	X
Water Quality Limited, 303(d) and TMDL Critical Basins	X			X		X	X	X	X	X
CWA, Storm Water Rules	X	X								
CWA Section 319 Non-point Source Programs (Grants)						X	X			
Endangered Species Act (ESA), and Proposed 4(d) Rule	X	X		X	X	X	X	X	X	X
Agricultural Water Quality Management Act (Program) / Senate Bill 1010						X				
Oregon Department of Agriculture Pesticide Laws					X	X				
Oregon Department of Forestry Forest Practices Act								X		
Bureau of Land Management (BLM) Practices - FLPMA Federal Land Policy Act					X	X	X	X		
Oregon Department of Transportation (ODOT) Practices	X				X					
Lane County Rural Comprehensive Plan	X	X		X				X		
Lane County (RCP) Riparian Ordinance		X				X	X			
Lane County Septic and Sewer Codes		X								
Springfield Drinking Water Protection Overlay Zone		X		X						

Summary of Recommendations to Support Regulatory Efforts

The primary focus of current regulatory efforts is to control non-point source impacts to the watershed. The traditional point source solution is to create discharge limits or restrictions, require permits for discharges, monitor discharges, and enforce noncompliance.

Non-point source impacts do not respond well to the traditional command and control method. Enforcement is very difficult because the sources are not at discrete locations and their impacts tend to be cumulative and blended with other non-point source impacts (e.g., the mixture of impacts is much more complex).

Currently, there are several rules and regulations under review that will have effect the impacts from both point and non-point sources in the McKenzie River watershed.

In addition to supporting the efforts identified below, EWEB's Program should seek to identify other opportunities to protect water quality. These efforts may be other regulations, relationships, and potential efforts sponsored by EWEB in areas that appear lacking.

CWA, Storm Water Rules

As a small municipal separate storm sewer systems (MS4), the City of Springfield must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from their MS4 to the "maximum practicable extent," to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. The program must be implemented by 2003, and include the following six minimum control measures: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping.

The City of Springfield's MS4 program will provide additional monitoring and controls on storm water discharges to the McKenzie River above Hayden Bridge. In addition, other small communities may need to develop similar (albeit on a smaller scale) stormwater management plans.

EWEB should actively support Springfield's efforts to develop and implement a stormwater management program, including measures to reduce stormwater runoff above the Hayden Bridge Intake and improve runoff quality. This provides an opportunity to input the "drinking water" perspective with Springfield, and could result in some cost sharing measures that will provide Springfield with a strong program, and provide EWEB with better drinking water quality protection.

Endangered Species Act (ESA), and Proposed 4(d) Rule

In Section 9 of the Endangered Species Act (ESA), listed species are afforded a range of protective measures, both substantive and procedural. The most immediate effect is that unauthorized taking of a species is illegal. A "taking" includes anything that adversely affects a species or its habitat. The Federal regulations have a different interpretation on what constitutes a "take" of an endangered species or a "take" of a threatened species.

In the McKenzie River, Spring Chinook salmon and bull trout are listed as "threatened" species, and are under the jurisdiction of USFW and National Marine Fisheries Service (NMFS) respectively. NMFS has issued a proposed 4(d) rule that imposes a general prohibition against harming Spring Chinook or their habitat (known as taking). The rule encourages programs tailor-made to local conditions that conserve fish, and collaborative and meaningful conservation planning. Programs that conserve species and are adopted under a 4(d) rule can also be adopted as part of a recovery plan. This 4(d) rule may have the most comprehensive approach to impacts to water quality (e.g., both point and non-point sources) in the McKenzie River watershed.

EWEB should seek opportunities to participate and support local efforts to protect Spring Chinook and bull trout and their habitat, with a collateral affect of protecting water quality of the McKenzie River. EWEB activities also impact the McKenzie River watershed. EWEB should continue to evaluate our practices and actively seek to comply with new regulations.

Agricultural Water Quality Management Act (Program) / Senate Bill 1010

Agricultural activities are a non-point source of pollutants within a watershed that do not respond well to traditional point source "regulatory" solutions. The most effective way to reduce agricultures impacts on water quality is to encourage voluntary changes in work practices. These changes require solid relationships and trust. To this end EWEB should actively support any efforts in this area.

Senate Bill 1010 requires the Oregon Department of Agriculture (ODA) to develop an Agricultural Water Quality Management (AgWQM) Area Plan for watersheds in cooperation with the affected parties (e.g., agriculture). EWEB along with the McKenzie Watershed Council have been adding the Local Advisory committee responsible for making recommendations for the AgWQM Area Plan for the McKenzie River (combined with the Coast and South Forks of the Willamette).

EWEB should support development and implementation of an Agricultural Water Quality Management Area Plan and rules for the McKenzie watershed to reduce agricultural runoff and improve runoff quality. This support can be supplemented by attending the local advisory committee meetings, offering technical support (e.g., experience), and potentially sharing some funding.

Lane County Rural Comprehensive Plan

Lane County is currently updating the "McKenzie Watershed Land Use Policies for Developed and Committed Lands." One key component of the update is including restrictions on any new uses "of dangerous chemicals or processes that may adversely affect the quality of the air, ground, or water of the McKenzie Watershed." The County is seeking assistance on what should be considered "dangerous" and how to implement this through a permitting process. EWEB should work with SUB and other interested entities to assist the County and creating clear implementable processes.

The Plan update is also restricting the amount of growth, stormwater management, and restricting the numbers of livestock on land.

EWEB should encourage the County to develop clear guidelines on regulating "dangerous chemicals" and "non-point" sources within the watershed. In addition, EWEB should also technical expertise (along with SUB) on the development of the regulations concerning the use of dangerous chemicals.

Lane County Riparian Ordinance

Driven by the critical habitat assessment requirements of the ESA listing of Spring Chinook salmon and bull trout, the County is reviewing the effectiveness of the riparian regulations. These codes regulate removal or alteration of vegetation for development and construction of structures in riparian areas on rural lands. Lane County staff has asked a technical working roup (staff from the McKenzie Watershed Council partners) to recommend changes that would comply with ESA 4(d) rules for salmon, asked a technical working roup (staff from the McKenzie Watershed Council partners) to recommend changes that would comply with ESA 4(d) rules for salmon.

EWEB should support strengthening the Lane County Riparian Ordinance to improve properly functioning riparian habitat. These changes will apply to EWEB facilities and activities within the watershed. EWEB's best interest over the long term is to support protection of water quality, and compliance with ESA restrictions. In addition EWEB should continue to work with the McKenzie watershed council to provide meaningful support the riparian ordinance.

Lane County Septic Codes

Driven by the critical habitat assessment requirements of the ESA listing of Spring Chinook salmon and bull trout, the County is reviewing the effectiveness of the septic system review process. The groundwater in the McKenzie watershed interacts strongly with the surface water of the McKenzie River, and is therefore more susceptible to groundwater contamination.

The County's focus is two fold. First, to expand the program in three areas: 1) have mandatary inspections of septic systems before authorizing any change in use permits; and 2) initiate an education and/or incentive program encouraging regular inspection of septic systems; and 3) restrictions on placement of new systems. Second, to have the water districts to provide technical expertise for water quality protection.

EWEB should support regulatory changes that would protect the water quality of the McKenzie River by: 1) strengthening inspection of septic systems; 2) encouraging proper maintenance of septic systems; and/or 3) ensuring protective siting of new septic systems.

Summary of Recommendations on Tracking Regulations

Several existing rules, regulations, and work practices currently limit or restrict impacts (e.g., discharges) to the McKenzie Watershed. EWEB should monitor these regulations for changes, which are likely to come in one of two forms: 1) efforts to flesh out and increase restrictions (driven by agencies or environmental groups); or 2) efforts to repeal or reduce restrictions (driven by affected parties responding to increased regulation of their activities).

EWEB should track changes in the following rules and regulations that would protect drinking water quality.

Clean Water Act (NPDES Permits)

Oregon implements the Federal Clean Water Act (CWA) and a parallel state program that regulates the discharge of wastes into waters of the state. The programs are administered by the Oregon Department of Environmental Quality (DEQ). One aspect of the CWA, is that Federal and state laws prohibit the discharge of any wastes into waters of the state by commercial or industrial activities without obtaining a National Pollutant Discharge Elimination System (NPDES) waste discharge permit. Wastes include substances that may cause pollution or tend to cause pollution. The 1995 GEM report identified 16 permitted discharges to the McKenzie River above the Hayden Bridge intake.

The presence of NPDES permitted discharges (and limitations on new permits or increases of discharges, discussed under the Three-Basin Rule) within the McKenzie watershed provides:

1. Identification of large point source discharges to the McKenzie;

2. Access to the restrictions, controls and management practices surrounding the discharges and their associated activities; and

3. A mechanism for enforcement (e.g., up to a third party law suit) if the permitted discharge does not comply with permit conditions.

Three-Basin Rule (Limits on CWA Permitted Activities)

The Three-Basin rule provides an added level of protection to prevent the increase of discharges to the McKenzie River. EWEB should monitor for plans for discharges that are restricted by the Three-Basin Rule, and monitor for legislation to lessen the rules restrictions. As urbanization continues in the McKenzie Watershed, and its sister rivers the Santiam and Clackamas, pressure may increase to revoke or change the Three-Basin rule.

Water Quality Limited, Section 303(d), and TMDL Critical Basins

The McKenzie River is listed in the 303(d) list and has a TMDL for temperature. The listing could impact new or changes in activities that would increase the river temperature. The listing adds an incentive for practices that would decrease river temperatures.

CWA Section 319, Non-point Source Program (Grants)

Section 319 of the CWA requires the development of a non-point Source Management Program Plan. Oregon's program is administered by the DEQ.

The goal of DEQ's Non-point Source (NPS) Program is to prevent and eliminate water pollution from non-point sources of water pollution in all water bodies in the state. DEQ's overall strategy is to further develop its own and other agencies' or individuals' capabilities in each of the ten program areas, emphasizing watershed protection and enhancement, voluntary stewardship, and partnerships among all watershed stakeholders.

The DEQ has identified ten program elements and capabilities necessary for an effective non-point-source control/watershed-management program. Individual NPS control projects may contribute to only one or two of these elements, but all the elements are interdependent and must be adequately provided by one means or another for the overall program to succeed (the 10 elements are listed in the attached technical analysis document).

In addition to tracking changes under Section 319 of the CWA, EWEB should evaluate using the DEQ NPS guidelines as a standard for evaluating NPS reduction efforts in the watershed. In addition, EWEB should seek opportunities to obtain grant funds to NPS impacts in the watershed.

ODA Pesticide Laws / House Bill 3602

One of the ODA's mandates, implemented through the Pesticide Division is to: 1) ensure effective use of fertilizers in agricultural and consumer uses; 2) promote proper use of pesticides and investigate incidents involving misuse; and 3) certify and license pesticide applicators and assure proper training in pesticide handling and use; and 4) implement Oregon Pesticide Use Reporting System (PURS) as required by House Bill 3602.

Enacted in 1999, HB 3602 establishes a comprehensive, reliable and cost-effective system for collecting and organizing information on all categories of pesticide use within the state. This includes collecting, evaluating and summarizing information from all types of pesticide users, including agricultural and forest producers, government agencies, utilities and industrial users, commercial application companies, and firms making applications in urban settings.

PURS is in the process of being implemented, and is required to be in place by January 1, 2001, with the first comprehensive report due July 1, 2003. This monitoring effort can protect the watershed in two ways: 1) the act of having to report, may cause some entities to rethink how and when they use pesticides (e.g., it may promote a more integrated pest management approach); and 2) provide an accurate baseline of pesticide use within the watershed.

EWEB should review information collected via the PURS system to further evaluate risk to drinking water quality.

Oregon Department of Forestry, Forest Practices Act

In 1991, the Oregon Forest Practices Act was modified to require the Board of Forestry and the Department of Forestry to review many aspects of the Act that relate to water quality and fisheries. As a result in 1994, the Board of Forestry implemented new classification and protection rules for waters of the state. The rules expanded riparian protection measures for many streams, lakes, and wetlands. For water bodies with salmon and other game fish, or threatened and endangered fish species, the riparian rules are intended to provide for the retention of key ecological processes and functions found in mature forest riparian stands. These rules also include incentives for landowners to enhance aquatic habitat and to manage their lands in a manner that will accelerate the restoration of degraded riparian conditions.

In addition to tracking changes to the FPA, EWEB should promote using the FPA guidance as a basis for comments on activities within the watershed and support best management practices in excess of the rule's requirements.

Bureau of Land Management (BLM) Policies

The Bureau of Land Management [BLM] manages over 16 million acres of public lands in Oregon. The BLM administers diverse resources on and uses of the nation's public lands, including energy and minerals, timber, livestock forage, fish and wildlife habitat, scenic and recreation resources, wilderness areas, and archaeological and historic sites. The BLM about 6 percent of the land in the McKenzie watershed. The management of BLM lands within the McKenzie Watershed will be impacted by the listing of Spring Chinook salmon and bull trout as threatened species.

EWEB should track changes in BLM practices and management guidelines that would protect drinking water quality.

Oregon Department of Transportation (ODOT) Practices

The Oregon Department of Transportation (ODOT) work practices include regulation of transportation, maintaining state roads, and improving (e.g., enlarging) state roads. In addition, ODOT's activities (e.g., surface and shoulder work, drainage work, vegetation control, bridge work and snow and ice removal) have potential environmental impacts.

ODOT has developed a maintenance management system (MMS) of best management practices to mitigate its maintenance practices. ODOT has initiated a process to map habitat along state highway corridors in relation to ODOT maintenance practices. This information is then displayed on a new series of maps called the Restricted Activity Zone (RAZ) Maps. These maps are distributed to the District Maintenance Crews and Region Project Development Staff. The maps have designations of "No Restriction" (e.g., normal operations), "Caution" (e.g., sensitive area), and "Restricted" (e.g., permit required) for each mile of highway.

EWEB should encourage ODOT resource mapping and creation of Restricted Activity Zone Map for the state roads in the McKenzie Watershed. EWEB should support efforts to create appropriate "Caution" and "Restricted" zones. Secondarily, EWEB should encourage the use of approved ODOT practices as a model for EWEB activities and promote these practices

in the watershed. EWEB should also encourage ODOT to create better roadside vegetation management practices.

Springfield Drinking Water Protection Overlay Zone

The federal Safe Drinking Water Act requires that every state have a drinking water protection program in place to gaud against contamination of groundwater. In 1995, the EPA certified Oregon's Wellhead Protection Program. To comply with the SDWA requirements, and to ensure safe drinking water for their constituents, the Springfield Utility Board (SUB) along with the City of Springfield and the Rainbow Water District Developed the Springfield Drinking Water Protection Plan that was adopted May 17, 1999.

EWEB should fully support adoption and implementation of the Springfield Drinking Water Protection overlay district. Furthermore, EWEB should evaluate SUB's drinking water protection overlay district as a model for other areas within the McKenzie Watershed.

Detailed Regulation & Agency Review

The U.S. Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (DEQ), and the state and federal fish and wildlife agencies have primary focuses of protecting water quality. These agencies regulations and programs tend to provide buffers and restrictions on activities to protect water quality.

The state and federal resource agencies (e.g., agriculture and forestry) tend to focus on best management practices.

Lane County and some of the fisheries agencies (e.g., ODFW recreational and commercial fishing requirements) have interests in both protective and management measures.

Many of the agencies have programs and grant funding for riparian and habitat restoration (e.g., ODFW's) Wetland Joint Ventures Project. Finding and following up on all of these possibilities should be conducted during the implementation of this plan.

Clean Water Act (NPDES Permits)

Risk Categories: Addresses impacts from Contamination from Urbanized Areas, Commercial and Industrial Facilities, Fish Hatcheries, and Dams and Powerhouses.

Analysis: Oregon implements the Federal Clean Water Act (CWA) and a parallel state program that regulates the discharge of wastes into waters of the state. The programs are administered by the Oregon Department of Environmental Quality (DEQ). One aspect of the CWA, is that Federal and state laws prohibit the discharge of any wastes into waters of the state by commercial or industrial activities without obtaining a National Pollutant Discharge Elimination System (NPDES) waste discharge permit. Wastes include substances that may cause pollution or tend to cause pollution.

The 1995 GEM report identified 16 permitted discharges to the McKenzie River above the Hayden Bridge intake. The types of permits issued are:

1. five cooling water permits (three for EWEB hydro, one discontinued);
2. four storm water discharges (one includes a vehicle wash permit);
3. three community onsite sewage systems;
4. three underground storage tank cleanups (one also has a cooling water permit); and
5. two discharges from ODFW fish hatcheries.

These discharges do not include U.S. Army Corps of Engineer dams or the storm water discharges associated with Springfield and Thurston.

Conclusion: The presence of NPDES permitted discharges (and limitations on new permits or increases of discharges, discussed under the Three-Basin Rule) within the McKenzie watershed provides:

1. Identification of large point source discharges to the McKenzie;

2. Access to the restrictions, controls and management practices surrounding the discharges and their associated activities; and
3. A mechanism for enforcement (e.g., up to a third party law suit) if the permitted discharge does not comply with permit conditions.

EWEB should track changes in the CWA and NPDES permitting requirements that would protect drinking water quality.

Three-Basin Rule (Limits on CWA Permitted Activities)

Risk Categories: Addresses impacts from Contamination from Urbanized Areas, Commercial and Industrial Facilities, Fish Hatcheries, and Dams and Powerhouses.

Analysis: The DEQ enforces the Three-Basin Rule (OAR 340-041-0470), which restricts new discharges to the McKenzie River above the intake at Hayden Bridge. It allows for the renewal or transfer of existing discharges, however they may not increase their permitted mass load. In addition, new industrial facilities and agricultural operations may be established in the watershed if they can show that they will not discharge to surface waters, and that their discharge will not pollute groundwater.

The DEQ may issue general NPDES for: General Permit 1200C or 1200CA for storm water construction activities; General Permit 1500 for underground storage tank cleanups (using best available technology); General Permit 100 for non-contact cooling water; General Permit 200 for filter backwash; General Permit 500 for boiler blowdown water; General Permit 700 for suction dredging (if it is not in an area designated as a Scenic Waterway); and Clean Water Act (CWA) Section 401 water quality certifications. The primary impacts from these types of permits is temperature and turbidity.

The rule authorizes the DEQ to issue storm water permits provided the permittee maintains an effective monitoring and water quality evaluation program. In addition, if cumulative affects of storm water discharge are shown to be contributing to degradation of water quality, the DEQ may initiate more stringent discharge standards.

The DEQ may authorize a new domestic sewage treatment facility if there is no discharge to surface waters, and groundwater is protected. The analysis for permitting must show that the facility will replace a significant number of failing individual on-site sewer disposal systems. The system would be restricted from accepting discharges that could incapacitate it.

Conclusion: The Three-Basin rule provides an added level of protection to prevent the increase of discharges to the McKenzie River. As urbanization continues in the McKenzie Watershed, and its sister rivers the Santiam and Clackamas, pressure may increase to revoke or change the Three-Basin rule.

EWEB should monitor for new discharges and track changes that impact drinking water quality.

Water Quality Limited, Section 303(d), and TMDL Critical Basins

Risk Categories: Addresses impacts from Storm Sewer Outfalls, Commercial and Industrial Facilities, Agricultural Activities, Forest Practices, Recreation, Fish Hatcheries, and Dams and Powerhouses.

Analysis: To comply with section 303(d) of the CWA, the DEQ has developed a list of water bodies that can not meet water quality standards without application of additional pollution controls. These waters are referred to as "water quality limited" (WQL) and must be periodically identified. WQL waters requiring the application of total maximum daily loads (TMDLs) (or other sufficiently stringent pollution control requirements) are identified in a document commonly referred to as the "303(d) list". This list, developed by the DEQ, is subject to public review and must be approved by EPA.

The 303(d) list is a sub-set of the larger list of "water quality limited" waters. WQL waters are defined by whether treatments above and beyond "best available technology", "best practicable treatment", and normally applied "best management practices" are required to protect beneficial uses. A water body retains "water quality limited" status so long as the attainment of water quality standards requires a heightened level of treatment or watershed management, even if standards are currently being met or a TMDL is being implemented.

WQL waters which (a) don't meet standards, and (b) haven't yet received TMDLs or TMDL equivalents are placed on the 303(d) list. The other WQL water bodies will still be identified in DEQ's regular *Water Quality Status Assessment (305(b)) Report.*

Total Maximum Daily Load (TMDL) is a strategy for bringing a water body back into compliance with water quality standards (e.g., for improving water quality to the point where recognized beneficial uses of the water are fully supported).

A TMDL addresses pollution problems by systematically identifying those problems, linking them to watershed characteristics and management practices, establishing objectives for water quality improvement, and identifying and implementing new or altered management measures designed to achieve those objectives.

A full TMDL development process determines the pollutants or stressors causing water quality impairments, identifies maximum permissible loading capacities for the water body in question, and then, for each relevant pollutant, assigns load allocations (Total Maximum Daily Loads) to each of the different sources, point and non-point, in the watershed.

Different TMDL development processes will be used in different situations depending on the types of sources involved. More complex and lengthy processes are required where the contributions of both point sources (e.g., sewage treatment plants, industrial facilities) and non-point sources (e.g., forestry, agriculture, grazing, and untreated urban storm water runoff) make the situation complex.

Conclusion: The McKenzie River is listed in the 303(d) list and has a TMDL for temperature. The listing could impact new or changes in activities that would increase the river temperature. The listing adds an incentive for practices that would decrease river temperatures.

EWEB should track DEQ's development of the Total Maximum Daily loads for temperature in the McKenzie River.

CWA, Storm Water Rules

Risk Categories: Addresses impacts from Storm Sewer Outfalls, and Contamination from Urbanized Areas.

Analysis: The 1972 amendments to the Clean Water Act (CWA) prohibit the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Efforts to improve water quality under the NPDES program focused on reducing pollutants in industrial process wastewater and municipal sewage treatment plant discharges. Over time, it became evident that more diffuse sources of water pollution, municipal separate storm sewer systems (MS4) and storm water runoff construction sites, were also significant contributors to water quality problems.

In 1990, EPA promulgated rules establishing Phase I of the NPDES Storm Water Program. Phase I of the program addressed discharges from medium and large MS4s and from large construction activities (e.g., disturbing 5 acres or more of land). The Phase II (finalized in December 1999) expanded the to include operators of small MS4s in urbanized areas and operators of small construction sites (e.g., disturbing 1 to 5 acres).

The CWA Storm Water Program provides cities with approved MS4 programs the authority to administer NPDES permits within their jurisdiction.

The environmental problems associated with discharges from MS4s in urbanized areas and discharges resulting from construction activity are discussed separately below. EWEB has identified storm sewer outfalls and contamination from urbanized areas as the first and second highest risks, respectively, to Hayden Bridge's surface water quality.

Storm water Discharges from Municipal Separate Storm Sewer Systems (MS4s)

Storm water discharges from MS4s in urbanized areas (see definition below) are a concern because of the high concentration of pollutants found in these discharges. Concentrated development in urbanized areas substantially increases impervious surfaces, such as city streets, driveways, parking lots, and sidewalks, on which pollutants from concentrated human activities settle and remain until a storm event washes them into nearby storm drains. Common pollutants include pesticides, fertilizers, oils, salt, litter and other debris, and sediment. Another concern is the possible illicit connections of sanitary sewers, which can result in fecal coliform bacteria entering the storm sewer system. Storm water runoff picks up and transports these and other harmful pollutants then discharges them – untreated – to waterways via storm sewer systems. When left uncontrolled, these discharges can result in fish kills, the destruction of spawning and wildlife habitats, a loss in aesthetic value, and contamination of drinking water supplies and recreational waterways that can threaten public health.

The EPA definitions for coverage under Phase I and Phase II of the Storm water regulations:

Urbanized Area (UA): is a land area comprising one or more places – central place(s) – and the adjacent densely settled surrounding area – urban fringe – that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas.

Large MS4: is any MS4 located in an incorporated place or county with a population of 250,000 or greater, covered under Phase I.

Medium MS4: is any MS4 located in an incorporated place or county with a population between 100,000 - 249,999, covered under Phase I. The City of Eugene was regulated as a Medium MS4 under Phase I.

Small MS4: is any MS4 that is not already covered by the Phase I storm water program. Small MS4s include Federally-owned systems, such as military bases. Many MS4s in areas below 100,000 in population, however, have been individually brought into the Phase I program by NPDES permitting authorities. Such already regulated MS4s do not have to develop a Phase II program. The City of Springfield will be regulated under Phase II.

As a small MS4, the City of Springfield must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from their MS4 to the "maximum extent practicable," to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. The program must be implemented by 2003, and include the following six minimum control measures: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping.

The City of Springfield has formed a Water Resource Management Department to develop and implement a MS4 compliant program in 2001. EWEB staff has started conversations with Springfield staff on monitoring requirements at discharge points.

Storm water Discharges from Construction Activities

Sediment runoff rates from construction sites are typically 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction activity can contribute more sediment to streams than can be deposited over several decades, causing physical and biological harm to our Nation's waters.

Uncontrolled runoff from construction sites is a water quality concern because of the devastating effects that sedimentation can have on local water bodies, particularly small streams. Numerous studies have shown that the amount of sediment transported by storm water runoff from construction sites with no controls is significantly greater than from sites with controls. In addition to sediment, construction activities yield pollutants such as pesticides, petroleum products, construction chemicals, solvents, asphalts, and acids that can contaminate storm water runoff. During storms, construction sites may be the source of sediment-laden runoff, which can overwhelm a small stream channel's

Large construction permits (e.g., construction sites greater that 5 acres) are already required. Small construction permit applications are due by March 10, 2003 (specific compliance dates are set by the local NPDES permitting authority). The City of Eugene under its MS4 authority, has already implemented a permitting program for large and small construction activities. The City of Springfield is modeling its construction erosion control program on the City of Eugene's.

Conclusion: The City of Springfield's MS4 program will provide additional monitoring and controls on storm water discharges to the McKenzie River above Hayden Bridge.

EWEB should actively support Springfield's efforts to develop and implement a stormwater management program, including measures to reduce stormwater runoff above the Hayden Bridge Intake and improve runoff quality. This provides an opportunity to input the drinking water perspective with Springfield, and could result in some cost sharing measures that will provide Springfield with a strong program, and provide EWEB with better drinking water quality protection.

CWA Section 319, Non-point Source Program (Grants)

Risk Categories: Addresses impacts from Agricultural Activities, and Forest Practices.

Analysis: Section 319 of the CWA requires the development of a non-point Source Management Program Plan. Oregon's program is administered by the DEQ.

The goal of DEQ's Non-point Source (NPS) Program is to prevent and eliminate water pollution from non-point sources of water pollution in all water bodies in the state. DEQ's overall strategy is to further develop its own and other agencies' or individual's capabilities in each of the ten program areas listed below, emphasizing watershed protection and enhancement, voluntary stewardship, and partnerships between all watershed stakeholders.

The DEQ has identified ten program elements and capabilities necessary for an effective non-point-source control/watershed-management program. Individual NPS control projects may contribute to only one or two of these elements, but all of the elements are interdependent and must be adequately provided for by one means or another for the overall program to succeed. The ten elements are:

1. Standards: Defining the desirable and/or minimally acceptable conditions necessary to support sensitive beneficial uses (e.g., standards, criteria, or benchmarks for water quality, erosion, riparian condition, upland vegetation, or other watershed condition parameters).

2. Assessment: Condition assessment of the water specifically and of the watershed as a whole, focusing on the standards established above.

3. Coordinated Watershed Planning: The joint and cooperative evaluation by all watershed stakeholders of needs, opportunities, constraints, and options for sound watershed management; the production of a practical and implementable action plan.

4. Education: The delivery of information about watershed functions, values, conditions, responses, and management techniques; offered to land managers and the general public; intended to direct attitudes, beliefs, and actions toward improved watershed management practice.

5. Demonstration Projects: Relatively small-scale projects designed to demonstrate the viability of sound watershed management techniques; sited widely throughout the state to promote best management practices and to help galvanize local activism.

6. Technical Assistance: Field-based experts and literature resources provided to help land managers select and implement best management practices suited to their ecoregion, land use, style of operation, and other management goals.

7. Cost-Share Assistance: Financial assistance and incentives for implementation of watershed enhancement practices on private lands; coupled with contractual agreement by landowners to maintain the enhancements for an extended period.

8. Stewardship: The adoption by local groups of responsibility for the condition of their watershed resources; active local promotion of the concept of watershed enhancement and the protection of sensitive beneficial uses.

9. Watershed Enhancement Projects: Coordinated enhancement and protection projects covering whole watersheds and sustained over a number of years; perhaps initiated sooner or more densely in higher priority areas but also implemented in every ecoregion and geo-political area of the state.

10. Enforcement: The field-based capability to investigate and remedy the violation of applicable standards or regulations.

Grant funds are available through Section 319 of the CWA. Each year, DEQ identifies programmatic and geographic targets, solicits project proposals, assembles a proposal package for EPA's review, develops contracts and agreements for disbursement of grant funds, oversees program implementation, and evaluates program accomplishments. Projects are targeted to address needs related to the ten major program elements.

Initially, due to smaller grants and the need to address a diverse collection of issues, projects tended to be smaller in budget and scope and shorter in duration. Funding levels continued to increase as did the number of projects from 1987 to 1994. Since 1995, funding levels have been sustained, however the emphasis has changed to fewer bigger, and longer projects in order to address needs for whole watershed enhancement, and reduce the total number of projects being managed.

Conclusion: *In addition to tracking changes under Section 319 of the CWA, EWEB should evaluate using the DEQ NPS guidelines as a standard for evaluating NPS reduction efforts in the watershed. In addition, EWEB should seek opportunities to obtain grant funds to NPS impacts in the watershed.*

Endangered Species Act (ESA), and Proposed 4(d) Rule

Risk Categories: Addresses impacts from Storm Sewer Outfalls, Contamination from Urbanized Areas, Commercial and Industrial Facilities, Roadside Vegetation Management, Agricultural Activities, Forest Practices, Recreation, Fish Hatcheries, and Dams and Powerhouses.

Analysis: The Endangered Species Act (ESA) provides for the protection of threatened and endangered species as well as the conservation of ecosystems on which these species rely. The U.S. Department of the Interior Fish and Wildlife Service (USFWS) lists species (fish, wildlife and plants) identified by the USFWS as threatened or endangered. The protection of wildlife, plants and associated habitat benefits water quality. The protection of fish species, and their habitat has an even larger impact on protecting water quality.

The Oregon Department of Fish and Wildlife (ODFW) identifies and lists threatened and endangered wildlife species. The Oregon Department of Agriculture (ODOA) identifies and lists threatened and endangered plant species. ODFW and ODOA confer with and provide support to the USFWS for federal listing of plant, fish and wildlife species. The U.S. Department of Commerce, National Oceanographic and Atmospheric Administration (NOAA), National Marine and Fisheries Service (NMFS) determines the listing status of anadromous fish that are under NMFS jurisdiction (e.g., salmon). The actual listing, delisting, or change in listing status for these species is then conducted by the USFWS.

In Section 9 of the ESA, listed species are afforded a range of protective measures, both substantive and procedural. The most immediate effect is that unauthorized taking of a species is illegal. A "taking" includes anything that adversely affects a species or its habitat. The Federal regulations have a different interpretation on what constitutes a "take" of an endangered species or a "take" of a threatened species.

In the McKenzie River, Spring Chinook salmon and bull trout are listed as threatened species, and are under the jurisdiction of NMFS and USFW respectively.

The agencies have several mechanisms for determining allowable activities and permissible "takes". Section 7 of the ESA provides for consultations between Federal agencies. For example, EWEB's hydro projects have entered into a Federal agency consultation process, between the Federal Energy Regulatory Commission (FERC) and the fisheries agencies. Section 10 of the ESA provide for individual consultation are used for individual "take" permits which require a habitat conservation plan (HCP). Section 4(d) of the ESA allows for the adoption of regulations for the conservation of species listed as threatened. No "takes" are allowed for endangered species.

The USFW has jurisdiction over Bull Trout. The USFW have considered the "take" of endangered and threatened species as equivalent. Therefore, the USFS has not issued a 4(d) rule for Bull Trout. This means that all activities and impacts within the McKenzie that would result in a "take" of Bull Trout are prohibited. What activities would constitute a "take" is determined by USFW.

The NMFS has jurisdiction over Spring Chinook, and has issued a draft 4(d) rule that represents the regulations NMFS believes necessary to conserve seven salmonid species listed as threatened (Spring Chinook is the only salmonid species listed in the McKenzie River as threatened).

The 4(d) rule imposes a general prohibition against harming threatened fish or their habitat (known as taking), except where sufficiently protective programs tailored to local conditions are in place and added Federal protection are unnecessary. This encourages programs tailor-made to local conditions that conserve fish. The rule encourages collaborative and meaningful conservation planning. Programs that conserve species and are adopted under a 4(d) rule can also be adopted as part of a recovery plan.

Conclusion: *EWEB should seek opportunities to participate and support local efforts to protect Spring Chinook and bull trout and their habitat, with a collateral affect of protecting water quality of the McKenzie River. EWEB activities also impact the McKenzie River watershed. EWEB should continue to evaluate our practices and actively seek to comply with new regulations.*

Agricultural Water Quality Management Act (Program) / Senate Bill 1010

Risk Categories: Addresses impacts from Agricultural Activities.

Analysis: The Agricultural Water Quality Management Program administered by the Oregon Department of Agriculture's Natural Resources Division, is responsible for addressing non-point source water pollution associated with agricultural lands and activities. The Agricultural Water Quality Management Program has evolved in response to requirements under various state and federal laws, such as the Clean Water Act.

Until 1993, the Oregon Department of Agriculture (ODA) addressed agricultural water quality concerns primarily through the Confined Animal Feeding Operation Program (CAFO), the Container Nursery Irrigation Water Management Program, several voluntary watershed plans, and through landowner assisted activities associated with Soil and Water Conservation Districts (SWCD).

In 1993, the Oregon Legislature passed Senate Bill 1010 (ORS 568.900 - 568.933) or the Agricultural Water Quality Management Act, which provides for ODA to be the lead state agency working with agriculture to address non-point source water pollution. Through the Agricultural Water Quality Management Act (AgWQM Act), ODA is authorized to develop and carry out a water quality management plan for any agricultural or rural lands area whenever a water quality management plan is required by state or federal law. Other Oregon Revised Statutes (ORS) referenced in the department's water quality program are ORS 468B.025 through 468B.050.

The AgWQM Act watershed planning process is begun by ODA once water quality issues in a watershed have been identified and a watershed plan is required by state or federal law. One example of such a "trigger" for the planning process is a listing under section 303(d) of the CWA.

Senate Bill 1010 gives the ODA the ability to enforce plan requirements when necessary and the ability to collect fees. The fees will provide stable funding for the program. These authorities should enable ODA to meet the requirement to provide "reasonable assurance" that agricultural non-point pollution loads will be reduced and the agricultural load allocation under the TMDLs will be achieved.

The ODA is working with farmers and ranchers to develop Agricultural Water Quality Management Area Plans (AgWQM Area Plans) for watersheds. These watershed based plans identify measures and strategies necessary for landowners to prevent and control water pollution resulting from agricultural activities.

AgWQM Area Plans have been completed and subsequently Oregon Administrative Rules (OARs) have been adopted into law for the following subbasins:

Tualatin River Subbasin
Bear Creek Subbasin
Umatilla River Subbasin
Upper Grande Ronde River Subbasin

An AgWQM Area Plan and OARs have been proposed for the Umpqua River Basin, but are being re-reviewed based on public comments.

AgWQM Area Plans and OARs are currently in the public comment phase for the:

North Coast Basin
Yamhill River Subbasin
Lower Deschutes Subbasin

A local advisory committee to develop a AgWQM Area Plan for the McKenzie (combined with the Coast and South Forks of the Willamette) began meeting in May 2000. EWEB along with the McKenzie Watershed Council have been attending the Local Advisory committee meetings.

Conclusion: The most effective way to reduce agricultures impacts on water quality is to encourage voluntary changes in work practices. These changes require solid relationships and trust. *EWEB should support development and implementation of an Agricultural Water Quality Management Area Plan and rules for the McKenzie watershed to reduce agricultural runoff and improve runoff quality. This support can be supplemented by attending the local advisory committee meetings and offering technical support (e.g., experience) and potentially some shared-funding.*

Oregon Department of Agriculture (ODA) Pesticide Laws

Risk Categories: Addresses impacts from Roadside Vegetation Management, and Agricultural Activities.

Analysis: The Oregon Department of Agriculture (ODA) administers the Oregon Pesticide Control Act (OrPCA). The ODA's Pesticide Division mandates are to: 1) ensure effective use of fertilizers in agricultural and consumer uses; 2) promote proper use of pesticides and investigate incidents involving misuse; and 3) certify and license pesticide applicators and assure proper training in pesticide handling and use; and 4) implement Oregon Pesticide Use Reporting System (PURS) as required by House Bill 3602.

The 1999 Oregon Legislature and Governor John Kitzhaber recognized the benefits of Oregon having a comprehensive, reliable and cost effective system for collecting and organizing information on all categories of pesticide use within the state. Therefore, House Bill 3602 was enacted.

Implementation of the Oregon Pesticide Use Reporting System was assigned to the ODA. While the enacted legislation specifies activities to be conducted and time lines for completion, many details of the system have been assigned to the department to design and develop. One of the activities assigned to the department, as an aid in designing, developing and implementing the pesticide use reporting system, was the conduct of a detailed analytical review.

The review does not present a single plan for design of a pesticide use reporting system. Rather, it identifies, describes and evaluates various options. The ODA intends to use this review as a "tool" in designing and developing the pesticide use reporting system specified in HB 3602. Other "tools" are also planned for use in this process. These other "tools" include:

- Recommendations of the stakeholder work group appointed by Governor Kitzhaber;
- Recommendations of other Oregon agencies and federal agencies;
- Conclusions derived from conduct of a pilot pesticide use reporting program;
- Additional recommendations which may be provided by Oregon State University and by the Oregon Health Sciences University;
- Any related legislative requirements enacted by the 2001 Oregon Legislature;
- Suggestions provided by the Oregon Board of Agriculture, the public and specific groups.

Conclusion: The Oregon PURS is in the process of being implemented, and is required to be in place by January 1, 2001, with the first comprehensive report due July 1, 2003. This monitoring effort can protect the watershed in two ways: 1) the act of having to report, may cause some entities to rethink how and when they use pesticides (e.g., it may promote more of an integrated pest management approach); and 2) provide an accurate baseline of pesticide use within the watershed.

EWEB should review information collected via the PURS system to further evaluate risk to drinking water quality.

Oregon Department of Forestry, Forest Practices Act

Risk Categories: Addresses impacts from Forestry Practices.

Analysis: DEQ continues its active participation with the Oregon Department of Forestry (ODF), Oregon Department of Fish and Wildlife (ODFW), and others in evaluating several aspects of the Oregon Forest Practices rules that are crucial to water quality and aquatic habitat protection. Examples are: stream-type classification; stream shading requirements; riparian management requirements; and the cumulative effects of road building and other forest management practices on aquatic ecosystems. One outcome of this legislatively mandated and funded effort will include recommendations to the Board of Forestry for revision of the Forest Practices rules.

The DEQ participated in the implementation of Senate Bill 1125, which was passed by the 1991 Oregon Legislature. The legislation amended the Oregon Forest Practices Act and required the Board of Forestry and the Department of Forestry to review many aspects of the Act that relate to

water quality and fisheries. Chief among these tasks was a review of the Department of Forestry's classification and protection of waters of the state. Additional efforts have been focused on cumulative effects studies, reforestation standards, and an assessment of the effects of forestry on salmon and steelhead populations.

The new classification and protection rules for waters of the state were implementation by the Board of Forestry in 1994. The rules expanded riparian protection measures for many streams, lakes, and wetlands. For water bodies with salmon and other game fish, or threatened and endangered fish species, the riparian rules are intended to provide for the retention of key ecological processes and functions found in mature forest riparian stands. These rules also include incentives for landowners to enhance aquatic habitat and to manage their lands in a manner that will accelerate the restoration of degraded riparian conditions.

The Department of Forestry has also begun an active monitoring program to evaluate the effectiveness of the "waters of the state" rules and other aspects of the Forest Practices Program. Forestry staff have evaluated the effects of timber harvests on stream temperatures and sediment in small streams in coordination with DEQ biomonitoring efforts. Forestry personnel will continue to evaluate the effectiveness of the new rules at maintaining stream temperatures at their natural levels, and will soon begin a project to assess best management practices to control sediments. Findings from these studies will be used to develop a BMP guide and revise Forest Practices Rules as necessary.

Conclusion: *EWEB should track changes in the Forest Practice Act rules that would protect drinking water quality. In addition, EWEB should promote using the FPA guidance as a basis for comments on activities within the watershed, and support best management practices in excess of the rule's requirements.*

Bureau of Land Management (BLM) Practices

Risk Categories: Addresses impacts from Roadside Vegetation Management, Agricultural Activities, Forest Practices, and Recreation.

Analysis: The Bureau of Land Management was created in 1946 by merging the Grazing Service with the General Land Office within the Department of the Interior. The first unified legislative mandate for the BLM occurred in 1976 when Congress enacted the Federal Land Policy and Management Act (FLPMA).

In FLPMA, Congress recognized the value of the remaining public lands by declaring that these lands would remain in public ownership. Congress also gave us the term "multiple use" management, defined as "management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people." The Bureau of Land Management [BLM] manages over 16 million acres of public lands in Oregon. The BLM administers diverse resources on and uses of the nation's public lands, including energy and minerals, timber, livestock forage, fish and wildlife habitat, scenic and recreation resources, wilderness areas, and archaeological and historic sites. The BLM about 6 percent of the land in the McKenzie watershed.

The BLM is responsible for stewardship of critical water resources, including watersheds, riparian areas, and aquatic habitat. The management of agency forest lands is conducted through implementation of the Northwest Forest Protection (NWFP) Act in cooperation with a variety of agencies, including the U.S. Forest Service. The BLM has entered into restorative efforts to protect wetlands and riparian habitat to comply with the mandate of the President's 1998 Clean Water Action Plan (CWAP).

The BLM's initial efforts under the CWAP focused on stream restoration in areas impacted by abandoned mines and grazing. For grazing, the BLM is has implemented Standards and Guidelines (S&Gs) that establish criteria and requirements aimed to address soil stability, distribution of energy and nutrients, ecological recovery and watershed conditions. The BLM is the lead agency The following items are those for which the BLM is a lead agency under CWAP for the following areas:

1. Enhancing the condition (e.g., improve trends) in riparian streams and rivers currently designated as "functioning at risk.'

2. Improve rangeland health by restoring sustainability function and diversity of rangeland ecosystems. The BLM and FS have developed interagency standardized rangeland health inventory and monitoring system.

3. Work with other agencies, including the U.S. Department of Agriculture, to accelerate the rate of abandoned hardrock mine cleanup.

4. Revise and upgrade processes for the issuance and renewal of use authorizations and licenses to ensure that they adequately address water quality, monitoring and compliance issues.

5. Implement with the FS a strategy for assessing threats to watersheds and water quality stemming from forest health problems. Specifically, the BLM will develop a strategy for targeting fuel treatments or other techniques for those priority watersheds most threatened by disease and wildfire damage.

6. Work with other federal agencies to test the watershed analysis process developed under the Northwest Forest Plan in targeted watersheds throughout the country.

The BLM has initiated an integrated noxious weed management program (WMP). The WMP utilizes biological, mechanical, chemical controls and an educational effort. Currently, BLM's focus on noxious weeds is on the east side of the Cascades and southern Oregon. Since noxious weeds are often spread along transportation corridors, in fact ODOT has already addressed a spotted knapweed infestation and Carmen-Smith. The BLM may be taking a more active role on with its WMP in the McKenzie Watershed.

Conclusion: The management of BLM lands within the McKenzie Watershed will be impacted by the listing of Spring Chinook salmon and bull trout as threatened species.

EWEB should track changes in BLM practices and management guidelines that would protect drinking water quality.

Oregon Department of Transportation (ODOT) Practices

Risk Categories: Addresses impacts from Storm Sewer Outfalls, and on Roadside Vegetation Management.

Analysis: The Oregon Department of Transportation (ODOT) is responsible for regulation of transportation, maintaining state roads, and improving (e.g., enlarging) state roads. ODOT's largest direct environmental impact is the maintenance of state transportation corridors. ODOT "maintenance" activities are dived into five categories:

1. Surfacing and Shoulder Work
2. Drainage Work
3. Vegetation Control
4. Bridge Work
5. Snow and Ice Removal

From 1995 to 1999, ODOT issued several documents in an iterative process that reviewed its maintenance practices and developed best management practices to minimize the impact of maintenance activities. This culminated in July 1999 with the insurance of their Maintenance Management System (MMS) in document entitled, Oregon Department of Transportation, Routine Road Maintenance, Waster Quality and Habitat Guide, Best Management Practices.

The ODOT Guide has six key areas:

- Description of maintenance activities with minimization/avoidance actions
- Description of the ODOT training program for routine maintenance and environmental considerations
- Letter of commitment from the agency director
- Description of the process for review, documentation and monitoring implementation and effectiveness of the actions
- Relevant references or examples
- Definitions of terms

With the exception of roadside vegetation management, ODOT's work practices have been approved under the ESA 4(d) rule.

ODOT is currently inventorying the states road system, to determine when and where to apply the ODOT Guide. ODOT's Environmental Services section surveys the state transportation corridors (e.g., ± 500 feet from road centerline) and active "clear zones" (e.g., areas immediately impacted by highway maintenance operations). The surveys are used to develop maps containing the following resources:

- Dominant Land Cover Type
- Fill slope Toe = Functional Riparian
- Functional Overstory Value
- Late Successional Stage
- Riparian Area Contiguous

- Riparian Management Area
- Salmonids Present
- Sensitive Resource Areas
- Spawning/Rearing/Off-Channel Areas
- Tributaries
- Wetlands
- Wildlife/Trees Snags
- Archaeology Probability
- Slide Probability

Using a Resource (RES) Map, a team of environmental specialists (e.g., biologists, archaeologist, and project managers) meet with the local road crew to determine the sensitivity of resources to each of the maintenance the five maintenance activities. Each mile of highway then receives one of the following sensitivity designations:

1. **No Restrictions**: Proceed as normal

2. **Caution**: May be a resource of concern in the area. Proceed according to the Integrated Pest (Vegetation) Management (IPM) Plan or the Maintenance Management System (MMS) manual. Otherwise, contact the Region Environmental Coordinator

3. **Restricted**: Needs some sort of clearance such as a permit, Biological Assessment, or archaeological survey prior to work and ground disturbance. Can also apply to a restricted time frame such as an in-water work period.

This information is then displayed on a new series of maps called the Restricted Activity Zone (RAZ) Maps. Both the RES and RAZ maps are distributed to the District Maintenance Crews and Region Project Development Staff.

Conclusion: *EWEB should encourage ODOT resource mapping and creation of Restricted Activity Zone Map for the state roads in the McKenzie Watershed. EWEB should support efforts to create appropriate "Caution" and "Restricted" zones. Secondarily, EWEB should encourage the use of approved ODOT practices as a model for EWEB activities and promote these practices in the watershed. EWEB should also encourage ODOT to create better roadside vegetation management practices.*

Lane County Rural Comprehensive Plan

Risk Categories: Addresses impacts from Storm Sewer Outfalls, Contamination from Urbanized Areas, Commercial and Industrial Facilities, and Recreation.

Analysis: Lane County is currently updating the "McKenzie Watershed Land Use Policies for Developed and Committed Lands." One key component of the update is including restrictions on new uses "of dangerous chemicals or processes that may adversely affect the quality of air, ground, or water of the McKenzie Watershed." The County is seeking assistance on what should be considered "dangerous" and how to implement this through a permitting process. EWEB should work with SUB and other interested entities to assist the County and creating clear implementable processes.

The Plan update is also restricting the amount of growth, stormwater management, and restricting the numbers of livestock on land.

Conclusion: *EWEB should encourage the County to develop clear guidelines on regulating "dangerous chemicals" and "non-point" sources within the watershed. In addition, EWEB should also technical expertise (along with SUB) on the development of the regulations concerning the use of dangerous chemicals.*

Lane County Riparian Ordinance

Risk Categories: Addresses impacts from Contamination from Urbanized Areas, Agricultural Activities, and Forestry.

Analysis: Lane County is in the process of reviewing the provisions and effectiveness of Lane Code 16.253 Class 1 Stream Riparian Regulations , which regulates the removal or alteration of vegetation for development purposes and construction of structures in riparian areas on rural lands, and for compliance with state and federal regulation. As a result of listing spring Chinook salmon and bull trout under the ESA, county staff has asked a technical working group, composed of staff from McKenzie Watershed Council partner organizations, to review and develop recommended changes to the county riparian ordinance to comply with ESA 4(d) rules for salmon, finalized by NMFS in June, 2000.

EWEB is participating on the technical advisory group. In addition, EWEB will continue to work cooperatively with the county to develop ordinance language that will protect riparian habitat, and consequently water quality.

Conclusion: *EWEB should support strengthening the Lane County Riparian Ordinance to improve properly functioning riparian habitat. These changes will apply to EWEB facilities and activities within the watershed. EWEB's best interest over the long term is to support protection of water quality, and compliance with ESA restrictions. In addition EWEB should continue to work with the McKenzie watershed council to provide meaningful support for the riparian ordinance.*

Lane County Septic Codes

Risk Categories: Addresses impacts from Contamination from Urbanized Areas.

Analysis: Lane County is in the process of reviewing the provisions and effectiveness of its application of the health codes as required by the DEQ. Currently, the County review process is limited to ensuring that the size of a proposed system is compatible with the proposed use. As compared with other systems, groundwater in the McKenzie watershed interacts strongly with the surface water of the McKenzie River (e.g., surface water is more susceptible to groundwater contamination.

As a result of the listing of Spring Chinook salmon and bull trout under the ESA, county staff is establishing a special task force to expand requirements for septic systems. Currently, the program is focusing on three areas: 1) having mandatary inspections of septic systems before authorizing any change in use permits; and 2) initiating an education and/or incentive program for septic system

owners to have their systems inspected regularly; and 3) restrictions on where new systems may be located. County staff is looking to the water districts to provide the technical expertise for water quality protection.

Conclusion: *EWEB should support regulatory changes that would protect the water quality of the McKenzie River by: 1) strengthening inspection of septic systems; 2) encouraging proper maintenance of septic systems; and/or 3) ensuring protective siting of new septic systems.*

Springfield Drinking Water Protection Overlay Zone

Risk Categories: Addresses impacts from Contamination from Urbanized Areas, and Commercial and Industrial Facilities.

Analysis: The City of Springfield is drafting Article 17 which will add a Drinking Water Protection (DWP) Overlay District in the Springfield Development Code. The focus of the code is to reduce or eliminate the use of hazardous materials hydrologically upstream from the wellheads. The City is using the Uniform Fire Code definitions of hazardous material. The primary focus of the code is the elimination of Dense Non-Aqueous Phase Liquids (DNAPLs).

DNAPLs do not dissolve into water, and are heavier (denser) than water. Therefore, DNAPLs sink in groundwater (toward wellheads), do not dissipate in groundwater, can not (qualified) effectively be remediated in groundwater, and are often very toxic in low concentrations. These characteristics make DNAPLs the most difficult chemical contaminant to treat for groundwater drinking systems.

Changes in property use, expansion of existing uses or any other activity that requires a City permit will trigger a review. Existing uses are grand fathered in and capped at current usage levels.

The thresholds for allowable chemicals and quantities in the ordinance vary by Time of Travel Zone (TOTZ). Uniform Fire Code (UFC) storage and labeling requirements (such as secondary containment) apply in all of the TOTZs.

All new uses of DNAPLs are banned in the 0-1 year, 1-5 year, and 5-10 year TOTZs.

In the 0-1 and 1-5 year TOTZs, the code also prohibits:

1. underground storage tanks or transmission lines of hazardous chemicals;
2. injection wells;
3. landfills or transfer stations;
4. fill material contaminated with hazardous materials; and
5. any new land uses or facilities that would use DNAPLs.

The code also restricts the application rates of fertilizers with nitrates, and limits the aggregate volume of hazardous chemicals to 500 gallons in the 0-1 year TOTZ.

The City of Springfield has initiated scientific review of Material Safety Data Sheets (MSDS) by a panel. The review panel is creating DNAPL and a non-DNAPL chemical list for use by permitting staff. This list may be useful to EWEB and others in reviewing chemicals.

The Springfield Drinking Water Protection Overlay is focused on protecting groundwater. The area of the overlay covers most of Springfield, Thurston, and portions extend as far as Walterville. This overlay implements more restrictive chemical use and more extensive permitting requirements within urban areas that drain to the McKenzie River above Hayden Bridge. This ordinance is one of the most comprehensive and restrictive local mechanisms in the urban area closest to the Hayden Bridge Intake.

Conclusion: *EWEB should fully support adoption and implementation of the Springfield Drinking Water Protection overlay district. Furthermore, EWEB should evaluate SUB's drinking water protection overlay district as a model for other areas within the McKenzie Watershed.*

DRINKING WATER PROTECTION PLAN

ENVIRONMENTAL SETTING & RISK ASSESSMENT

Brenda Sirois
Water Resource Planner
Eugene Water & Electric Board
August 2000

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ENVIRONMENTAL SETTING & RISK ASSESSMENT

Basin Overview

The McKenzie River watershed is a sub-basin of the Willamette River watershed and is bounded on the west by the Willamette Valley and on the east by the crest of the Cascade Range (Figure 1). Elevations in the McKenzie watershed study area range from over 10,000 feet at the summits of the Three Sisters, to about 450 feet at Hayden Bridge. Much of the watershed is mountainous with approximately 90 percent of the watershed lying above 1,000 feet in elevation and 70 percent is above 2,000 feet. Most of the basin consist of steep ridges with relatively flat and narrow valleys. The McKenzie River originates at Clear Lake at an elevation of about 3,000 feet above sea level and flows southward for approximately 15 miles before turning westward and continuing about 60 miles to reach Hayden Bridge in Springfield.

The study area for EWEB's drinking water protection plan includes the entire McKenzie River basin (approximately 1,160 miles) that lies upstream of Hayden Bridge intake facility. The drinking water protection area includes the rural communities of Walterville, Leaburg, Vida, Blue River, McKenzie Bridge, and east Springfield. In general, the watershed supports a timber, agricultural and recreation economy. Most of the drinking water protection area is located in Lane County with a small segment in Linn County (Figure 2).

Geology & Soils

The McKenzie watershed includes portions of three geologic provinces (Baldwin, 1985; Walker and MacLeod, 1991). The High Cascades volcanic peaks, including the Three Sisters, are composed of Pleistocene age andesite lava and pyroclastic deposits. These prominent stratovolcanoes rise above a Pliocene-Pleistocene age platform of basalt and andesite lavas, such as the thick sequence of flows exposed on the flanks of Foley Ridge. From Clear Lake to Trailbridge Reservoir, the McKenzie River skirts the western edge of an area of very young basalt lava that extends west and northwest from McKenzie Pass. Another young lava flow extends west from the North Sister area along the valley of White Branch and Lost Creek. The porous nature of the young volcanic lavas of the High Cascades allows infiltration and storage of large volumes of precipitation.

The eastern portion of the watershed was scoured by glaciers several times during the Pleistocene Epoch, and active glaciers persist on each of the Three Sisters. While the High Cascades remain clearly marked by glacial processes, physical evidence of the glacial history of the western cascades has been poorly preserved (Swanson, 1980). From above Belknap Springs to Blue River, the McKenzie River flows through a classically shaped glaciated valley characterized by steep valley walls and a relatively broad flat flood plain underlain by glacio-fluvial deposits of coarse volcanic sand and gravel. West of Blue River, the McKenzie River enters a much narrower and non-glaciated canyon.

FIGURE 1
LOCATION MAP

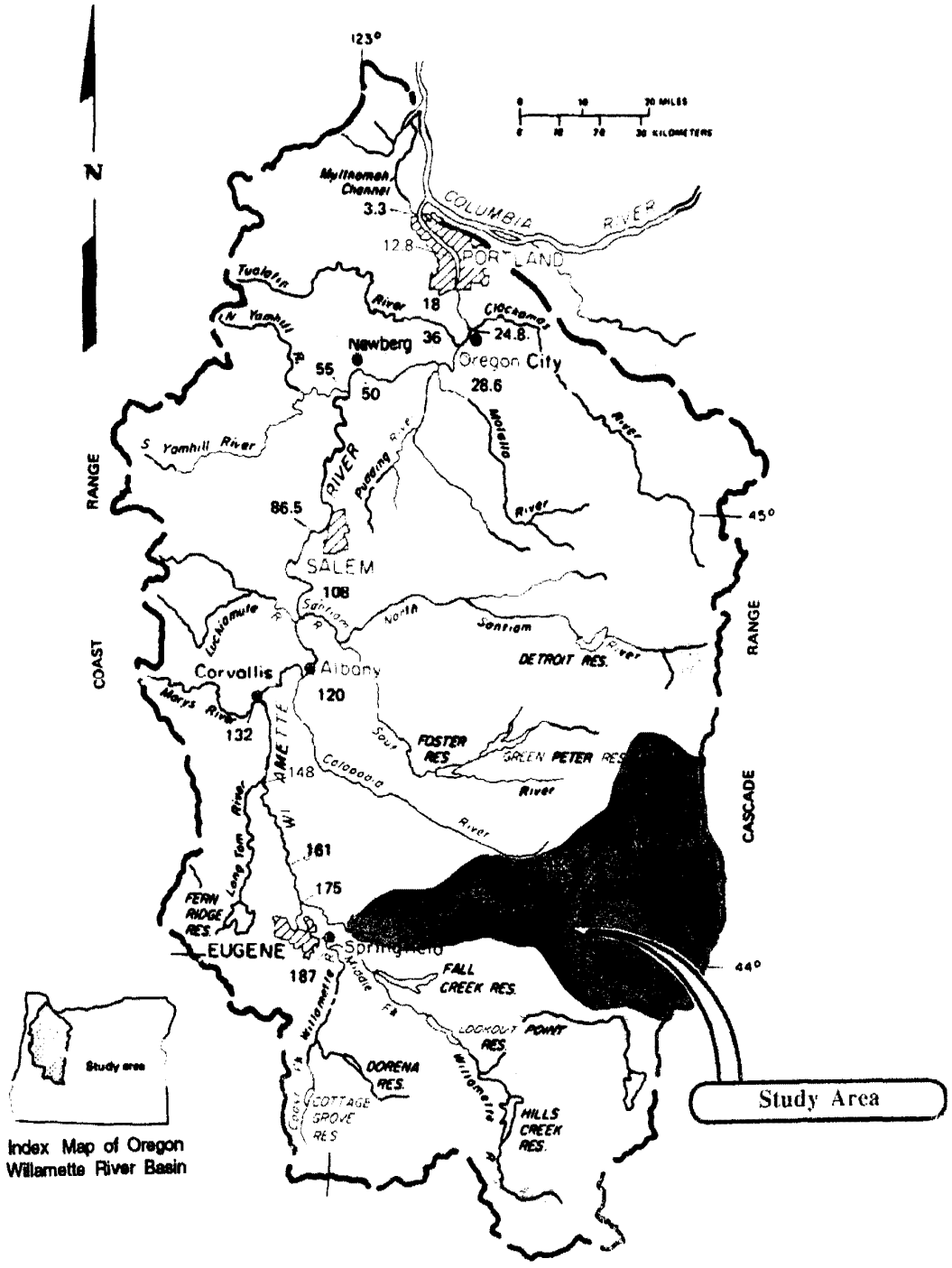
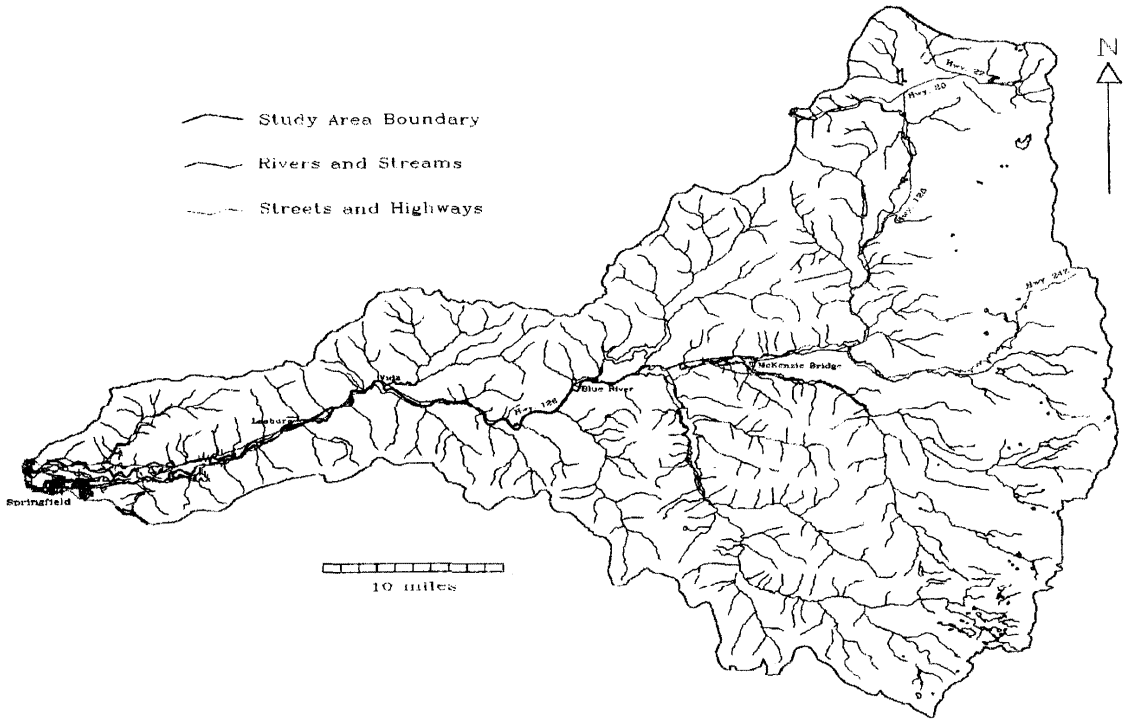


FIGURE 2
McKENZIE WATERSHED RISK ASSESSMENT
BASE MAP of STUDY AREA



Further downstream, just below Martin Rapids, small fluvial terraces have been preserved. The meandering river has widened its valley below Walterville, producing broader terraces and rich alluvial soils.

Agriculturally productive soils are generally found along the lower river valley bottom lands. Soils located along the steeper slopes are suited mostly for lower intensity cultivated crops, pasture, recreation, timber and wildlife.

Climate

The climate in the watershed is characterized by mild, wet winters and warm dry summers. Local microclimates produce significant variations within the study area. Annual average precipitation rates vary from 49 inches at Eugene to 110 inches in the High Cascades. The average annual precipitation at McKenzie Bridge is 67.4 inches. December receives the largest amount of precipitation with an annual average of 10.66 inches. July receives the smallest amount of precipitation, with an annual average of 0.80 inches (NOAA, 1992). The annual average precipitation at the H.J. Andrews Experimental Forest located near Blue River is 90.6 inches, with 71% of the precipitation falling between the months of November and March.

Average temperatures at the Andrews station range from 33.1 degrees Fahrenheit in January to 64 degrees Fahrenheit in July. It is important to note that minimum recorded temperatures appear to have increased over the last two to three decades. An analysis of temperature records for the period 1973 to 1991 (Greenland, 1993) indicates that during this period, minimum, maximum and mean temperatures are increasing. The greatest increase have been observed for the spring months.

Hydrology & Streamflow

The major tributaries to the McKenzie River from the south include Lost Creek, Horse Creek, South Fork McKenzie River, and Quartz Creek. All of these, except Quartz Creek originate in the high cascades with Lost and Horse Creek draining from glaciers on the west flank of the Three Sisters Mountains. Smith River, Blue River, Gate Creek and Camp Creek are the primary tributaries joining the main stem from the north. In all, there are about 1,780 stream miles (including the Mohawk sub-basin), of which approximately 1,040 miles flow year round.

Stream flow volumes in the McKenzie River approximate seasonal rainfall and snow melt patterns, with peaks usually in February and May and low flows from August through October. From 1990 to 1998 historical stream flow for the McKenzie River near Walterville ranged from about 1,000 cubic feet per second to almost 45,000 cubic feet per second. The drainage area for the stream flow recorded at the Walterville gaging station is about 1081 square miles. Average annual river flows for the McKenzie River are 454 cubic feet per second at the outlet of Clear Lake and 5,890 cubic feet per second near the confluence with the Willamette.

Natural flow patterns in the McKenzie have been altered by dams, diversions, water withdrawals and development. The McKenzie River is diverted by EWEB for power generation at two locations.

The Leaburg Canal at river mile 24 near Leaburg Dam diverts part of the McKenzie River for five miles at the Leaburg powerhouse. Water diverted at the dam passes through a downstream migrant fish screen before entering the canal and water is returned to the McKenzie River through a 1,100 foot long tailrace. The other diversion is located at river mile 15 at the Walterville Landing. The Walterville Canal diverts part of the river for four miles to the Walterville powerhouse. Water is returned to the river through a 2 mile long tailrace canal, part of which is an old river meander channel.

There are a total of six dams along the McKenzie River and its tributaries. EWEB generates power through the operation of the Waltervile and Leaburg hydroelectric projects on the lower McKenzie and through dams on the upper McKenzie at Carmen-Smith and Trailbridge hydroelectric projects. The Army Corp of Engineers operates the Blue River Dam on Blue River and Cougar Dam on the South Fork of the McKenzie. These dams provide storage for flood control, flow augmentation and navigation functions. Hydroelectricity is also generated at Cougar Dam.

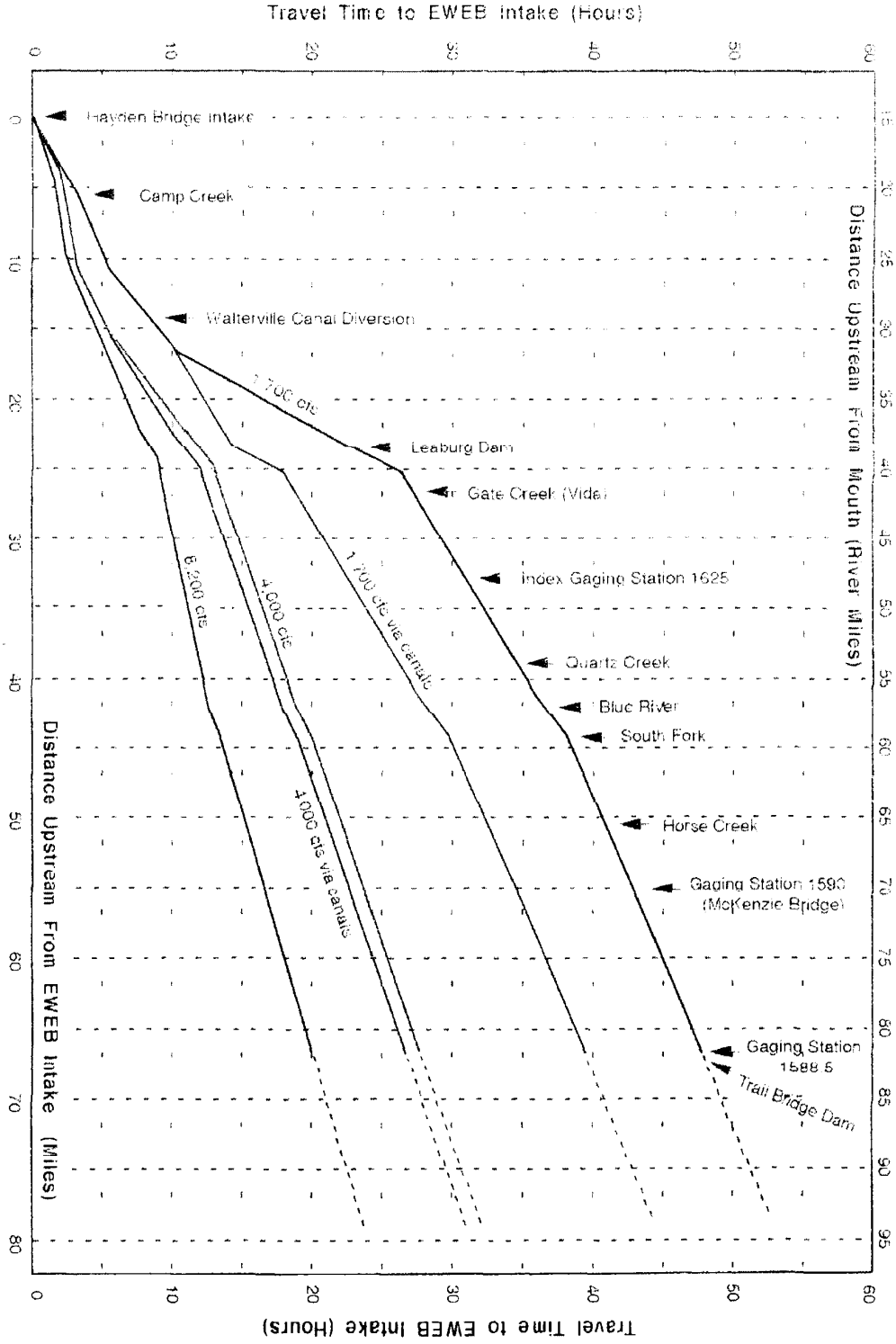
McKenzie River Travel Times

The United States Geological Survey (USGS) has made time-of-travel measurements for short sub-reaches of the McKenzie River using the dye-tracer method. Arrival times were measured and travel rates calculated for low, medium, and high flows on individual short reaches. These rates were then integrated over the sub-reaches to produce time-of-travel graphs for the entire river. For this study, the USGS data for the McKenzie River have been re-graphed in order to show time-of-travel from upstream points referenced to the EWEB intake facility (Figure 3). The USGS findings illustrate the general rule that time of travel increases with low flow. Note that discharges shown are for the index gauge near Vida. To estimate approximate travel time from a given point on the river to Hayden Bridge, it may be necessary to interpolate between given discharge curves. The USGS study reveals that the two power canals (Leaburg and Walterville) play an important role in determining travel times: at moderate to low stream flows, water traveling via the canals will reach the intake facility significantly faster than water flowing in the river channel. This appears to be particularly true of the Leaburg power canal.

Water Use & Availability

The McKenzie watershed is the source of drinking water for over 200,000 people, most of whom do not live in the watershed. Eugene (EWEB) and Springfield (SUB and Rainbow Water District), as well as Marcola, Shangri-La, McKenzie Palisades, and Blue River Water Districts are the community water suppliers. All but EWEB obtains its drinking water from aquifers. The Oregon Water Resources Department (WRD) has issued water rights to divert about 10,962 cfs from the McKenzie River system. The vast majority of the water rights have been granted for non-consumptive hydroelectric use. Water permits and water rights are issued by the WRD for non-consumptive and consumptive uses. Non-consumptive beneficial water use categories include recreation, wildlife, fish, and hydroelectric. Consumptive uses include domestic, municipal, irrigation, industrial and mining.

FIGURE 3
TRAVEL TIME GRAPHS FOR STREAMFLOWS AT INDEX GAGING STATION



Several reaches of the upper main stem and virtually all of the South Fork McKenzie River are designated state scenic waterways. Authorizing statues have established that the highest and best uses of scenic waterways are for recreation and fish and wildlife. Much of the upper McKenzie River is also designated a federal wild and scenic river. Oregon Departments of Fish and Wildlife, Environmental Quality, and Park and Recreation can apply for instream rights. Currently, ten stream reaches in the watershed have instream water rights or minimum flows. These rights total 3,131 to 3,385 cfs, depending on the time of the year. Four of these reaches have a minimum stream flow for releases from stored water in the amount of 1,860 cfs.

Hydropower accounts for 91 percent of the surface water and about 7 percent of the stored water allocations. Water rights for irrigation accounts for 2.5 percent of the appropriated surface water and 92 percent of stored water. Less than 85 cfs of groundwater is allocated in the McKenzie watershed with 63 percent used for irrigation. Most of the remaining groundwater is appropriated for municipal use.

Water availability is a major factor in the determination of whether new water rights are granted. Currently, water appropriations are still available in the watershed for certain uses and during certain periods of the year.

Land Use & Zoning

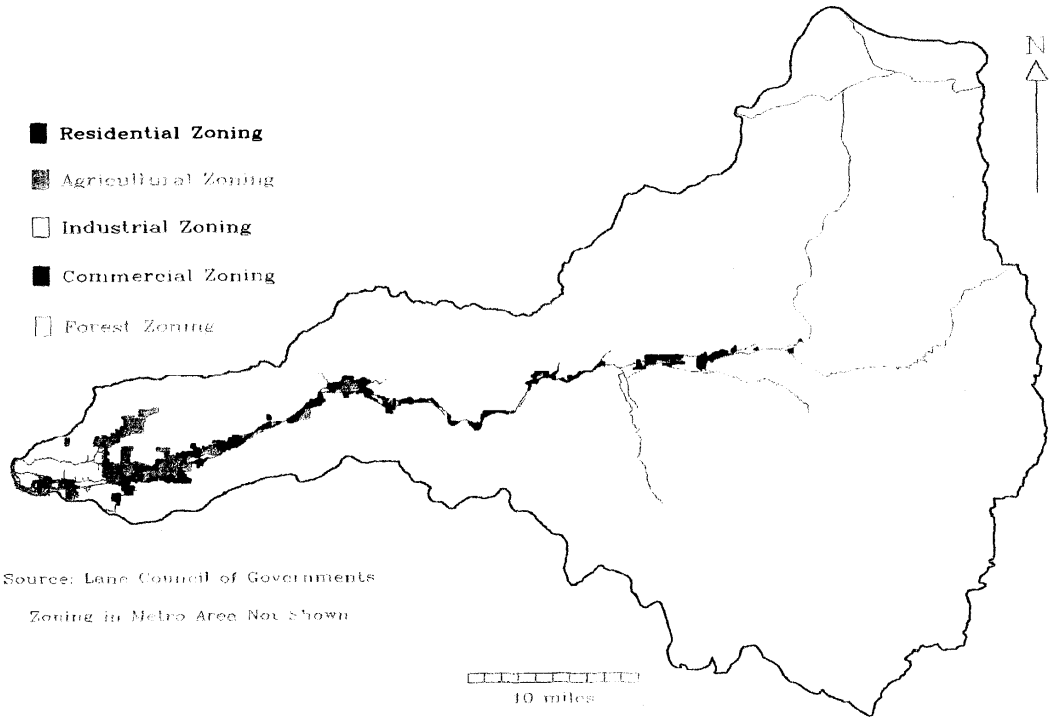
Approximately 69 percent of the watershed is under public ownership, with the Willamette National Forest being the largest single land manager, comprising about 62 percent of the watersheds acreage (Figure 4). The Bureau of Land Management holds about 6 percent of the watershed area with state, county, municipal, and other federal ownership comprising less than 1 percent.

Timber companies as a group are the largest private land owners in the watershed. Weyerhaeuser Company is the largest but several other timber companies also have large holdings (Rosboro Lumber Company, Giustina Land and Timber Company, Giustina Resources, John Hancock Company, and Willamette Industries). Forestry is the predominant land use in the watershed, with agriculture, rural and urban development essentially confined to the valleys. Urban land uses predominate with the Eugene-Springfield metropolitan portion of the watershed. Land use in this area is guided by the Eugene-Springfield Metropolitan Plan.

About 4 percent of the watershed is classified as suitable for cultivation with most of this land occurring near the mouth of the McKenzie River and along Mohawk River and Camp Creek. According to the Oregon State University Extension Service, agricultural production in the watershed makes up about one-fifth of Lane County's agricultural production. Filberts are the most extensive agricultural crop in the watershed and cover approximately 1,200 acres. Other crops in the watershed include blueberries, pumpkins, green beans, corn, carrots, mint, and grass seed.

The watershed includes about 225,000 acres of designated Wilderness and a 26 mile long National Recreation Trail. Forty-three recreational facilities draw visitors to the watershed. These include four Lane County parks, five state parks, one EWEB park, and BLM park, and 24 US Forest Service campgrounds.

FIGURE 4
McKENZIE WATERSHED RISK ASSESSMENT
LAND USE ZONING IN THE RURAL AREA



Demographics

According to 1990 US census data there are about 22,650 people living in the McKenzie watershed. White collar, service, and manufacturing/retail/wholesale made up about 70 percent of occupations held by McKenzie area residents in 1990. Between 1980 and 1990, farming and forestry occupations dropped from 4 percent to 3 percent, while technical, professional, executive, machine operator and material moving increased (US Census, 1990).

The Lane Rural Comprehensive Plan identifies eight rural communities within the McKenzie watershed. The communities of Walterville, Leaburg, Vida, Nimrod, Blue River, Rainbow, and McKenzie Bridge are located along the McKenzie River. Historically, these communities developed in conjunction with a forest related industry, such as a lumber mill. Today, these communities are essentially made up of small private ownership with some commercial development. Many of these communities also contain publicly designated land for government operations or parks.

Previous Water Quality Studies

Numerous studies (e.g., Seidler, 1979) have demonstrated that rainfall events result in a temporary increase in stream flow and an overall increase in mass loading of pollutants from nonpoint sources into the water system. The Phase One findings of an ongoing DEQ study in the Willamette River Basin indicate that roughly 70 to 80 percent of pollution enters the river system from nonpoint sources (DEQ, 1993). According to this work, about 90 percent of the nonpoint source discharge occurs during the rainy season. The statewide percentages of nonpoint source pollution of surface water caused by different land uses have been estimated as follows (DEQ and DLCD, 1994): urban runoff, 11.8 %; agriculture 38.7%; forestry, 17.4%; mining, 5.2%; construction, 3.3%; marine recreation, 13.8%; and natural impacts, 9.7%.

Working with the McKenzie Watershed Council, the Oregon Department of Environmental Quality Lab has established and maintained a watershed monitoring network for the McKenzie and has collected ambient water quality data in the McKenzie River for several years. The seven surface sample locations are McKenzie River at Coburg Road, Hendricks Bridge, McKenzie Bridge and Highway 126 between Koosah Falls and Clear Lake, and the Mohawk River at Hill Road, Blue River at the town of Blue River, and the South Fork of the McKenzie River at USFS 19.

DEQ reports that the McKenzie watershed contains some of the highest quality streams in the state. Oregon Water Quality Index (OWQI)[1] results indicate that, with the exception of the Mohawk River[2], water quality is excellent throughout the year. Spatial trends indicate a decrease in quality from upstream to downstream. Temporal trends show continued significant improvement in water quality.

[1] The Oregon Water Quality Index (OWQI) analyzes a defined set of water quality variables and produces a score describing general water quality. The water quality variables included in the OWQI are temperature, dissolved oxygen (percent saturation and concentration), biochemical oxygen demand, pH, total solids, ammonia, nitrogens, total phosphorus, and fecal coliforms. OWQI scores range from 10 (worst case) to 100 (ideal water quality).

[2] Although the Mohawk drainage system is in the McKenzie River basin, it is not part of this risk assessment because it lies downstream from the intake at Hayden Bridge

According to the report, for the period of record for each of the monitoring sites, although water quality is generally excellent, there are a few problems. Dissolved oxygen standards violations were found at the Coburg Road station and the Hendricks Bridge station. The Oregon Water Quality Index found high levels of ammonia and nitrogen (as nitrate), biochemical oxygen demand, total solids, and fecal coliforms at the Coburg Road station and at the Hill Road station. According to the report, the above standards violations and criteria exceedences, coupled with the OWQI findings, indicate the presence of point and nonpoint source pollution in the lower portions of the McKenzie Watershed.

Risk Assessment

In 1995 EWEB contracted with GEM consulting to perform an Environmental Risk Assessment (ERA) of the McKenzie Watershed for portions of the watershed located above EWEB's drinking water intake and water treatment plant.

This section provides a brief synopsis of the methodology used to perform the 1995 ERA. The final report describing the ERA (and subsequent updates) of EWEB's Drinking Water Supply is included in this technical appendix to the Drinking Water Protection Plan.

The need to conduct the ERA was identified in the early 1990's as part of EWEB's water resource and environmental management plans. The objective of this 1995 work was to identify and assess potential environmental risks within the watershed that could adversely impact the drinking water quality of EWEB's sole source of water.

The ERA was accomplished by compiling, organizing, integrating, evaluating, and summarizing existing information, and by performing limited field surveys to supplement and verify information. A phased approach was undertaken.

Summary of Phase 1

During Phase 1 GEM Consulting contacted and/or searched the libraries and databases of the following agencies for information related to practices or land uses that may pose a risk to the drinking water:

- Eugene Water & Electric Board
- Lane County
- Lane Council of Governments (LCOG)
- Springfield Utility Board (SUB)
- City of Springfield Public Works
- United States Forest Service (USFS)
- Bureau of Land Management (BLM)
- US Army Corp of Engineers
- US Geological Survey (USGS)
- US Environmental Protection Agency (EPA)
- Oregon Department of Environmental Quality (DEQ)

- Oregon Water Resources Department (WRD)
- Oregon Department of Agriculture (ODA)
- Oregon Department of Fish & Wildlife (ODFW)
- Oregon Department of Forestry (ODF)
- Oregon Department of Transportation (ODOT)
- Oregon State Police
- Oregon Division of State Lands (DSL)
- Oregon State University (OSU)
- University of Oregon (U of O)
- Lane County Extension Services
- Oregon, Lane & Linn County public health agencies
- Oregon Water Resources Research Institute (OWRI)
- Governor's Watershed Enhancement Board (GWEB)
- Oregon Watershed Health Program
- McKenzie Watershed Council Coordination Team

A digital base map for the study area was developed to provide a standard framework for the analysis and presentation of the information gathered. The base map was generated with Geographic Information System (GIS) software which integrates the map with the risk inventory database compiled during Phase 2. Previous work conducted by LCOG staff in support of the McKenzie Watershed Council was utilized in the initial development of the digital base map and some of the database files.

Summary of Phase 2

The risk inventory developed during this phase includes both nonpoint source impacts and point source discharges[3], and the potential hazards associated with them that could adversely impact EWEB's drinking water quality. The risk inventory was compiled from many sources. Information regarding commercial or industrial facilities with hazardous materials storage was acquired from the office of the State Fire Marshal through HAZCOM Dial-up service. Additional information was obtained from the toxic release inventory and incident report. Location of underground storage tanks (UST's) were obtained from a statewide database maintained by the DEQ which also maintains lists of UST cleanup sites, hazardous waste generators and water quality permits of various types. These information sources, and the various limitations on their usefulness and reliability are discussed in detail in the 1995 Final report. Supplemental information was obtained from telephone directories of the study area, through interviews with agency and company staff, and through limited field verification.

[3]Point source and nonpoint source are two general categories frequently used to examine and to manage pollution and pollutant sources. Point source originates from a definite source and can be traced to a particular (generally permitted) discharge at a particular facility. Nonpoint source pollution is traditionally defined as originating from diverse sources that are numerous and/or that cover a large areal extent.

The following categories were used to describe and identify potential risks:

- Agriculture
- Dams, Diversions and Powerhouses
- Development/Urbanization
- Eutrophication
- Forestry Practices
- Golf courses and Cemeteries
- Industrial and Commercial Facilities
- Nurseries
- Recreation
- Resource Extraction
- Roadside Vegetation Management
- Septic System Failure
- Storm Water Outfalls
- Transfer Stations
- Transportation
- Underground Storage Tanks (UST's)
- Permitted Discharges (Point Sources)

Agriculture

Agricultural activities in the McKenzie watershed study area include both commercial and hobby farms. These lands are concentrated in the lower portion of the watershed, primarily around Walterville and in the Camp Creek Valley. Cattle ranches, seed orchards and nurseries have been identified in the watershed. Commercial crop production includes hazelnut orchards, christmas and holly tree, corn, wheat, pumpkins, peppermint, and blueberry farms. Hobby farms include backyard gardens, small beef herds, horses and a variety of other farm animals including sheep and goats.

Potential nonpoint source pollutants include sediments, nutrients, pathogens, oxygen-depleting organics, and pesticides. Many different chemicals are used on the various commercial crops found in the McKenzie watershed area with different application rates. Of the known chemicals that are used atrazine, captan, lorsban and 2,4-D are the greatest concern because of their reported solubility.

Dams and Powerhouses

Six dams have been constructed on the McKenzie River and its tributaries for hydroelectric and flood control purposes. Dams and powerhouse operations typically involve the use of fuels, paints, solvents, and coolants/lubricants.

Development/Urbanization

Stormwater runoff from urban areas represents both a water quantity and a water quality problem. Development and construction are two major contributors of non-point source pollution.

Throughout western Oregon, deterioration in water quality has been documented where disturbance from road construction has occurred (Fredriksen, 1970). Construction sites which lack effective erosion sedimentation control measures have a much higher soil erosion rate than undisturbed areas. Increased runoff is also associated with areas where urbanization has converted open-space land to impervious surfaces. In the McKenzie watershed study area, the heaviest pressure for residential development is in the east Springfield , Thurston, and Walterville areas. The conversion of forest and farm land to residential development is the most common land use change presently occurring in this part of the study area.

Pollutants found in surface water runoff in urbanized watersheds include sediments, nutrients, pathogens, metals, petroleum products, and toxic chemicals. Also metals such as copper, lead, nickel, and zinc have been shown to exceed federal water quality criteria in many urbanized basins in western Oregon (DEQ, 1992).

Eutrophication

In the McKenzie watershed, eutrophication has been a major concern at EWEB's Walterville Peaking Pond. Water from the peaking pond is used to supplement the water supply to the turbines at the Walterville Powerhouse during periods of peak demand. Eutrophication may also be occurring in other areas where water remains shallow and relatively stagnant.

Forestry Practices

Forestry practices include activities related to growing and harvesting timber. Pollutants typically associated with forest practices include nutrients, sediments, organics, and heat. Erosion and subsequent sedimentation results from timber harvest, road construction, stream crossings, and high intensity fires. Increased water temperature results from removal of riparian vegetation that shades streams.

Golf Courses and Cemeteries

There are two golf courses and two cemeteries located within the McKenzie watershed study area. Both golf courses use fertilizer, fungicide, pesticide, and herbicide chemicals and adhere to the IPM (Integrated Pest Management) philosophy. It is believed that the cemetery also uses similar chemicals for their turf building and lawn maintenance.

Industrial and Commercial Facilities

A variety of businesses including auto service stations, repair shops, dry cleaners, beauty salons, print shops, medical facilities, logging and construction companies, and sand and gravel operations represent other potential nonpoint sources of pollutants. The majority of these are located in the east Springfield and Thurston areas of the watershed study area

Nurseries

Seven nurseries have been identified within the study area. Nurseries contribute to nonpoint source pollution, primarily by nutrients, toxic chemicals, and sediment. Container nurseries, in particular, tend to be sites of relatively intense use of fertilizers, insecticides, and fungicides.

Recreation

The McKenzie watershed includes a portion of the Three Sisters, Mount Washington and Mount Jefferson Wilderness areas, the 26 mile long McKenzie River National Recreation Trail, 12.7 miles of designated federal Wild and Scenic River, and 16 miles of designated Oregon Scenic Waterway. At least forty-three recreational facilities exist in the watershed including four Lane County parks, five state parks, one EWEB park, one BLM park, and 24 US Forest Service campgrounds. Hoodoo Ski Bowl and 8 snowparks provide winter recreation and a variety of private lodges, resorts and cabins offer accommodations to visitors.

Recreational activities such as boating, hiking, hunting, camping, sightseeing, biking, and fishing can contribute nonpoint source pollutants to the river. Potential pollutants associated with outdoor recreation activities include untreated or partially treated human waste, petroleum hydrcarbons, detergents, solvents, paints, and non-degradable litter.

Resource Extraction

On BLM lands extraction activities have consisted of crushed aggregate production and recreational placer gold mining. Several gravel quarries are found within the McKenzie watershed study area. Gravel mining is associated with increased sedimentation, petroleum hydrocarbons, and metals.

Roadside Vegetation Management

Untreated road runoff finds its way into the river via roadside ditches and streams. Potential pollutants include sediments, petroleum products, metals and herbicides. Oregon State Law mandates that state agencies shall implement integrated pest management (IPM) practices when engaged in pest control.

ODOT operates a roadside herbicide spray program within the McKenzie watershed study area. The South Eugene Maintenance Section is responsible for Highway 126 between milepost Springfield and Walterville. The McKenzie Bridge Maintenance Section is responsible for the roadside spray program from Walterville up to the Lane County line. The Santiam Junction Maintenance Section is responsible for Highway 126 and Highway 20 in the portion of the watershed study area that lies within Linn County. The Lane County Public Works Department operates a roadside spray program along county roads. The County uses Integrated Vegetation Management (IVM) in their program. Some of the herbicides and pesticides used include Rodeo, Garlon 3A, Telar, Oust, Weedone, Roundup, and Krenite.

Septic System Failure

Nonpoint source pollution originating from septic systems is attributed to failing or malfunctioning systems. Sewage disposal systems consist of a septic tank and a drainfield. A system failure can occur when effluent exceeds the absorbent capacity of the soils. This results in a sludge backup in the plumbing and/or the release of partially treated effluent onto the ground surface. Other causes for system failure include poor soil conditions, inadequate design, inadequate construction, lack of maintenance and abuse of the system.

Potential pollutant sources from failing tanks include nitrate contamination, nutrients, toxic chemicals, organics and pathogens.

Residents of the five rural communities within the watershed study area (McKenzie Bridge, Blue River, Vida, Leaburg, and Walterville) rely on septic systems. With increased rural population there will be an increase potential for groundwater contamination.

Storm Sewer Outfalls

Urbanization is characterized by many types of impervious surfaces, including roof tops, driveways, buildings, sidewalks, parking lots, and highways. Sediment and chemicals may accumulate on these surfaces and be washed off into storm drains or ditches during heavy rainfall.

Numerous potential sources of contamination, due to runoff or to accidental spillage or release are created in any area where surface runoff reaches the McKenzie River upstream of the Hayden Bridge intake.

Transfer Stations

Two solid waste transfer stations operated by Lane County are located within the watershed study area. At solid waste transfer stations, spills, improper management of waste, or generation of leachate from waste decomposition could produce run-off laden with nutrients, oils/greases, toxic chemicals, sediments, oxygen depleting organics, metals, and pathogens.

Transportation

Truck movement on Highway 126 through the watershed includes shipments of a wide variety of hazardous materials, but gasoline and diesel are probably by far the most common. Any information regarding hazardous material cargo is based on a limited and sporadic inventory taken at the Walterville weigh station.

Underground Storage Tanks

Underground storage tanks (UST) are used for the storage of petroleum and other regulated substances. UST systems represent a threat to water quality due to deterioration of the tank, improper installation, or pipe/connection failures. In addition, active UST sites represent potential sources of surface water contamination through spills and overfills during product delivery.

Permitted Discharges (point sources)

Point source discharges on the McKenzie River upstream of EWEB's water intake have been identified primarily from a database of water quality permit holders at DEQ's Western Regional office in Eugene. Facilities with water quality permits, from which permitted discharge and/or runoff could potentially impact the McKenzie River upstream of EWEB's intake at Hayden Bridge, are listed in Table 1.

TABLE 1
DISCHARGE PERMITS IN THE McKENZIE WATERSHED AREA
Source: DEQ Water-Quality Permits Database

Name, Address	DEQ WQ File No.	Permit Number(s)	Discharge Type(s)	Category & Class	Contact Information
EWEB Filtration Plant	28285/A	0200-J	Filter Backwash and Settling Basin	Ind./Minor	Doug Wise 341-8500
Oregon Ind. Lmbr Prods, 3850 Mrcola Road	10721/A	1200-W	Stormwater (Wood Products)	Ind./Minor	Murray McDowell 746-2531
Leavitt's Freight Co., 3855 Marcola Road	104563/A	1200-T	Stormwater (Transportation)	Ind./Minor	Terry Leavitt 747-4236
Reed's Fuel Company, 4100 Commercial	106911/A	1200-T 1700-J	Stormwater; Vehicle Washwater	Ind./Minor	746-6535
Weyerhaeuser Corp., 785 N. 42nd	96244/A	1500-J 101081	UST Cleanup; Process and Cooling Water	Ind./Major	Richard Hanson 741-5666
Blue Water Boats, 5280 High Banks Road	107821/A	1200-L	Stormwater (Light Industrial)	Ind./Minor	Gary Bolling 741-1111
BP Service Station 5720 E. Main	105878/A	1500-J	UST Cleanup	Ind./Minor	Bill Cummins 726-9413
Former Sunny Station, 5737 Main (now Texaco)	105879/A	1500-J	UST Cleanup	Ind./Minor	726-8077
EWEB Walterville Powerhouse	28395/A	0100-J	Cooling Water	Ind./Minor	Jay Lestrange 484-2411 ext. 4548
Douglas Clayton, 41539 Deerhorn Road	100095/A	0100-J Terminated	Cooling Water	Ind./Minor	Douglas Clayton 896-3839
EWEB Leaburg Powerhouse, 42520 McKenzie Hwy.	28391/A	0100-J	Cooling Water	Ind./Minor	Jay Lestrange 484-2411 ext. 4548
ODFW McKenzie Salmon Hatch.., 43863 Greer Dr.	64500/A	0300-J	Treated Hatchery Discharge	Agr./Minor	Dave Rogers 896-3513
ODFW Leaburg Trout Hatch.., 90700 Fish Hatchery Rd.	64490/A	0300-J	Treated Hatchery Discharge	Agr./Minor	Steve Wells 896-3294
U.S. Basketball Academy (Elite Sports Promotion, Inc.)	104458/A	100772 (WPCF)	Commercial Onsite Sewage System	Dom./Minor	Bruce O'Neil 741-7761
Suess Co. dba Patio RV Park, 55636 McKenzie River Dr.	108188/A	101207 (WPCF)	Commercial Onsite Sewage System	Dom./Minor	C. Suess 342-3060
EWEB Trail Bridge Dam and Powerhouse	28393/A	0100-J	Cooling Water	Ind./Minor	Jay Lestrange 484-2411 ext. 4548
Big Lake Youth Camp, West. Or. Conf. 7th-day Adventist	108135/A	101204 (WPCF)	Community Onsite Sewage System	Dom./Minor	Richard Beck 652-2225

Development of a Risk-Inventory Database

A comprehensive inventory of potential risks to EWEB's drinking water quality was organized in a database. Each inventoried risk, including specific facilities or features, land use activity, or permitted sources, is captured in the database with information including name, address, contact person, a description of the potential hazards with each identified risk and location coordinates.

Summary of Phase 3

Phase 3 involved an analysis of the risks to identify how much, if at all, each of the inventoried risks might pose a threat to the drinking water quality. A set of criteria were developed to characterize the probability and the magnitude that an inventoried risk would have on the drinking water supply:

PROBABILITY CRITERIA

- Size of facility or area involved
- Location of facility or activity in respect to the mainstem and/or tributary to the main stem of the McKenzie River.
- Number and/or amount of hazardous substances present or handled
- Routine releases to the environment of whatever size or substance
- Adequacy of containment, if any.
- Frequency of hazardous substance handling events of whatever size
- Preparedness for immediate response

MAGNITUDE CRITERIA

- Types and amounts of hazardous substances involved in occurrence or activity
- Presence of acutely hazardous and/or non-degradable compounds
- Volumes involved in individual hazardous substance handling events.

Based on the criteria listed above, each facility, land use activity or permitted practice identified in the risk inventory database was assigned a numerical value from 1 to 5 for its relative probability of occurrence and relative potential magnitude. Table 2 and 3 illustrate how this scoring system was applied to the 1995 inventoried risks in the watershed study area.

This approach allowed EWEB to identify the most important risks and focus its resources on developing strategies for protecting the drinking water quality of the water supply.

TABLE 2
SCORING SYSTEM FOR PROBABILITY CRITERIA

Ranking	General Description	Examples
1	Inactive sites or small sites with minimal chemical handling, if any	Decommissioned service stations, market with no fueling facilities, tire stores, welding shops, electrical subsstations, mini-storage
2	Moderate chemical handling, or moderately large area involved	Pest control business, animal clinics, feed stores, swimming pools, transfer stations, airstrips, water treatment plants, cemeteries
3	Active chemical handling or fueling	Auto repair and body shops, logging and construction companies, service stations, hazardous materials transport
4	Probable or periodic impact	Nurseries, quarries, golf courses, storm sewer outfalls, direct domestic discharges, service stations near river
5	Routine impact from facility, or constant area-wide impact from land-use	Fish hatcheries, powerhouses, large manufacturing plants, forestry activities, agriculture

TABLE 3
SCORING SYSTEM FOR MAGNITUDE CRITERIA

Ranking	General Description	Examples
1	Inactive sites or small volumes and/or low toxicities	Markets, motels, docomissioned service stations, masonary business
2	Small to moderate volumes and/or moderate toxicities	Schools, animal clinics, feed stores, welding, small auto repair, small manufacturing, logging and cosntruction companies
3	Moderate to large volumes and/or toxicities	Auto repair, medium sized manufacturing, active service stations, powerhouses
4	Large volumes and/or moderate high toxicities	Storm sewer outfalls, cleaners, forestry activities
5	Large to very large volumes and/or high toxicities	Hazmat truck accidents, large manufacturing plants, fish hatcheries

Summary of Approach Used to Update EWEB's Source Water Assessment

In 1999 EWEB contracted with Golder & Associates to update its 1995 Source Water Assessment. The following describes the approach used.

Phase 1 Conversion of Files from 1995 Report into GIS Format

Database and CAD files from the 1995 GEM report were converted into GIS files. The files were converted into ArcView shapefile format.

Phase 2 Update of the GEM 1995 Database to Include Point & Non-Point Sources

The following databases were obtained and queried to identify if there are any potential sites or land use activities occurring in the McKenzie Watershed that would have a negative impact on the drinking water quality. Any duplicate information observed from the 1995 work and the recent information was eliminated and the databases updated to reflect the most recent and available information.

- CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System
- NFRAP (No Further Remedial Action Planned database comprising sites removed from CERCLIS
- ERNS (Emergency Response Notification System)
- The United States Geological Survey Federal Water Wells database
- NPL (National Priorities List)
- RCRIS (The Resource Conservation & Recovery Information System
- The Oregon SPILLS database
- The Oregon State Priority List (SPL) and State Cleanup Lists (SCL)
- The Facility Index System (FINDS)
- The PCB Activity Database
- The RCRA Administrative Tracking System (RAATS)
- The Toxic Chemical Release Inventory System (TRIS)
- The Toxic Substances Control Act (TCSA)
- The Hazardous Materials Information Reporting Systems (HMIRS)
- The Federal Superfund Liens (NPL Liens)
- The Leaking Underground Storage Tank Sites Lists (CSCSL)
- The Confirmed & Suspected Contaminated Sites List (CSCSL)
- The Solid Waste Facilities Handbook (SWF/LS)
- The Statewide UST Site/Tank Report (UST)
- Source Information System (SIS: Includes NPDES permits and WPCF permits)
- Pesticide (Information on commercial, private and public pesticide applicators)
- Confined Animal Feed Operations (CAFO)
- Water Rights including surface water, groundwater, groundwater registrations, and in-stream flows

- Hazardous Materials Database includes information on hazardous material spills and on the location of activities that may potentially result in a release of hazardous materials along highway corridors in the watershed.
- Department of Forestry FACTS database which is based on the permitting process for machine operation that requires a notification for any forestry activity that might disturb the land such as partial cuts, clear cuts, road construction, herbicide, insecticide, rodenticide, fungicide and/or fertilizer applications.
- Storm water Outflow contains location of Storm water outflows
- Land-Use database located by tax lot parcel.

These databases were compiled into seven GIS compatible dbase IV datasets and two stand alone dbase IV datasets. The two stand alone datasets are the Department of Agriculture's Pesticide and the Confined Animal Feed (CAFO) databases. The pesticide database contains no coordinate information and the CAFO database records are located downstream from the water supply intake.

Phase 3 Modification of the 1995 Risk Inventory Database

A number of modifications were made to the 1995 database structure to enhance the ability to query, analyze, manage and update information on potential risks to the drinking water supply.

- Inclusion of a Point/Polygon field to separate non-point and point risks
- Separation of the databases into a point and non-point source
- Inclusion of a DEQ Land Use field to categorize significant potential sources of contamination. This field is based on information presented within Chapter 5.2 and Table 5.2 of DEQ's 1999 Source Water Assessment Plan for Oregon's Drinking Water Assessment Program (SWAP)
- Inclusion of general contaminant classes as described in DEQ's SWAP (i.e. in-organics, organics, turbidity and micro-organisms)
- Inclusion of sources of data to facilitate updating and managing of information.

Table 4 describes the updated risk inventory database. Table 5 is a sample of the output from the updated point source risk inventory database.

Phase 4 Scoring/Ranking Updated Risk Inventory

Potential risks to EWEB's drinking water source were assessed in the following manner:

Point sources

Each identified point source was scored based on the probability and magnitude criteria described in Table 4 and Table 5. The database was sorted by probability score, magnitude score, probability plus magnitude score and by EWEB risk category. For the EWEB risk inventory category ranking, the number of point sources for each category was summed and the categories ranked according to the number of point sources. Categories with more sources were ranked higher than those with fewer.

TABLE 4
EWEB RISK INVENTORY DATABASE STRUCTURE

Data Source	Source Date	Hazard	Relative Risk	Relative Magnitude	Point / Poly	DEQ Land Use Category	EWEB Inventory Category	Primary Contaminants	Inorganic Contaminants	Organic Contaminants
Original Data Source.	Date of Original Data Source.	Description of Hazard (if available):	Relative Probability of Impact to The Drinking Water Supply.	Relative Magnitude of Impact to the Drinking Water Supply.	Segregation of Point and Non-Point Sources:	ODEQ & OHD 1999 SWAP Land Use Categories	Based on GEM (1995) Categories:	Based on ODEQ & OHD 1999 SWAP Contaminants of Concern.	Based on ODEQ & OHD 1999 SWAP Contaminants of Concern:	Based on ODEQ & OHD 1999 SWAP Contaminants of Concern:
EPA ERNS	1999	spill	GEM (1995)	GEM (1995)		Comm/Indust	AG	M - micro organisms	N - nitrates	P - petroleum cpds
EPA FINDS	1999	UST	1 - inactive or small sites with minimal chemical handling	1 - inactive sites, small volumes and/or low to mod. toxicities	Point - point which have potential contamination attributes (e.g. UST sites)	Ag/Forest	DAM	I - inorganics	M - metals	V - volatile organic cpds
GEM	1995	LUST	2 - mod. chemical handling / mod. large area involved	2 - small to mod. volumes and/or low to mod. toxicities	Poly - polygons which have potential contamination attributes (e.g. land use parcels)	Res/Muni	DEVELOP	O - organics		S - semi volatile organic cpds
ODOT HAZMAT	1999	lagoon	3 - active chemical handling or fueling	3 - mod. to large volumes and/or mod. toxicities		Other	EUTROPH	T - turbidity		
RCRA Small Generator	1999	erosion	4 - probable or periodic impact	4 - large volumes and/or mod. to high toxicities			FOREST			
SIS	1999		5 - routine impact from facility, or constant area-wide impact from land use	5 - large to very large volumes and/or high toxicities			GOLF_CEM			
State Cleanup List	1999						COMM_INDUST			
State LUST	1999						REC			
State Spills	1999						MINE			
State USTs	1999						ROAD_MAINT			
LCOG Stormwater Outfalls	1999						RES_SEPT			
							STORM			
							LF_TRNSF			
							TRANSP			
							UST			
							WTR_RGT			
							WEYCO			
							RES_MUNI			
							ODFW			

TABLE 5
SAMPLE OUTPUT FROM UPDATED POINT SOURCE RISK INVENTORY DATABASE

DATA SOURCE	SOURCE DATE	HAZARDS	REL_ RISK	REL_ MAG	POINT/ POLY	DEQ LAND USE CAT.	EWEB RISK INV. CAT.	PRIMARY CON	INORG CON	ORG CON	CHEM	PHYS	BIO
EPA ERNS	1999	OIL: DIESEL spill	3	3	point	Com/Indust	COMM_INDUST	O		P,S	TRUE	FALSE	FALSE
EPA ERNS	1999	OIL, FUEL: NO. * spill	3	3	point	Com/Indust	FOREST	I,O	N	P,S	TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST				TRUE	FALSE	TRUE
EPA FINDS	1999		4	2	point	Com/Indust	MINE	O,T		P,V,S	TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST				TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST	O		P,V,S	TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST				TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST	O		P,V,S	TRUE	FALSE	FALSE
EPA FINDS	1999		2	2	point	Com/Indust	COMM_INDUST				TRUE	FALSE	FALSE
EPA FINDS	1999		4	2	point	Com/Indust	MINE	O,T		P,V,S	TRUE	FALSE	FALSE
GEM	1995	chems below RQ, operations in Marcola	1	1	point	Com/Indust	COMM_ INDUST	I			TRUE	FALSE	FALSE
GEM	1995	Fuel/Chemical Spill, Urban Runoff	4	4	point	Res/Muni	STORM	O,I,T	N,M	P,V,S	TRUE	TRUE	FALSE
GEM	1995	Fuel/Chemicals/Nutrients	4	4	point	Res/Muni	STORM	O,I	N	P,V,S	TRUE	TRUE	FALSE
GEM	1995	Fuel/Chemical Spill, Urban Runoff	4	4	point	Res/Muni	STORM	O,I,T	N,M	P,V,S	TRUE	TRUE	FALSE
GEM	1995	Fuel/chemical spill/runoff, welding	2	2	point	Com/Indust	COMM_INDUST	O,I	M	P,V,S	TRUE	FALSE	FALSE

NOTE: Due to the size of this table the columns containing Name/Address/Location are not shown. The complete table is available upon request.

Non-Point Sources

Each tax lot parcel inventoried by LCOG was scored based on the probability and magnitude criteria previously described. The database was then sorted by probability, magnitude, risk plus magnitude and by EWEB risk inventory category. The number of acres for each category were summed and the categories ranked according to area.

Identification of the Most Critical Risks

Based on the assigned rankings each of the risks were plotted on a two-dimensional matrix which has a relative probability as the x-axis and relative magnitude as the y-axis. This plot illustrates the relative ranking amongst all of the inventoried risks. Examination of the risk ranking matrix identifies the risks that pose the most probable and/or largest potential threats to EWEB's drinking water supply, based on the application of the ranking criteria that were applied. The most critical potential risks are listed below:

- Weyerhaeuser Corporation
- Storm Sewer Outfall from 48th, 52nd, 58th, High Banks
- 65th St. Storm Sewer, Cedar Creek
- 69th St. Storm Sewer, Cedar Creek
- 72nd St. Storm Sewer, Cedar Creek
- EWEB Walterville Powerhouse
- EWEB Leaburg Powerhouse
- ODFW McKenzie Salmon Hatchery
- ODFW Leaburg Trout Hatchery
- US Army Corp Cougar Dam & Powerhouse
- EWEB Trail Bridge Dam & Powerhouse
- Runoff from Road Surfaces & Urbanized Area
- Roadside Vegetation Management
- Recreation
- Agricultural Runoff
- Hazardous Material Transport Accidents
- Forest Practices

These can be summarized:

- Agricultural activities
- Dams & powerhouses
- Fish hatcheries
- Forestry activities
- Hazardous material transport accidents
- Recreation
- Roadside vegetation management
- Runoff from road surfaces and urbanized areas
- Storm sewer out falls
- Weyerhaeuser Corporation