LOWER YAKIMA RIVER SUSPENDED SEDIMENT TMDL

USEPA Submittal Document

To ask about available formats for the visually impaired call 360-407-7472. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

VOLUME 2

Publication # 98-10-202 - Vol. 2

RETURN DRAIN TO THE SUNNYSIDE VALLEY IRRIGATION CANAL

WASHINGTON STATE DEPARTMENT OF ECOLOGY

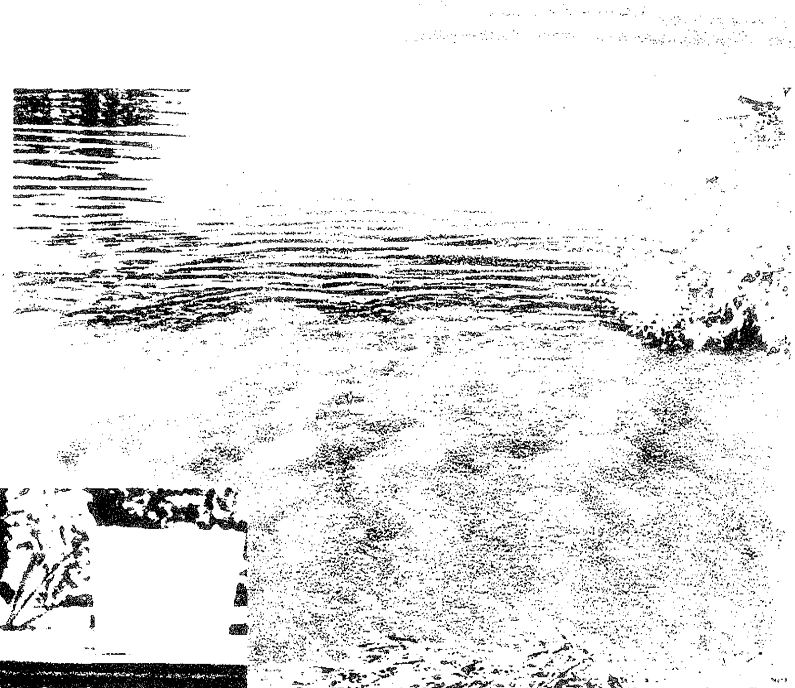
Prepared by the Washington Department of Ecology

August 1998

APPENDIX 3

Granger Drain HUA

FY 1997



Project Personnel

Robert G. Stevens, Washington State University Cooperative Extension

Alan Fulk, Natural Resources Conservation Services

Granger Drain return flow entering Yakima River

PAM NO PAM

The effect of PAM on sediment load at the end of furrow.

Producer and fieldmen observe PAM in action.

TABLE OF CONTENTS

I.	Annual Accomplishments	2
II.	Endangered Species and Cultural Preservation Activities	8
III.	Measured Changes in Water Quality	9
IV.	Impacts on Water Use and Impairments	10
V.	Economics	10
VI.	Pollution Risk Assessment	11
VII.	Cost Share	12
VIII.	Research Needs	12
IX.	Comments/Remarks	13

Appendix A - ASDWQ Tables
Appendix B - Producer Surveys/Questionnaires
Appendix C - Granger Drain News, Bulletins, Etc.
Appendix D - Proposed 1998 Section 303(d) List

PROJECT STAFF

Washington State University
Robert G. Stevens, *Extension Soil Scientist*
Kevin Davis, *Agricultural Research Technician*
Virginia Prest, *Technical Writer*

Natural Resources Conservation Service
Alan Fulk, *District Conservationist*
Chris Johnson, *Soil Nutrient Specialist*
Cal Aylsworth, *Soil Conservationist*

South Yakima Conservation District
Laurie Crowe, *Dairy Resource Technician*

I. Annual Accomplishments

A. Cooperation with Agencies and Organizations

This year has been a pivotal year in the effort to improve water quality in the return flows from the Granger Drain Hydrologic Unit. Although Washington State University (WSU) Cooperative Extension (CE), Natural Resource Conservation Service (NRCS) and the South Yakima Conservation District (SYCD) have been actively involved since 1991, other agencies have not taken an active role in the effort. During 1997 the Washington State Department of Ecology (Ecology), the Yakima River Watershed Council and the Board of Joint Control (BOJC) for the two local irrigation districts have all stepped up their involvement and commitment to cleaning up the return flows (see Section IX. Comments/Remarks for additional details). Endangered Species Act, Safe Drinking Water Act and Clean Water Act concerns are nearing reality in the Yakima Basin putting more pressure on local groups to make progress in their efforts to improve water quality.

The Granger Drain HUA personnel continue to work with the Yakima River Watershed Council in developing water quality strategies for the Yakima River Watershed. This citizen-based group published the first draft of their plan *"A 20/20 Vision for a Viable Future of the Water Resource of the Yakima River Basin"*. This plan addresses both water quantity and quality issues. The Granger Drain HUA water quality program has served as a model for parts of this effort.

The BOJC hired a water quality specialist and began monitoring water quality in the return flows making up the Granger Drain. The data collected in 1997 will be compared to samples taken in 1991 prior to HUA project initiation and data collected by Ecology in 1995. The BOJC is establishing water quality parameters for water leaving producer fields. This will significantly increase project personnel's ability to work with producers who in the past have not seen the need to participate.

Granger Drain HUA personnel played an active role with the local Environmental Quality Incentives Program (EQIP) working group. This effort brought significant cost share moneys to area producers to implement irrigation system improvements that will both increase irrigation efficiency and reduce soil loss through irrigation related erosion (see Section VII. Cost Share for additional details).

Granger Drain HUA personnel participated in implementation of a new WSU CE program, Master Watershed Stewards. Thirty people from diverse backgrounds were given 46 hours of training on issues/uses of the Yakima River Basin. The Granger Drain HUA was part of a field trip to look at solutions to nonpoint water quality issues. The class participants are expected to spend 50 hours in community education and watershed activities.

NRCS and SYCD personnel hosted Washington State Senate Agriculture Committee, State Conservation Commission, and Dairy Federation for an on-farm visit to local dairies. They reviewed various aspects and needs for dairy waste management planning.

Granger Drain HUA personnel presented information regarding Granger Drain HUA at the National Watershed Water Quality Project Symposium in Washington, DC (Appendix C.).

B. Impact of Informational and Education Activities

HUA personnel continued to deliver education and demonstration projects, lend technical assistance, and develop on-farm partnerships in an effort to address water quality issues in the Granger Drain HUA and the Yakima River watershed. Projects addressed nutrient loading in the soil profile, sediment loading to return flows to the Yakima River, irrigation management practices, and mapping Granger Drain area.

Nutrient Loading

Several projects addressed nutrient loading as a result of current fertilizer and animal manure application practices. Producers continue to use soil testing to determine nutrient levels in the soil but usually only in the first foot of the soil profile. Project activities continued to emphasize the potential impacts of considering nutrient levels in the entire rooting profile available for plant nutrient uptake or leaching to groundwater. Waste Management Plans were updated on 16 dairies. Seven crop producers on 20 fields adopted nutrient management changes.

Irrigation Practices/Sediment Loading

Sediment loading continued to decline as irrigation system improvements were made in the Granger Drain HUA. Rill irrigated fields have been upgraded with system improvements including installation of sprinkler systems and drip irrigation, particularly in the portions of the irrigation district that has upgraded to pressurized irrigation water delivery. The Granger Drain includes many production systems that cannot be sprinkler irrigated because it results in lower yields for a variety of reasons. Drip irrigation is a viable solution to sediment loading especially in permanent crops such as hops, grapes and tree fruits. However drip irrigation systems require a sophisticated filtering system and a change in management strategies. In many production systems, installing drip irrigation may not be possible because of cultural practices; i.e. row crop production requires plowing at a depth that would destroy the drip equipment installed in the field or drip may simply be too expensive with regards to potential crop profits.

Granger Drain personnel continued to assist crop producers with furrow/rill irrigation to implement the use of polyacrylamide (PAM). This product, when added in small amounts to irrigation water to reach 10 ppm, can reduce sediment loading to outflows by 90%. During FY97, nine crop producers representing 536 acres tried PAM for the first time with mixed success. PAM requires additional management practices to attain maximum benefit. PAM increases infiltration so the inflow rates need to be increased during the advance phase of the irrigation. If the inflows are not increased the water may not reach the end of the field in optimum time (0.25-0.40 of the total set time, advance plus soak), and the top of the field will receive considerably more water than the bottom. In addition, the best results are obtained when the inflow rate is cutback after the advance phase; this requires additional labor expenditures. Of the nine producers, eight have committed to utilize PAM in FY98. The producer, who had unsatisfactory results with PAM, did not want assistance from project personnel so it is difficult to determine the reason. There is a concern with PAM-irrigation outflows reaching the Yakima River because of potential environmental concerns. Project personnel educate producers that PAM is only needed in the advance phase to achieve maximum results.

Irrigation Water Management

Several crop producers participated in an educational program to learn Scientific Irrigation Scheduling. Cooperators received soil water monitoring devices, an irrigation scheduling software program, weekly soil water monitoring with neutron probe readings and technical assistance to assess crops' current irrigation needs and also forecast future irrigation based on historical weather data. The program was implemented to reduce energy costs, decrease outflows from the field, and reduce deep percolation as well as total soil loss from the field.

Mapping
Significant progress was made with Yakima County (Granger Drain area) to share GIS information to facilitate developing GIS data layers to look at such issues as irrigation practices in relationship to soil type and slope and cropping patterns. This effort is ongoing with an anticipated application of looking at land area available for application of dairy manure with respect to increasing dairy herd sizes.

C. Farming Practices and Land Implementation

Dairy manure is added to much of the Granger Drain HUA land, especially in annual cropping systems. It is a partnership that has been established between the dairy producers and row crop producers that results in an easy disposal system for dairy manure and relatively low priced fertilizer for row crops. The unit of measurement is number of truckloads per acre and manure is not routinely tested for nutrient content. Project personnel educated crop producers concerning 1) mineralization process in the soil and potential nitrogen inputs throughout the season; 2) the benefits of split application of fertilizer inputs timed with crop needs; 3) timing soil testing to more accurately read inputs from manure and nutrients available for crop needs; and, 4) potential nutrient levels of dairy manure, the potential advantages as well as the disadvantages in using this as a nutrient source.

Generally, dairy manure is handled by the dairy operation. Crop producers can receive the dairy manure for a nominal fee and oftentimes for free. The dairyman is actually responsible for spreading the manure on the fields, in most cases. Crop producers seldom deal with the manure other than plowing it into the soil profile. While the dairymen generally try to get a fee for their manure, it is usually to offset the equipment maintenance and transportation cost, and does not result in a profit.

The nutrient levels in the dairy manure vary widely up to 15# N per ton, depending on bedding, water content, and other parameters. This makes it very difficult to determine nutrient levels with any kind of accuracy without testing. Crop producers tend to under estimate inputs from manure and may apply additional commercial fertilizer to meet crop needs. Often, nutrient needs are determined by optimum crop yields instead of field history. While N tends to be the initial interest because of the threat for leaching of excess nitrate to groundwater, P loading is becoming a problem in surface irrigated soils. A general decrease in addition of commercial fertilizer above manure rates has been observed in recent years.

Seven dairy operations, 20 fields, participated in FY97 project focusing on manure management and nutrient loading to soil profiles. Initial soil samples were collected from twenty fields; soils were sampled in one-foot increments to a depth of four feet. Field histories, including crops, yields, manure application and commercial fertilizer applications, were collected on each field. Project personnel worked with dairymen to determine expected nutrient levels at the end of the 1997 growing season. All fields were to be sampled again in the fall of 1997 after the crop was harvested. The actual nutrient levels and the calculated nutrient levels were to be compared. In addition, two cooperators agreed to participate in an on-farm demonstration comparing strips in the field of manure and no manure. Yield and nutrient level comparisons were to be made between treatments. Project personnel were not able to obtain fall 1997 soil samples. Cooperating dairymen were reluctant to continue demonstration work because of a pending lawsuit filed against several dairymen from a local citizens group. The dairies have been put on notice that they will be sued in 1998 unless they prove that they are not polluting surface water. Project personnel hope to complete the project during FY98.

Seven dairy operations have begun some type of composting operations on their dairies. While the initial investment is expensive for equipment and labor, the composted dairy manure has several definite management advantages. A reduction in bulk by 35% significantly reduces transportation cost allowing the nutrients to be spread over a larger area. Composting also makes a more consistent material which allows the producer to have a better understanding of the nutrient content of the material that he is applying. The physical characteristics of composted manure improve the producer's ability to apply the material uniformly across the field. The composting process converts the manure to a form that can be more easily stored without offending neighbors. Additional markets can also be developed. Although composting is not the total solution to over production of nutrients for the land area available for application near the dairies, it is one of many tools that will be needed to solve the problem.

Irrigation Practices/Sediment Loading
There is a trend in the hop production region to upgrade irrigation systems to drip irrigation, but this is usually done in conjunction with a revamping of the entire system. The hop variety is changed, plant spacing is adjusted from the traditional 7X7 to 3X14, and drip irrigation is installed. It is an expensive investment, but it has shown to improve water quality 100% in terms of sediment loading because there is no surface runoff. There is still a concern about leaching of nitrates to

groundwater but drip irrigation uses water more efficiently than rill (surface) irrigation and so irrigation management becomes a tool that is more marketable. EQIP funding has been targeted at this conversion because it produces the highest environmental return for the investment.

In the interim, many crop producers are utilizing PAM. It is a granular product that looks like sugar that is applied directly to the irrigation water. It has routinely shown a 90% reduction in sediment in outflows from the furrow irrigated fields. The product is relatively inexpensive at approximately $4-6 per acre. Project personnel have used PAM since its introduction in 1993, and continue to help growers with technical aspects including formulations, equipment needed, and application rates. WSU CE provided product and technical assistance to new users to introduce them to the benefits of PAM. Nine crop producers (representing 536 acres) used PAM for the first time in FY97. Producers are educated that this is only a short-term solution and long range solutions generally require system upgrades and perhaps a change in cropping practices.

D. Reduction in Nutrient Utilization

Seven dairy operations, 20 fields, participated in the FY97 project focusing on manure management and nutrient loading to soil profiles. Initial soil samples were collected from twenty fields; soils were sampled in one-foot increments to a depth of four feet. In addition, two cooperators agreed to participate in an on-farm demonstration comparing strips in the field of manure and no manure. Yield and levels of residual soil nutrients were to be used to evaluate practices. Sixteen dairies within the project area updated their manure management plans.

E. Reduction in Contaminants from Field

Many hop growers are upgrading their irrigation systems to drip. It is an expensive investment, but it has been shown to improve water quality 100% in terms of sediment loading because there is no surface runoff. There is still a concern about leaching of nitrates to groundwater but with proper management drip irrigation uses water more efficiently than rill (surface) irrigation and leaching is generally reduced. The use of drip irrigation is usually accompanied with an increased interest in irrigation scheduling.

Many producers are using PAM, a polyacrylamide. It has routinely shown a 90% reduction in sediment in outflows from the furrow irrigated fields. Nine crop producers (536 acres) used PAM for the first time in FY98.

F. Off-Site Objectives

The BOJC constructed two sedimentation basins to collect soil from return flows prior to return to the Yakima River. This soil generally comes from eroded irrigated farmland. The sedimentation basin allows particles to settle out of the water prior to returning to the Yakima River. As of September 1997 an average of 4,000 tons per week of sediment had been removed from one of the sedimentation basins during the irrigation season. The sedimentation basins also collect nutrients and chemicals that are attached to the soil particles in the return flow, effectively reducing the amounts arriving at the Yakima River. The sedimentation basins are not a long-term solution but they have allowed the BOJC to demonstrate the amount of sediment in the return flows helping producers understand the magnitude of the problem. They have used it as a teaching tool for crop producers, dairymen and other agency personnel. They have also used the information to assist in defining goals for water quality improvements and reduction in return flows coming off irrigated farmland.

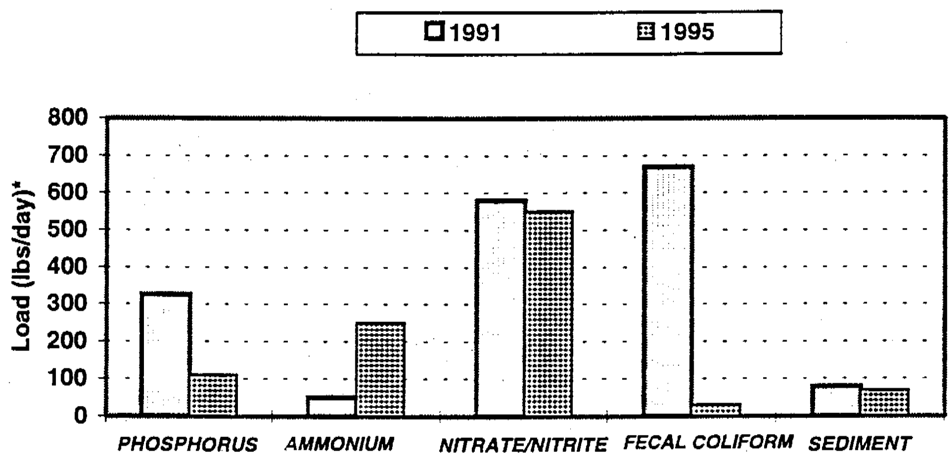
II. Endangered Species and Cultural Preservation Activities

Several salmon stocks and steelhead in the Yakima River basin are currently being considered for listing under The Endangered Species Act. This action will potentially increase the urgency with which water quality problems are corrected within the basin. The potential listing has already caused additional working relationships to be formed within the basin. Because the Yakama Indian Nation resides within the Yakima River Basin additional emphasis is being placed upon returning fish runs.

III. Measured Changes in Water Quality

Ecology implemented a sampling program in 1995 to evaluate water quality parameters in the Yakima River and irrigation return flows. The sampling data was used to set goals for individual tributaries as part of the Total Maximum Daily Load (TMDL) process as required by the Environmental Protection Agency for imparted water bodies. Ecology sampled several sites on the lower Yakima River, including several sites that were a part of South of Ecology's 1995 data with SYCD's 1991 data for fecal coliform, nitrate-nitrite N, ammonium

Figure 1. Granger Drain Pollutant Loads to Yakima River



N, phosphorus and sediment loads to the Yakima River. The pollutant loads are represented as an average per day during the irrigation season (approximately 4/15 to 10/15). Figure 1 indicates a significant reduction in fecal coliform bacteria and phosphorus loading to the Yakima River from the Granger Drain. The data indicates only a marginal improvement in nitrate-N and sediment loads. The data also indicates a large increase in ammonia-N in 1995, which has yet to be explained.

IV. Impacts on Water Use and Impairments

Suspended sediment and persistent pesticide loads from irrigated agricultural areas of the lower Yakima River basin have long been recognized as serious impairments to water quality. This stretch of the river remains on the Section 303(d) list because of continued impairment of water quality due to sediment and sediment-borne pollutants like DDT from irrigation returns. The Granger Drain remains on the 1998 Section 303(d) list for the parameters: 4,4'-DDD, 4,4'-DDE, Ammonia-N, DDT, Dieldrin, Dissolved Oxygen, Endosulfan, Fecal Coliform, pH, and Temperature (see Appendix D).

V. Economics

During FY97, a variety of management practices and structural improvements were implemented in crop production and dairy systems.

Several irrigation systems were upgraded within the project area. Costs were dependent upon the type of system installed; but as the cost increased so did the water quality benefit. Irrigation system installation is estimated at $507 per acre (See Table 1 located in Section VII. Cost Share). A gate pipe system will cost about $200 per acre while a drip system is generally estimated at $1000 per acre. The drip system cost is considerably higher but the water quality benefit approaches 100% because the sediment leaving the field is decreased to zero and the potential to leach nutrients to groundwater is minimal. The type of system installed depends on the cropping system, the topography, and financial resources of the individual producer.

Dairy operations spend approximately $54 per animal unit for installation of waste storage structure. While this cost is relatively low, it only stores approximately 20-35% of the manure (liquid portion from milking parlors). In the Granger Drain HUA, most of the manure is in the form of solids. It is trucked and spread on fields for crop production. The manure does provide a source of nutrients and can add additional benefits including increasing soil organic matter and increasing water-holding capacity of the soil. The down side is the inconsistent application of product and therefore nutrient variability across the field.

Seven dairy operations have started composting operations. When composted, dairy manure becomes a more homegenous product in terms of nutrient content and structure. The bulk is reduced by approximately 35%, making it easier to transport and to spread, as well as reducing transport costs. Composting also makes the manure more environmentally friendly by reducing odor and potential for movement with water. Unfortunately, dairy producers are not recovering the costs associated with the composting process and cost share dollars have not been applied to this type of practice. But the potential to reduce the dairy waste by 35%

has meant a reduction from 194,220 tons of dairy manure to 126,243 tons of compost on seven dairies with a total animal unit count of 16,185. However, composting does not reduce the P and K output from the dairies. Approximately half of the dairies custom compost with local businesses providing the equipment and expertise, the other half are purchasing their own equipment and learning as they go.

VI. Pollution Risk Assessment

Project personnel continued efforts to help crop producers and crop consultants to understand the correlation between the effect of irrigation water management and soil fertility practices on yield and protection of environmental quality. Educational activities included one on one consultation, speaking at grower meetings, and speaking at crop consultant meetings.

VII. Cost Share

A total of $735,244 was utilized in cost share programs within the Granger Drain HUA project boundaries. The monies came from three sources including the EQIP Program and state conservation programs. Approximately 51% ($378,280) of cost share dollars were spent to make improvements to dairy manure storage facilities, 46% ($337,088) was used to improve irrigation systems, the remaining 3% was utilized to fund changes in management practices. The following table shows the distribution of cost share dollars by practice, units affected, unit costs, and project costs.

Table 1. Cost Share Projects funded in FY97

Practice	NRCS Code	Units	Number of Units	Cost per Unit	Project Cost	Cost Share
Dairy Waste Lagoon	425	AU	9340	$54	$504,360	$378,270
Dairy Waste Management	312	AU	14955	$1	$14,955	$11,216
Solid Set	442	AC	42	$725	$30,450	$22,838
Center Pivot	442	AC	330	$540	$178,200	$133,650
Wheel Line	442	AC		$945	$0	$0
Drip System	441	AC	60	$1,000	$60,000	$45,000
Gated Pipe	430-HH	AC	50	$200	$10,000	$7,500
Irrigation Delivery	430-DD	AC	402	$400	$160,800	$120,600
Sediment Basin	350	EA	2	$5,000	$10,000	$7,500
Irrigation Water Management	449	AC	432	$10	$4,320	$3,240
Cover Crop	340	AC	4	$60	$240	$180
PAM	201	AC	140	$50	$7,000	$5,250
Structural Improvements			886	$507.28	$449,450	$337,088
Management Improvements			576	$20.07	$11,560	$8,670
Dairy Waste Management		**AU**	**24295**	**$21**	**$519,315**	**$389,486**
Irrigation Water Management		**AC**	**1462**	**$630.66**	**$461,010**	**$345,758**
Total Cost Share Expenditures					**$980,325**	**$735,244**

VIII. Research Needs

Additional research is needed to understand the relationship between soil test phosphorus levels and the potential for phosphorus to be moved from a field through runoff and erosion. High levels of soil test phosphorus in excess of 10 times the agronomic requirement have been noted in some fields. Phosphorus movement into the second foot has also been found on the highly manured fields.

Composting is being used by some of the dairies as one solution to the manure management problem. Additional research is needed to increase our understanding of the nitrogen release rates from these composted materials. If nitrogen management is to protect the environment and provide adequate nitrogen to the crop during the growing season, we must be able to predict nitrogen availability and timing from various forms of manure additions.

IX. Comments/Remarks

A. Additional Programs within the Project:

Washington State Department of Ecology

In July 1997 the Department of Ecology (Ecology) published *A Suspended Sediment and DDT Total Maximum Daily Load Evaluation Report for the Yakima River* (#97-321). This TMDL had the objective of recommending suspended sediment reduction targets to protect aquatic life in the main stem and in tributaries. Targets were based on relationships between suspended solids and Washington State criteria for turbidity and DDT. The TMDL established 5, 10, and 15 year targets (see Appendix D). The requirement by 2002 is that all drains within the project area will comply with the 90th percentile turbidity target of 25 NTU (56mg/L TSS) at their mouths. The 2007 goal is for all points in the drain to meet the 25 NTU standard. The Granger Drain is currently contributing 10% of the TSS load in the Yakima River. The 2002 goal will require the Granger Drain to decrease TSS loads from 10% to 1% in the Yakima River (Appendix D, page 69). This will require more than a 90% reduction in sediment load. The establishment of the TMDL has given producers and agencies in the Granger Drain a goal and a time frame in which to address the problem.

Ecology has also developed a new program within DOE to be implemented in FY98. The program is a technical assistance/education program focusing on irrigation management and dairy waste management on-farm and will not result in enforcement action. The program will focus on the Yakima River Basin including the Granger Drain.

Yakima River Watershed Council

The Yakima River Watershed Council is a non profit organization formed in March 1994 to improve water supply and quality for both in stream and diversionary users. The Council published its first draft watershed plan *"A 20/20 Vision for a Viable Future of the Water Resource of the Yakima River Basin"* in October 1997. The plan focuses on six substantive areas as potential solutions: water conservation, transfer and marketing, storage, water quality, habitat restoration, and water management. HUA personnel have been very active in the development of the water quality portion of the plan and the HUA has been used as an example of how the education and implementation should be directed.

When adopted, this plan will be used to direct activities in the watershed. An interagency committee has been established to help coordinate activities especially in the water quality and habitat restoration efforts to obtain maximum effect from the dollars invested.

Board of Joint Control

In 1996 the Board of Joint Control (BOJC) was established linking the Sunnyside and Roza irrigation districts. Their mission is to enhance efforts on water conservation and water quality issues. Sunnyside and Roza Irrigation Districts supply irrigation water to producers in the Granger Drain HUA and maintain most of the drainage systems. The pending Endangered Species Act listing of the Yakima River steelhead and renewed interest in the Clean Water Act caused the new BOJC to take a new look at the relationship between irrigation practices and water quality problems in the return flows. Historically irrigation districts had tried to separate water delivery from return flow water quality problems. Efforts of the HUA personnel played a very important role in establishing this new attitude.

In the spring of 1997 the BOJC hired a water quality person to sample return flows and determine water quality. The effort will allow us to compare current data with water quality data collected in 1991 and 1995. Establishment of a water quality monitoring program has been one of the long-term goals of the HUA. Because of the effort of the HUA in the Granger Drain the BOJC selected the Granger Drain as their first emphasis area.

In an effort to clean up return flows the BOJC built two settling basins in the upper portion of the drain to demonstrate their effectiveness. The basins were very effective trapping 3,100 tones of sediment in five days. However, the basins were too small and demonstrated the importance of keeping the soil in the field and not trying to catch it in the drains. The BOJC is also working on a policy that will require producers to reduce the amount of sediment moving off their farms in runoff water. The proposed policy will be based on the 25 NTU requirements established in the TMDL for the lower Yakima River. The policy will be initiated during the 1998 growing season with producers developing a plan to meet TMDL timelines.

Washington State University

Washington State University in cooperation with Bonneville Power Administration implemented the Scientific Irrigation Scheduling program during 1997. This program covered a seven county area in southeast Washington and included several growers in the Granger Drain. The program educated crop producers in the use of a variety of soil water measurement devices, weather information from WSU's Public Agriculture Weather System, and an irrigation scheduling model, Washington Irrigation Forecaster. The program's focus was to help producers become more aware of utilizing management strategies in their irrigation regime. The crop producers can save dollars in terms of energy expenditures and the environment can realize benefits in terms of less runoff and deep percolation. This program has been funded for additional work in 1998 and will include Granger Drain Cooperators.

B. Special Findings, Concerns, Needs:

Additional research is needed to understand the relationship between soil test phosphorus levels and the potential for phosphorus to be removed from a field through runoff and erosion. High levels of soil test phosphorus in excess of 10 times the agronomic requirement have been noted in some fields. Phosphorus movement into the second foot has also been found on the highly manured fields.

Composting is being used by some of the dairies as one solution to the manure management problem. Additional research is needed to increase our understanding of the nitrogen release rates from these composted materials. If nitrogen management is to protect the environment and provide adequate nitrogen to the crop during the growing season, we must be able to predict nitrogen availability and timing from various forms of manure additions.

Appendix A - ASDWQ Tables

Project Name: Granger Drain

V-C.1.a: **Application of Nitrogen Managment Practices/Activities Primarily for Ground Water Protection**

FY	Practice/Activity Code and Name (1)	Unit	Number Installed
1997	449 - Irrigation Water Management	Plans	7
Summary	449 - Irrigation Water Management	Plans	47

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.1.b: **Application of Nitrogen Managment Practices/Activities Primarily for Surface Water Protection**

FY	Practice/Activity Code and Name (1)	Unit	Number Installed
1997	449 - Irrigation Water Management	Plans	6
	425 - Waste Storage Ponds	Pond	4
	312 - Waste Management Plan	each	9
Summary	449 - Irrigation Water Management	Plans	46
	425 - Waste Storage Pond	Pond	13
	313 - Waste Storage Structure	No.	6
	312 - Waste Management Plan	each	9

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.1.c: Application of All Nitrogen Managment Practices/Activities for Water Quality Protection (1) - Summary

FY	Practice/Activity Code and Name (1)	Unit	Number Installed
1997			
	449 - Irrigation Water Management	Plan	6
	425 - Waste Storage Pond	No.	4
	312 - Waste Management Plan	No.	9
Summary			
	449 - Irrigation Water Management	Plan	46
	425 - Waste Storage Pond	Pond	13
	313 - Waste Storage Structure	No.	2
	312 - Waste Management Plans	No.	18

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.4.a2: Animal Waste Management Practices/Activities by Farm Type. (1), Adoption of Improved Application Operation

FY	Type	Number	Size (2)	Animal Units (3)
1997				
	Dairy	5	230	11,830
Summary				
	Dairy	15	133	19,068

(1) Includes carcass disposal
(2) Express in average number of acres for all farms of one type
(3) Consult Agricultural Waste Management Field Handbook for definition

Project Name: Granger Drain

V-C.4.b: **Animal Waste Practices/Activities**

FY	Practice/Activity Code and Name (1)	Unit	Number Installed
1997			
	425 - Waste Storage Pond	Ponds	5
	590 - Nutrient Management	Acres	675
	449 - Irrigation Water Management	Acres	675
	442 - Sprinkler System	Systems	4
	312 - Waste Management Plan	Each	9
Summary			
	425 - Waste Storage Pond	Pond	14
	313 - Waste Storage Structure	No.	2
	Waste Storage Pond Testing		1
	590 - Nutrient Management	Acres	675
	449 - Irrigation Water Management	Acres	675
	442 - Sprinkler System	Systems	4
	312 - Waste Management Plan	Each	9

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.5.a: **Application of Practices/Activities Primarily for Erosion Control (1)**

FY	Practice/Activity Code and Name	Unit	Number Installed
1997			
	201 - 'PAM' Polyacrylamide	Demos	15
	441 - Trickle Irrigation System	System	2
	442 - Sprinkler Irrigation System	System	7
	441 - Trickle/drip Irrigation System	System	3
	430 - Irrigation Pipeline	Feet	7249
Summary			
	201 - 'PAM' Polyacrylamide	Demos	29
	441 - Trickle Irrigation System	System	13
	442 - Sprinkler Irrigation System	System	22
	340 - Cover Crop	No.	2
	620 - Underground Outlet	No.	7
	Surge Flow Demontration	No.	1

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.5.b: **Application of Practices/Activities Primarily for Sediment Control (1)**

FY	Practice/Activity Code and Name	Unit	Number Installed
1997	201 - 'PAM' Polyacrylamide	Acres	15
	441 - Trickle Irrigation System	System	3
	442 - Sprinkler Irrigation System	System	7
	350 - Sediment Pond	No.	2
Summary	201 - 'PAM' PolyacrylamidE	Applied Practices	29
	441 - Trickle Irrigation system	System	13
	442 - Sprinkler Irrigation System	System	22
	340 - Cover Crop	No.	2
	620 - Underground Outlet	No.	7
	Sediment Pond	No.	3
	Tail Water Recovery System	No.	1

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.5.c: **Application of all Erosion and/or Sediment control Practice/Activities (1), Summary**

FY	Practice/Activity Code and Name	Unit	Number Installed
1997			
	201 - 'PAM' Polyacrylamide	Applied Practices	15
	441 - Trickle Irrigation System	System	3
	442 - Sprinkler Irrigation system	System	7
Summary			
	201 - 'PAM' Polyacrylamid	Applied Practices	29
	441 - Trickle Irrigation system	System	13
	442 - Sprinkler Irrigation System	System	22
	340 - Cover Crop	No.	2
	620 - Underground Outlet	No.	7
	Surge Flow Demontration	No.	1
	350 - Sediment Pond	No.	3
	447 - Tailwater Recovery System	No.	1

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.8: Application of Irrigation Water Management Practice/Activities (1)

FY	Practice/Activity Code and Name	Unit	Number Installed
1997			
	449 - Irrigation Water Management	Plan	7
	430 - Irrigation Pipeline	No.	3
	441 - Trickle Irrigation System	System	3
	442 - Sprinkler Irrigation system	System	7
Summary			
	449 - Irrigation Water Management	Plan	47
	430 - Irigation Pipeline	No	8
	441 - Trickle Irrigation System	System	13
	442 - Sprinkler Irrigation system	System	22

(1) Includes all annual and permanent practices/activities (P/A). Annual P/A's initially installed with USDA assistance are assumed to be continued by the producer in subsequent years without assistance. The individual years report BOTH annual numbers installed with assistance and continued by the producer without further USDA assistance.

Project Name: Granger Drain

V-C.9: Demonstration Practices Adopted (1)

FY	Practice/Activity Code and Name	Unit	Units Adopted
1997			
	PAM/Irrigation	Site	15
	Composted Dairy Manure Demo	Site	7
	Scientific Irrigation Scheduling and Moisture Monitoring	Site	1
Summary			
	CottonWood Demonstration	Site	1
	Manure Management	Site	8
	Return Flow Demonstration	Site	1
	Surge Flow Demonstration	Site	1
	PAM/Irrigation	Site	32
	Composted Dairy Manure Demo	Site	10
	Scientific Irrigation Scheduling and Moisture Monitoring	Site	25

(1) This table only applies to Demonstration Projects (DP's). List Practices/ Activities that are adopted by producers in the Demonstration Project but are not; (a) on any of the projects' demonstration sites, (b) installed with technical assistance from DP staff.

Appendix B – Producer Surveys/Questionnaires

Questions

Grower ID#

1. Field Information

	1996	1995	1994	1993	1992
Crop					
Estimated Yield					
Manure Applied					
Fertilizer Applied					
N					
P					
K					

2. Ask to leave strips of manure and no manure to monitor uptake of nutrients.

3. What would it take to apply manure to other field source?

Individual
Soil Sample Report

Grower ID
Sampling Date
Soil pH

Nutrient Levels

	Depth	ppm	lbs/ac mmhos
Nitrates (NO_3)	1 ft		
	2 ft		
	3 ft		
	4 ft		
Ammonium (NH_4)	1 ft		
Phosphorus (P)	1 ft		
Potassium (K)	1 ft		
S. Salt	1 ft		

***Analysis by Agricheck

Appendix C - Granger Drain News, Bulletins, Etc.

Adoption of Best Management Practices (BMPs) to Meet Water Quality Goals in the Granger Drain Hydrologic Unit Area

R.G. Stevens, T.W. Ley and V.I. Prest
Washington State University, Prosser, Washington

This report provides an overview of the Granger Drain Hydrologic Unit Area which has been active since 1991. Implementation and evaluation approaches utilized, environmental benefits measured and lessons learned are reported.

Setting

The Granger Drain Hydrologic Unit Area (Granger HUA) is located in the southern portion of the Yakima River Valley in central Washington State. The Granger Drain is composed of a natural and man-made drainage network that drains approximately 17,000 acres of highly productive irrigated agricultural land. The area within the Granger HUA is part of a desert climatic zone receiving 7-9 inches of precipitation annually. Crop production is dependent upon irrigation water from mountain storage reservoirs. Irrigated soils are predominately silt loams found on rolling topography (2-8%). Irrigation return flows from surface irrigation systems are collected in a series of sub-drains and are returned to the Yakima River via the Granger Drain. This highly productive agricultural system supports a wide variety of crops including: corn, pasture, asparagus, alfalfa, grapes, mint, orchards, hops, wheat and many specialty crops. The Granger HUA has eighteen dairies within its boundaries with cow populations ranging from 100 to over 3,000 and averaging over 600 producing cows.

There are approximately 450 agricultural producers in the project area. This number comprises both commercial operators (275) and noncommercial operators, with outside employment. Most of the small acreages are utilized as pasture. The area surrounds and includes two small communities, Granger and Outlook, with a combined population of 2,000.

Suspended sediment, nutrient and pesticide loads from irrigated agricultural areas of the lower Yakima River basin have long been recognized as serious impairments to water quality. The effects of soil erosion on farmland and the effects of sediment and dichlorodiphenyltrichloroethane (DDT) on the aquatic resource have been the focus of numerous activities by several agencies. Several reaches of the lower Yakima River and several of its tributaries violate numerous state water quality criteria and federal

---

Presented at the National Watershed Water Quality Project Symposium, September 22-26, 1997, Washington, D.C.

guidelines (Rinella, et al. 1992, Ecology, 1994, 1995). The Granger Drain (WA-37-1024) has been cited by the Washington Department of Ecology (Washington DOE) as exceeding standards in the following parameters: DDT, 4-4'-DDE, 4-4'-DDD, Dieldrin, Endosulfan, fecal coliform, dissolved oxygen, temperature, pH and ammonia. The Washington DOE estimated that the Granger Drain contributed 60 tons/day of suspended solids during the 1995 irrigation season (unpublished data Joe Joy, Washington DOE).

Objectives

The overall project goal is to reduce nutrient, biological and sediment loading from the Granger Drain to the Yakima River mainstream to a level which allows the river to meet its classification as a "Class A" water according to Washington DOE standards. The specific water quality objectives are to accomplish the following: 1. Reduce sediment loading by: a. increasing irrigation use efficiency by improved scheduling; b. decreasing sediment load in tail water by using Best Management Practices (BMPs); c. reducing tail water movement off the field by reuse. 2. Reduce nutrient loading to surface and ground water by: a. proper assessment of yield goals and nutrient needs; b. reducing nitrogen movement by proper timing and placement; c. reducing excess nutrient applications through soil testing and crediting all available nutrient sources. 3. Reduce input of *E. coli* by: a. optimizing waste management and confined feeding operations; b. optimizing waste application methods and timing; c. renovation and management of pastures.

The key to all of the above objectives is the implementation of BMPs at the individual field level as part of a coordinated farm water quality effort.

Implementation and Evaluation Approaches

Project objectives are being met by providing educational materials, demonstrations, technical assistance and developing working partnerships. Implementations of BMPs has been directed at individual producers by using a newsletter and CE publications to provide educational materials, commodity and area meetings and demonstration sites to share technology and follow-up with individual producers to implement BMPs.

A major focus of the project has been directed at dairy operations and associated nutrient management concerns. Many of the eighteen operating dairies in the HUA have increased significantly in cow numbers, with some dairies more than doubling. These increases have placed an additional strain on waste facilities and nutrient loading. The Lower Yakima Conservation District (CD) working with NRCS has worked with fifteen of the eighteen dairies to develop or update dairy waste management plans. This effort has been mainly directed at improvement in handling facilities to prevent movement of waste into surface waters. Approximately 44% of the $300,000 of FSA cost share money spent in the HUA has been spent on dairy waste facilities. Cooperative Extension's role has been to work with dairymen and other producers receiving manure to implement BMPs for nutrient management. Nutrient content of dairy waste, estimation of crop yield and nutrient requirement and the use of soil testing have been stressed as part of nutrient planning. A 1993 survey of dairy storage lagoons in the HUA found that with current management practices lagoons had significantly lower nutrient levels than other Northwest production areas (Table 1.). This information allowed dairymen to modify their application practices and better utilize this resource.

Table 1. A comparison of dairy lagoon nutrient concentration in Pacific Northwest production areas.

	TKN lbs/1000 gal	Inorganic N lbs/1000 gal	Total P lbs/1000 gal	Total K lbs/1000 gal
Granger Drain, WA	2.80	1.56	0.55	2.43
Whatcom County[1], WA	13.60	7.20	3.0	14.10
Willamette Valley[1], OR	4.88	4.46	0.37	5.10

[1] Data collected by Henry Bierlink in Whatcom County CE and by Mike Gangner in the Willamette Valley

Soil sampling to a depth of 4-6 ft in producer fields that have long histories of manure application have shown significant buildup of residual soil nitrate after harvest. These levels which often exceed 300 lbs N/ac have been used to demonstrate that excess nitrogen is being applied thus increasing the potential risk of significant nitrate being leached to ground water. Demonstration plots have been utilized to show that manure applications on these fields can be reduced or eliminated without yield reduction the next year. Phosphorus (P) soil test values in excess of 200 lbs P_2O_5/ac (bicarbonate extractant) have been found indicating long-term build up of P with its potential for movement to surface waters. Current efforts are addressing the potential for manure composting creating a product that can be economically transported greater distances from the dairies.

Since the major mechanism for the movement of nonpoint pollutants to the Granger Drain is through runoff from surface "furrow" irrigation, a major effort of the project was limiting the movement of sediment off the field. Converting surface furrow irrigation to either sprinkler or drip irrigation is the best long-term solution to this problem, because this essentially eliminates surface movement of NPS pollutants. However, this conversion is expensive and, therefore, implementation of this BMP is slow. Approximately 55% of the FSA cost share monies were used to help producers make this conversion and improve delivery systems. With proper management this conversion eliminates surface movement of nonpoint pollutants.

One of the most rapidly adopted BMPs was first introduced by the HUA project in 1994. Researchers had determined that small amounts of polyacrylamide (PAM) added to surface irrigation water could effectively reduce soil erosion under furrow irrigation. Some of Washington's first demonstrations were conducted in the HUA and sediment losses from the end of furrows were reduced by 90-95%. Producers have continued adopting the use of PAM and CE and NRCS personnel continue providing technical assistance to producers desiring to start using this practice. The use of PAM is a cost effective way of improving irrigation infiltration and significantly limiting movement of sediment and attached chemicals.

In 1992 the HUA was selected for a test site of a new field-level P index used to assess the potential for P movement. High P index levels were found associated with irrigated cropping practices where manure applications had been made (Stevens, et.al. 1993). This information is being used to increase producer's awareness of the long-term effects of continuous high rates of manure application.

In 1993 the HUA program utilized the Home*A*Syst program educating rural landowners of potential management practices that may lead to degradation of drinking water supplies and to introduce management practices that can reduce those risks. This was the first application of this tool in the state. Participants were solicited by offering free nitrate testing for domestic wells. Participants reported changes in current practices that would reduce the potential for drinking water contamination and environmental degradation.

To date the success of the project has been based on changes in public and producer's attitudes about water quality and their responsibility as an active part of the problem and the solution. Success has also been based on the successful implementation and continued use of BMPs by producers.

Although the Granger Drain HUA is a joint project with Natural Resource Conservation Service (NRCS), Washington State University Cooperative Extension (CE) and the Farm Service Agency (FSA), the activities of these groups in the HUA has been a catalyst for many working partnerships within the HUA and across the greater Yakima River Watershed. These partnerships are leading to increased efforts towards improving water quality across the Yakima River Watershed.

Environmental Benefits Measured

Although water quality monitoring has not been a part of this project, the Washington DOE has monitored portions of the Yakima River. In 1994 and 1995 the Washington DOE undertook a total maximum daily load (TMDL) evaluation in the lower Yakima River basin including the Granger Drain to control suspended sediments, turbidity and DDT contamination. Preliminary results of this study indicate reduced levels of *E. coli*. However, sediment levels continue to exceed acceptable levels. Washington DOE has established TMDL targets for sediment from the Granger Drain and the HUA is working with producers developing strategies to meet these goals. The TMDL requires return drains to be at 25 ntu or 56 mg/l for total suspended solids, requiring a 85-95% reduction in the Granger Drain discharge.

Based on the effort of the HUA project and the established TMDL, the local irrigation districts have initiated a monitoring program that will be used to evaluate the effectiveness of implemented BMPs and in evaluating future efforts.

Lessons Learned

In 1991 when this project was initiated the general public and producers had not accepted that a water quality problem existed or that they were part of the solution. The HUA over the years has served as an example of how water quality problems should be addressed in other areas in the watershed. During this time a Yakima River Watershed Council (YRWC) has been formed with an active water quality committee using the HUA as a focal point. As a part of the YRWC an interagency group has been formed coordinating efforts and facilitating transfer of technology between agencies and areas of the watershed.

Rate of adoption of BMPs was found to be directly related to cost of BMP implementation. Conversion of irrigation systems often costing $800-1,000/ac are much slower to be implemented than practices such as the use of PAM costing $4-6/ac per application. However, the implementation of expensive BMPs is often the only long-term solution to problems. Therefore, improving water quality in these cases should be considered a long-term effort.

Although the levels of sediment reduction that was initially anticipated have not been reached, producers and other involved parties are actively working on strategies to make things happen. One of the major lessons learned here is that it takes time to lay the groundwork that is often necessary in accomplishing complex goals such as improved water quality.

References

Ecology, 1994. "1994 Section 303(d) List submitted to EPA" Washington Department of Ecology, Water Quality Program, Olympia, WA. 63 pgs.

Ecology, 1995. Impaired and threatened water bodies requiring additional pollution controls-proposed 1996 Section 303 (d) list. Washington Department of Ecology Water Quality Report: ECY# WQ-R-95-83. Olympia, WA. 25 pgs.

Rinella, J.F., S.W. McKenzie, and G.J. Fuhrer. 1992. Surface-Water-Quality Assessment of the Yakima River Basin, Washington: Analysis of Available Water-Quality Data Through 1985 Water Year. USGS Open File Report 91-453, Portland, OR.

Stevens, R.G., T.M. Sobecki, and Thomas L. Spofford. 1993. Using the Phosphorus Assessment Tool in the Field. J. Prod. Agric. 6:487-492.

IT'S TIME!

IT'S THAT TIME OF YEAR AGAIN. FALLING LEAVES, FOOTBALL GAMES, RAINY DAYS, FOGGY MORNINGS, AND...WASTE STORAGE POND PUMPING.

IT IS VERY IMPORTANT TO HAVE YOUR WASTE PONDS AS EMPTY AS POSSIBLE BEFORE WINTER ARRIVES TO AVOID APPLYING MANURE ON FROZEN OR SATURATED SOILS.

AS COLD WEATHER APPROACHES, THE NUMBER OF DAYS AVAILABLE FOR MANURE APPLICATION BECOME FEWER AND FEWER. IT IS NOT AN APPROVED PRACTICE TO APPLY MANURE (LIQUID OR SOLID) ON SOILS THAT ARE SATURATED OR FROZEN.

SOUTH YAKIMA CONSERVATION DISTRICT ASSISTANCE IS AVAILABLE TO THOSE WHO WOULD LIKE TO UPDATE OR DEVELOP A WASTE MANAGEMENT PLAN. CALL US AT 829-3003 OR 837-7911.

IF YOU SHOULD HAVE A WASTE DISCHARGE, CALL MAX LINDEN OR RAY LATHAM AT WDOE 575-2807. THEY ARE WILLING TO WORK WITH YOU ON ANY PROBLEM YOU MIGHT HAVE.
CALL THEM BEFORE THEY CALL YOU

MANAGING ANIMAL WASTE DURING THE YEAR CAN BE DIFFICULT. DURING THE WINTER MONTHS IT IS NOT ONLY DIFFICULT, BUT IMPERITIVE.

TO REDUCE YOUR RISK FOR COMPLAINTS, CHECK THE AREAS THAT MAY BE "POTENTIAL TROUBLE SPOTS":

** RUN-OFF FROM PEN AREAS
** SEEPAGE FROM MANURE STACKS
** WASTE STORAGE STRUCTIONS
** RUN-OFF FROM SNOW MELT

ARE YOU READY FOR WINTER?

The Washington Irrigator NewsLetter

Vol. 2, Issue No. 1 **A WSU Cooperative Extension - Prosser Publication** January 1997

BPA and WSU establish partnership for 1997 SIS (Scientific Irrigation Scheduling) Education Project

The Bonneville Power Administration and Washington State University - Prosser established a partnership on a new project to help irrigation farmers increase their irrigation efficiencies and water management capabilities in central Washington. Tom Ley, Extension Irrigation Engineer, and Ginny Prest, Ag Research Technician at WSU-Prosser, are working on a new project that will focus on letting growers know the benefits of using Scientific Irrigation Scheduling (SIS) in a seven county area including Kittitas, Yakima, Benton, Franklin, Walla Walla, Grant and Adams.

The goals of this project are to 1) determine how many crop producers/landowners are currently using some form of irrigation scheduling to determine crop water use/needs and 2) to conduct demonstration projects to show crop producers the potential benefits of using SIS and to introduce technologies that are available to producers.

What does this mean to a producer? Well, SIS may be coming soon to a farm near you. The demonstration projects will be done ***on-farm***, at least four fields per county. Each demonstration project will consist of an irrigation system evaluation with the producer in the spring, as well as an early spring soil water content determination. Weekly soil water monitoring and irrigation forecasting utilizing the Washington Irrigation Forecaster (WIF) will be provided during the 1997 irrigation season. The software, training, and technical support will be provided to cooperators so that they can use their new skills to schedule the additional fields on their farm.

...SIS may be coming soon to a farm near you ......

There will be educational workshops on the components of SIS, the WIF software, and other irrigation BMP's in each county at the beginning, during and at the end of the 1997 irrigation season. For more information see workshop listings on page 4, ***A workshop will be in your area soon!***

Ley and Prest will also be looking for new ways to measure soil water on-farm other than the currently accepted measuring devices. WSU - Prosser will be field testing the new soil water probes to assess their reliability, ease of operation, and costs for equipment and labor.

Historically soil water monitoring has been performed by scientists, commercial consultants and irrigation specialists on the larger farms. Equipment such as the neutron probe, requires a special license. Additionally, much of the equipment is expensive to purchase. But as technology develops, new equipment and probes are becoming available that do not require a special license, are portable and are less expensive.

... it is hoped that the smaller sized farms may be able to utilize this technology so that they can monitor soil water...

Many of the larger farms will probably continue to utilize irrigation consultants, but it is hoped that the smaller sized farms will be able to utilize this technology so that they can monitor soil water too.

Funding for this project has been provided for by the Bonneville Power Administration.

And on the inside?

What is SIS? See page 2
WIF software? See page 3
PAWS is alive and well! See page 3
Your help is needed, please fill out our Survey -- See Insert
A workshop should be in your area soon ! See Page 4

Scientific Irrigation Scheduling (SIS) is:

A Best Management Practice (BMP) for:
- Water Quality Protection
- Water Conservation
- Energy Conservation

A systematic process for determining:
- When to irrigate
- How much to irrigate
- How to apply the desired amount

Easily tailored to site specific conditions:
- Soils
- Crops
- Irrigation methods/systems
- Climate/weather

Field soil water balance

Previous soil water level
+ Net irrigation
+ Effective rainfall
- Crop water use

= Current soil water level

SIS uses the following parameters to determine a potential irrigation schedule:

Soils Information
- Water holding capacity
- Soil depth
- Soil structure
- Soil variability

Crop Information
- Crop type
- Growth stage/development
- Rooting characteristics
- Water stress characteristics

Irrigation system information
- System type
- System capacity
- Application efficiency
- Application uniformity
- Desired operating parameters (set times, lengths, etc.)

Climate/Weather
- Evapotranspiration (ET) or Crop Water Use
- Daily weather data for computing ET
- Rainfall
- Exposure/Elevation

What is Scientific Irrigation Scheduling (SIS)?

Scientific Irrigation Scheduling (SIS) is a best management practice (BMP) available to all farmers. SIS is simply a process for balancing readily available water in the soil profile with crop water demand and the capacity of an individual irrigation system to replenish that demand. It uses soil water measurement informatior irrigation system capacity, current and expected weather conditions, and crop water needs to determine an irrigation schedule that will allow producers to apply irrigation water at the right time and in the right amount.

...SIS is simply a process for balancing available water in the soil profile with crop water demand and the capacity of individual irrigation systems.

SIS has the potential to increase irrigation application efficiency by 10-30 percent. Irrigation scheduling can reduce energy costs. There are other benefits as well. There is less leaching to ground water resulting in optimized nutrient utilization and there is reduced irrigation return flows.

Many growers have considerable knowledge and experience with their own crops, soils and irrigation systems. We recognize this and can help them use it to their advantage. In the long run the great thing about practicing scientific irrigation scheduling is the help provided in fine tuning of irrigation management. Cooperators we have worked with in the past generally agree that the process has helped them to get a better feel for the soil water status in the field at any given point in time and for a specific combination of crop, soil and irrigation system characteristics.

The down side of the process is there is a learning curve which takes time, probably the most precious commodity a producer has. Managing irrigation applications is often low on the priority list because of the relative low cost for water and energy. There are always so many "things" to do and so little "time" to do them.

WIF: Washington Irrigation Forecaster

In the simplest form, the problem of managing plant available soil water in the root zone is similar to tracking cash flow in a bank account. Irrigation and rainfall represent deposits, crop water use and deep percolation represent withdrawals, and the challenge is to manage the balance (root zone soil water content) between acceptable limits. The Washington Irrigation Forecaster (WIF) is a software package for IBM PCs and compatible computers, which provides the user with computer-assisted checkbook irrigation management information. WIF was originally developed by Ken Best as part of his Master of Science degree thesis in Agricultural Engineering at WSU. It was then enhanced with a menu-style user interface for data entry. Several revisions and updates of the WIF are planned as part of the irrigation scheduling education and demonstration project described on the front page. The WIF software package includes models of crop growth, crop water use, irrigation systems, and supporting data files specific to Washington State, which can be used to provide irrigation management information for 39 different crops.

continued page 3 WIF...

WIF continued ....

The WIF software package really consists of two programs: one to help build a data file for each field to be scheduled, and one to provide irrigation scheduling information. The program to build a field data file must be used before the irrigation scheduling program can be ran on the field that is to be scheduled. Input data required includes the crop (and emergence data if an annual crop), the location, soil type and depth (if depth is limiting full root zone development), field soil water status and the date of measurement, and irrigation system type and application rate. This field data is saved to a file specific to each field. It can be updated or revised as needed.

The WIF irrigation scheduling program is used to update the current soil water content in the root zone of the crop and to forecast crop water use. Soil water can be updated with a current measurement of the soil water content, or by calculating a soil water balance in the root zone. This means that crop water use (withdrawals) and irrigation and rainfall (deposits) must be entered. Crop water use can also be estimated using weather-based crop ET estimates such as those available from the PAWS weather network. Irrigation and rainfall data are measured or estimated for each field by the user.

Once the root zone soil water content is updated, the model provides a forecast of crop water needs and irrigation management recommendations up to 28 days into the future. This forecast is unique in that the first week of the forecast is based upon standard weather forecast information given in local newspapers, or on radio and TV. The irrigation management recommendations allow flexibility in making your irrigation decisions, and generally will provide information to help minimize over irrigation as well as avoid crop water stress.

It is recommended that you run the WIF program routinely (weekly) through the season and not rely completely on the long range forecast of irrigation needs. This usually only takes a few minutes once you learn to operate the program. Soil water content should be periodically measured through the season to keep the estimating procedures used in the program on track. Flow or water application measurements should also be made to check that the desired depths of application are actually being applied.

While the above description of WIF may sound somewhat complex and difficult to use, it is actually very easy to use after some initial "getting used to," and the irrigation management recommendations are easy to interpret.

PAWS- Public Agriculture Weather System

by Tom Ley, P. E.

Extension Irrigation Engineer

Is it alive or not??? Both Ginny and I have heard rumors and comments recently that PAWS, the Washington Public Agriculture Weather System, is dead. Let me say it right here and now (and by the way I manage the PAWS project), the opposite is true. PAWS is alive and well and planning and implementing exciting changes for the future.

I suppose many of the rumors are connected with the demise of the National Weather Service Agricultural Programs operated out of Yakima and Wenatchee. It is true that WSU PAWS and the National Weather Service had a very close and mutually beneficial working relationship. We have supplied NWS with all of our PAWS data from day one. In return they did an excellent job of disseminating useful PAWS weather, frost warning, and crop protection information over the NOAA weather radio. It was a sad omen when the valuable NWS AG Weather Program was terminated in April of 1996. This did not mean the end of PAWS however.

I suppose another recent development may also be giving rise to the rumors of PAWS' demise. During the 1996 growing season we actively transferred weather data to the Tree Fruit BBS operated at WSU Tree Fruit Research and Extension Center in Wenatchee. It was recently announced that this BBS was going to be discontinued. I am sure this has caused some alarm, particularly within the orchard industry. Please reduce your stress level now.

A plan has been developed and is being implemented at PAWS headquarters, WSU Prosser. A new BBS will be available (hopefully with all the major bugs worked out) by mid-March 1997 and will replace the current PAWS computer/modem user interface as well as the Tree Fruit BBS. This new BBS will allow easier and faster access to PAWS weather data and on-line computer models (insect pest and disease models, heat units and growing degree days, crop water use, etc.). There will also be capability to access this BBS over the Internet using TELNET. We also have plans to implement a PAWS Web site which will allow access to data and models.

It is true that PAWS has experienced decreasing budget allocations from WSU. Our goal is to fund our current operation and maintenance support from private industry, grants, and weather station sponsorship. For this reason part of our future support will come in the form of user fees for BBS and Internet access to PAWS similar to those implemented for the Tree Fruit BBS.

I believe WSU has made and will continue to stand by a long term commitment to house the PAWS network and provide personnel support. In fact I wish to take this opportunity to introduce the new PAWS Electronics Technician, Todd Elliott. Todd started on January 2, 1997 and is making significant contributions with the development of the new BBS and Internet access to PAWS.

Information about PAWS is currently available at our anonymous FTP site. Using a Web browser type ftp://frost.prosser.wsu.edu on the URL address line. This should connect you with our site where information about PAWS is posted. PAWS subscription fees will be posted there as well as informational updates on progress towards enhancing access to PAWS data and models. For those of you without Internet access, contact us at (509) 786-9367 for this information.

Want to find out more? A workshop will be in your area soon!

Date	*Time*	*Meeting /Contact Information*	*Location*
Feb 11	8a-4p	**Potato IPM/SIS Workshop** Eric Sorensen, (509) 545-3511	**TRAC, Pasco**
Feb 12	8a-4p	**Potato IPM/SIS Workshop** Gary Pelter, (509) 754-2011	**Hallmark Inn, Moses Lake**
Feb 27	9a-3p	**SIS Workshop** Contact Pat Daly, (509) 786-9230	**WSU - IAREC, Prosser**
Feb 27	6p-9p	**SIS Workshop** Walt Gary, (509) 527-3260	**WSU Extension Office, Walla Walla**
Mar 6	9a-2:30p	**SIS Workshop** Tom Hoffmann, (509) 962-7507	**Best Western, Ellensburg**
Mar 7	9a-1p	**SIS Workshop** Dana Faubion, (509) 574-1600	**WSU Extension Conference Room** **Yakima County Courthouse, Yakima**

For more information about the SIS Project, future workshops, or other irrigation BMPs, please feel free to contact either one listed below:

Tom Ley, P.E.
Extension Irrigation Engineer
(509) 786-9203 leyt@wsu.edu

Ginny Prest
Ag Research Supervisor
(509) 786-9215 prestv@wsu.edu

FAX (509) 786-9370

Washington State University
Cooperative Extension
Tom Ley, P.E.
Extension Irrigation Engineer
Irrigated Agriculture Research and Extension Center
24106 N. Bunn Road
Prosser, WA 99350

BULK RATE
U.S. POSTAGE
PAID
PERMIT #21
PROSSER, WA
99350

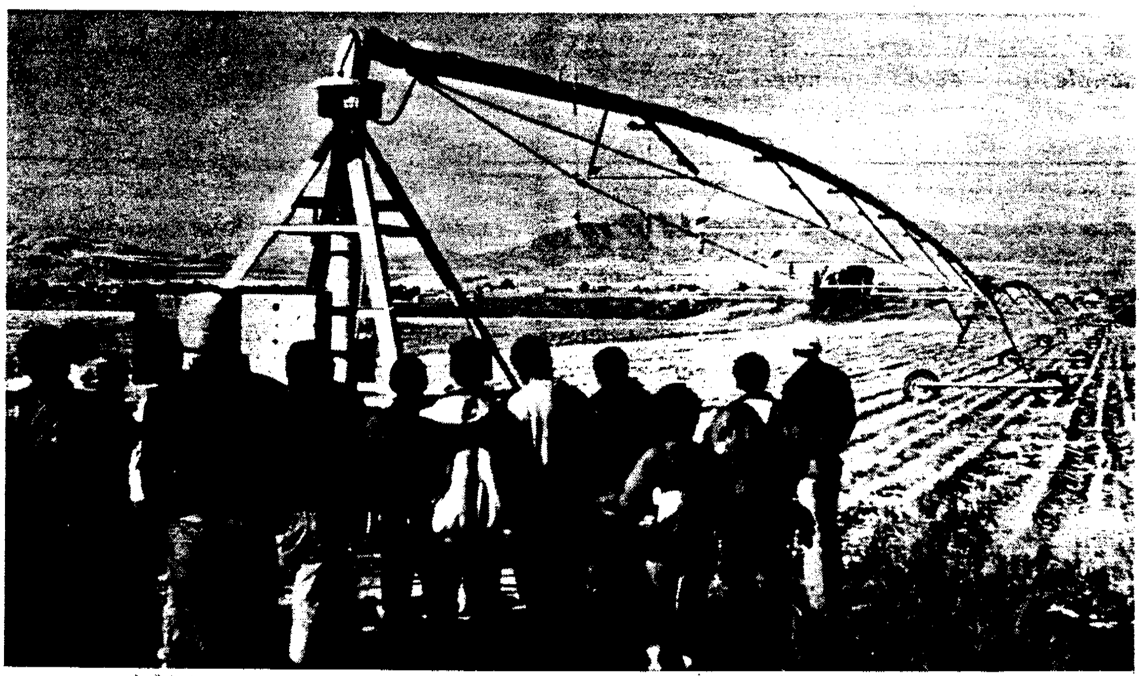
Irrigation Scheduling on Your Farm
A Survey of Central Washington

Please take a few minutes to fill out this survey. The following information is requested for two reasons. First, so we can determine if and how irrigation scheduling is practiced on-farm in Central Washington. Secondly, this survey will also be used to identify what is needed (equipment, tools, technical assistance and training, etc.) to enhance the adoption of Scientific Irrigation Scheduling (SIS) in your area, for your farm size and in other areas of irrigated agricultural areas in Washington State.

This is a Washington State University - Prosser program supported by funding from the Bonneville Power Administration. As always, this information will be kept confidential.

Thank you in advance for your time and even if you do not want to fill out the survey please return it with your correct mailing address so we can keep you on our mailing list. We might have something in the future that would be of value on your farm or in your consulting service.

Ginny Prest (509) 786-9215 and Tom Ley (509) 786-9203.



If you do not wish to participate in the survey but would like to continue to receive the Washington Irrigator NewsLetter, please provide the following information:

Please print

Name ______________________________

Business Name ______________________________

Mailing Address ______________________________

City ______________________ **Zip Code** ______________

Section 1 --- Please tell us about you.

A. Are you a farmer, grower, rancher, or producer? Yes No (circle one)

If Yes, continue on to the Section 2.
If No, please go to next question.

B. Are you a Crop Consultant, Irrigation Consultant, or someone who assists growers in determining an irrigation schedule? Yes No (circle one)

If Yes, continue on to Section 3.
If No, provide us with your mailing information so that you will continue to receive the Washington Irrigator NewsLetter.

Section 2 --- Please tell us about your farm.
This section is intended for use by irrigated crop producers and ranchers. If you are a consultant please continue on to Section 3 - Irrigation Scheduling.

A. Irrigated fields you own, lease, or manage.

Field Id	# of Acres	Irrigation System	95 Crop	96 Crop	97 Crop	Own/Lease
Example #1	*40 A*	*wheel line*	*Hay*	*Hay*	*Corn*	*Own*

B. Tell us about the pumps you use to supply irrigation water to your irrigation systems.

Pump Type	hp	Rated gpm	pressure	Pump Supplies # Acres	Water Source Surface/Well
centrifugal	*15*			*40 A*	*Surface*

C. What electrical utility provides you with power for your pumping stations? ____________

Section 3 --- This section is intended to be used by growers who schedule their own irrigations and by commercial/agency individuals who schedule irrigation for others?

A. Do you use/practice irrigation scheduling? **Yes** **Sometimes** **No** **(circle one)**

B. How many acres do you schedule? _______ **Acres**

C. How many farms does this acreage represent? _______ **Farm(s)**

D. What methods do you use to schedule irrigation water applications?

________ Calendar

________ Seat of the pants

________ Newspaper ET and rainfall data

________ Visual status of crop (color, wilt, etc.)

________ Crop temperature

________ Soil moisture monitoring

________ Personal weather observations/data collection

________ Infrared photography

________ Commercial irrigation scheduling service

________ Computer scheduling - irrigation scheduling software

________ Other (please indicate what) ____

E. What method do you use to measure soil water content?

________ Neutron probe

________ TDR

________ Moisture blocks (gypsum, Watermark)

________ Tensiometer/Irrometer

________ Feel/Appearance (color, etc)

________ Gravimetric sampling

________ Other (please indicate what) ____

F. How do you determine soil properties?

________ Soil surveys

_______ Send soil to lab for analysis

________ Other (please indicate) ____

G. Do you use crop evapotranspiration (ET) data to help determine irrigation recommendations? **Yes** **Sometimes** **No** **(circle one)**

________ From daily newspaper

________ From on site weather station

________ On-site pan evaporation

________ From a weather service with a weather station close to the farm

________ From computer software with historical averages

________ Other (please indicate) ____

H. Do you know/analyze irrigation systems to determine the application rate? Yes Sometimes No (circle one)

I. Do you know/analyze irrigation systems to determine the efficiency and/or uniformity of application? Yes Sometimes No (circle one)

J. Do you adjust your irrigation schedule based on the environmental variables that affect application rates/efficiencies/uniformities at the time of irrigation? Yes Sometimes No (circle one)

K. If you do not use scientific irrigation scheduling (SIS), please tell us why?

_______ No need _______ Too expensive

_______ Not enough time available _______ Do not know how

L. What information do you need about irrigation scheduling so that you might consider using it to manage soil water content and irrigation water applications?

____

____

____

M. Do you own/operate a computer? Yes No

N. What type of computer do you use?

______ IBM or IBM compatible ______ Apple

______ Macintosh

______ Other (please indicate) _______________________

O. What operating system does your computer use?

______ OS/2 version ______ ______ DOS version ______

______ Window 3.* ______ Windows 95

______ Other (please indicate) _______________________

P. Is your computer hooked up to a modem? Yes No

Thank you again for your time spent filling out this survey. It will provide us with valuable information and help us determine how Washington State University can better provide services to assist you in scheduling your irrigations. If you have any questions, please do not hesitate to contact either Ginny Prest at (509) 786-9215 or Tom Ley at (509) 786-9203.

Please place in the self addressed envelope enclosed and mail.

The Washington Irrigator NewsLetter

Volume 2, Issue No.2 | A WSU Cooperative Extension - Prosser Publication | July 1997

Scientific Irrigation Scheduling Project Going Strong

Robert G. Evans and Cindy Mead
Biological Systems Engineering, WSU-Prosser

The scientific irrigation scheduling (SIS) project funded by the Bonneville Power Administration is off and running strong. Twenty-four cooperators in seven south central Washington counties are participating in the 1997 SIS demonstration project. There are 6 fields in Adams County, 6 in Benton County, 2 in Franklin County, 2 in Grant County, 6 in Kittitas County, 6 in Walla Walla County, and 6 in Yakima County.

There are about 1800 total acres covered by this project and include rill, wheel line, hand line, solid set, center pivot, and drip irrigation systems. Crops being scheduled include alfalfa, sweet corn, hops, sugar beets, potatoes, asparagus, onions, cucumbers, dry beans, timothy hay, apples, sweet cherries, and wine grapes.

There are about 1800 total acres covered by this project....

Irrigations are being scheduled weekly using the Washington Irrigation Forecaster software (WIF), PAWS data and readings of weekly soil water status. The field demonstrations involve weekly soil water monitoring using a neutron probe. Some sites were also equipped with additional soil water monitoring tools (e.g., buried Watermark® sensors) to educate cooperators on the available devices and how they work. Project personnel are refining the process and improving the timeliness of the irrigation scheduling reports to assist irrigators in planning future cultural activities including water applications.

The primary purpose of this project is to conserve electrical energy and water resources as well as reduce irrigation costs for growers. Consequently, project personnel are also cooperating with the Kittitas County and Adams County Conservation Districts on some of their water management programs by providing irrigation scheduling services on selected fields.

The primary purpose of this project is to conserve electrical energy and water resources as well as reduce irrigation costs for growers.

There have been some changes in personnel for the Scientific Irrigation Scheduling Demonstration Project. Dr. Robert Evans, Agricultural Engineer, replaced Dr. Tom Ley who has left WSU, as project leader and the main technical support person for this project. Next, Ms. Cindy Mead was hired in May as the principal field technician responsible for the day-to-day operation of the SIS project. Dr. Mary Hattendorf at WSU Prosser has also assumed the management of the Washington Public Agriculture Weather System (PAWS) from Tom Ley.

And on the inside?

Irrigating with High Sodium Well Water — See Page 2
Keeping Microirrigation System - Clean is Critical — See Page 3
Irrigation Scheduling for Microirrigation Systems — See Page 4
Some Thoughts About "PAM" — See Page 5
The Changes at PAWS — See Page 6

Irrigating with High Sodium Well Water

Robert Evans - Biological Systems Engineering
WSU - Prosser

Many of the deep wells in central Washington produce water that is high in bicarbonate and sodium with a pH 8 or greater. Application of high sodium water quickly creates problems with soil sealing and limited infiltration of water into the soil. Overcrop applications of these waters can result in significant deposits of lime (calcium carbonate -$CaCO_3$) on fruit when used for cooling. If allowed to accumulate, sodium may also cause serious leaf burn if applied over crop on sensitive crops such as apples or grapes for either irrigation or cooling. These two separate problems must be considered together but treated individually.

Sodium ions held on soil exchange sites become available for leaching from the soil profile when exchanged for calcium ions. However, the high bicarbonate levels cause the calcium to be unavailable and the sodium builds up on or near the soil surface. The concentration of sodium causes soil structure to break down (deflocculate) and the soil surface develops an infiltration seal resulting in large amounts of runoff and dry root zones. This problem is best addressed by: 1) treating the soil with several tons of gypsum (calcium sulfate - $CaSO_4$) incorporated prior to planting; and 2) continuously keeping the pH of the applied water between 6 and 6.5 with an acidifying agent such as sulfuric acid. Irrigation systems can be used after planting to apply very finely powdered gypsum which is injected as a calcium source but water pH should be 6.5 or less for best results.

Deposits on fruit and leaf burn must be reduced by: 1) reduction of water pH every time the water is applied; and 2) periodic washing of the canopy using low pH water at night. Calcium carbonate (lime) precipitates can be readily controlled by maintaining the pH of the applied water at about 6.5-6.6 (a swimming pool pH tester can be used to monitor) by the careful injection of an acidifying agent or a sulfur burner. The use of "spent acids" from smelting or other industrial applications is not recommended. Technical grade sulfuric acid is commonly used and is the least expensive, but this is a dangerous compound to handle. Another compound that some use is a combined mixture of urea and sulfuric acid (N-pHuric) that is easy to handle but this use may apply nitrogen in excess of plant needs over the season. High quality phosphoric acid may also be used to lower pH but the amount of acidity required to lower pH of water to acceptable levels from phosphoric acid alone usually exceeds the crop's requirement for P. Certain chelating agents are often used to reduce calcium deposits on fruit because of safety concerns, but they are considerably more expensive and less effective than acids. Chelates do not affect water pH and are not needed when acidifying agents are used to lower water pH to acceptable levels. Chelates do not improve soil conditions created by high pH or sodium.

Injection equipment (pumps, tubing, etc.) must be able to withstand the specific chemicals being injected (e.g., PVC pipe cannot be used with concentrated sulfuric acid). The injection pump supplier should have the necessary information for you to purchase and install the correct materials. Positive displacement chemical injection pumps are recommended.

Use a simple, inexpensive portable pH meter to monitor the applied water throughout the season since the chemical characteristics of the water can vary over the year, and adjust injection rates accordingly. Remember that acidification only addresses the carbonate/ bicarbonate problem, it may do nothing for problems due to other salts and precipitates.

Mineral deposition tends to be more significant at lower application rates (<30 gpm/ac) because less is washed from the fruit during overtree evaporative cooling. Even with acid treatment, growers may still need to operate low application rate systems for 4-6 hours using with low pH water 1-2

Continued on page 5...High Sodium

continued from High Sodium ...

nights each week to try to wash off deposits. Water for overtree applications must be treated anytime and every time bicarbonate concentrations greater than about 50 ppm are present.

The treatment and use of chemicals requires an in-depth understanding of water and soil chemistry and an idea of what is desired. The first step in determining treatment needs is to have a chemical analyses made of the water supply (pH, electrical conductivity, Ca^{++}, Mg^{++}, Na^{+}, CO_3^{-2}, HCO_3^{-}). These analyses can be used to determine, among other needed information, the "lime deposition potential" (LDP). The LDP is estimated as the least concentration of either (CO_3^{-} milli-equivalents per liter [meq/L] + HCO_3^{-} meq/L) or Ca^{++} meq/L. Halverson and Dow (1975) suggested that a LDP below 2.0 should not be a problem for over crop irrigation. However, LDPs above 2 (100 ppm $CaCO_3$) should be cause for concern and probable treatment. An LDP above 4 (200 ppm $CaCO_3$) should be used for over crop irrigation with caution and only with pH reduction treatment. However, experience has shown that LDPs as low as 1.0 have caused serious mineral deposition problems with evaporative cooling applications.

All chemicals and/or chemical mixtures added to irrigation water should also be checked to avoid phytotoxic effects as well as for compatibility to prevent precipitations and maximize efficacy. Except for acids, chemicals should usually be injected upstream of any filters or screens. Injection locations should always provide for adequate mixing. With the exception of chlorine treatments for microirrigation and acidifying agents, the hydraulic systems must be flushed of the chemicals before turning off the water.

Special chemigation safety devices are required for all chemical injection systems under federal/state laws and regulations. There can be no reverse flows, system drainage or back siphoning.

Some Thoughts About "PAM"

Bob Stevens - Extension Soil Scientist
WSU - Prosser

More and more growers are using polyacrylamide (PAM) to reduce erosion and increase infiltration with furrow irrigation. Whether applied through the irrigation water or as a patch treatment in the furrow PAM has been very effective.

I recently received some interesting information from R.E. Sojka and R.D. Lents leading PAM researchers with USDA-ARS at Kimberly, Idaho. They noted two very important points about PAM use.

PAM use in the US for soil erosion control last year (based on an estimate of 400-500,000 acres treated at 3 lbs per acre) was about 1.5 million lbs of PAM applied. This is up from zero acres just a few years ago. Note this application is via irrigation water in one fashion or another, but the application is to the land. Data suggests that the worst case scenario for PAM-loss in tail water is under 5%. Using the NRCS standard the losses are much less than that. Furthermore, in less than 2000 ft of travel in return flow ditches the lost PAM has been shown to adsorb to entrained soil contained in the flow and/or ditch walls, reaching undetectable concentrations.

The industrial/government use of PAM is nearly 200X the use in agriculture, and most of that use is via direct additions to waters in close loop proximity to riparian resources. The annual growth in use of PAM for water treatment alone is over five times the entire use for erosion control in agriculture last year.

Sojka and Lentz also remind us that PAM reduces on-field erosion by ½ ton of soil per ounce of PAM used and that substantial reduction in N, P, BOD, COD and pesticides in return flows have been documented as a result.

To be effective the use of BMPs (Best Management Practices) such as PAM requires management. Irrigation application rates need to be modified (i.e., increased by as much as 2 times the normal rate) to obtain the full benefits of PAM, erosion reduction and infilitration increases, and to reduce the potential for increased leaching due to increased infiltration.

For additional information on the use of PAM contact Bob Stevens, WSU-Prosser, (509) 786-9231 or via email at stevensr@wsu.edu.

There have been some changes at Washington State University's
Public Agricultural Weather Systems, (PAWS) .

Mary Hattendorf - PAWS WSU - Prosser

The Public Agriculture Weather System (PAWS) is Washington State University's agricultural weather service. Weather data are collected electronically at the 58 stations throughout the state and transmitted by radio signal to the base station in Prosser. PAWS is one of the few near real time agricultural weather networks in the country, enabling it to provide up-to-the-hour information to growers.

PAWS has traditionally supplied weather data and models for growing degree days, evapotranspiration and irrigation scheduling, air stability, and pest and disease development. Major system changes have been instituted in the past few months, including high speed modem access on the 4 toll-free bulletin board phone lines, and a site on the World Wide Web(http://frost.prosser.wsu.edu).

PAWS data and models have been free of charge to users in the past; however, with tightening university budgets, PAWS has been required to support itself through paid subscriptions. PAWS new subscription structure is two tiered, with corporate rates at $1,065 per year, and individual rates of $130 per year. A corporate user is one who uses PAWS information to make recommendations to growers or clients. The individual rate is intended for in-house use by a grower, for instance.

PAWS future depends on your support. The PAWS system is actively seeking input from users on the new interface, services currently provided, and services not provided that may be valuable to users. We appreciate the interest in PAWS and plan to improve the system to meet client needs.

For more information, please contact Dr. M. J. Hattendorf at (509) 786-9219, or Todd Elliott, (509) 786-9367.

Robert Evans, Agricultural Engineer
Biological Systems Engineering Department
Washington State University
Irrigated Agriculture Research and Extension Center
24106 North Bunn Road
Prosser, WA 99350

Keeping Microirrigation Systems Clean is Critical!!!

Robert Evans - Biological Systems Engineering
WSU - Prosser

Plugging of microirrigation systems is a major problem and it may occur from single or multiple factors. Physical factors such as suspended materials passing through filters or broken pipes, root intrusion and aspiration of soil particles into the emitter orifices are common causes of plugging. Chemical factors such as precipitation of carbonates and iron oxides, and precipitates from chemical injections are significant causes of emitter plugging. Likewise, biological factors such as insects and spiders, algae, fungi and bacteria can be serious plugging sources.

Plugging is minimized with proper design and management. Adequate air relief, vacuum breakers and pressure relief valves must be appropriately sited to ensure proper operation. Management must include regular flushing of lateral lines and faithful injection of chlorine or its equivalent to prevent clogging by algae and other biological growths (colonial protozoa, sulfur bacteria, and other mucous organisms) and even to minimize root intrusion. Iron and manganese precipitating bacteria can be controlled by chlorine treatments of a well, aeration, or polyphosphates.

Most programs chemically treat the water during every irrigation event,

Most programs chemically treat the water during every irrigation event, generally at the end of the irrigation cycle, although periodic (e.g., weekly) shock treatments using very high dose rates can also be effective. Generally, biocides are injected only when fertilizers or other chemicals are not being introduced into the system. Flushing velocities must be high enough (at least 2 ft/sec) to transport and discharge heavy particulate matter from the pipelines. Lateral lines should never be flushed uphill.

Chlorine activity increases exponentially with decreasing pH. Thus, chlorine should be injected when the water pH is less than 6.5 which often requires injection of acids. Inject chlorine downstream from acids after the water pH has been lowered. A pH between 5.5 and 6.0 is preferred for optimal chlorine activity. Chemical compatibility is a concern if chlorine is injected simultaneously with other chemicals, even at low rates. Chlorine should always be injected separate from fertilizers and other chemicals as deadly chlorine gas may be produced by direct mixing in some cases.

All chemical injections should be filtered. Injection usually occurs after the pump and before the media and/or screen filters to trap any undissolved material. Chemicals should be injected into the center of the water flow to ensure quick dilution to safe levels, thus avoiding possible deterioration of the filter tanks, piping, valving or other components. Test kits for swimming pools are available to measure "total" chlorine or "free" chlorine. The use of free residual chlorine (D.P.D.) test kits is required.

Microirrigation also offers many other benefits when using chemical injection and application. For example, water soluble nutrients can be injected to more closely match crop requirements, increase nutrient use efficiencies, and reduce costs. Systemic pesticides and some soil fumigants may be injected with high efficacy. Consistent soil water contents and wetted soil volumes may also increase the efficacy of many chemical applications, but high application uniformities (e.g., DU 90%) are required since the chemical application uniformity will not exceed the water application uniformity.

For more information contact Bob Evans at WSU-Prosser (509) 786-9281 or through the internet at revans@tricity.wsu.edu.

Irrigation Scheduling for Microirrigation Systems

Robert Evans - Biological Systems Engineering
WSU - Prosser

Microirrigation systems normally irrigate only a fraction of the cropped land area. Consequently, the volume of water stored in the soil and available for crop use can be considerably less than the amount of total available soil water volume under surface or sprinkler irrigation systems that wet the entire surface area. Thus, microirrigation is typically characterized by frequent, small water (and often nutrient) applications that are placed directly into or near the crop root zone with minimal losses. This practice can maintain higher, less variable soil water contents than other irrigation methods, reducing the occurrence of plant water stresses which often results in increased yields.

The basic philosophy of microirrigation is to be able to replace water in the root zone in small increments as it is used by a plant at intervals ranging from several times a day to every two to three days rather than refilling a much larger soil water reservoir after several days or weeks. Consequently, the old ideas about field capacity, wilting point and total water holding capacity do not really apply to microirrigation since there is essentially no soil water reservoir. Thus, to avoid plant water stress, microirrigations are scheduled based on replacing the immediate past water use or current plant water status and not on soil parameters such as the maximum allowable depletion (MAD). Sometimes microirrigated crops in Washington are deliberately stressed, such as wine grapes, at certain times during the season to control canopy, improve fruitfulness or improve quality, however, they still receive frequent irrigations during the stress periods but at greatly reduced levels.

There are two major concerns when scheduling microirrigation systems. The first is determining when to irrigate. The second consideration is how much to apply during an irrigation. When to irrigate depends on crop, climate, soil, irrigation system and management factors. It will vary through the season. The maximum interval between irrigations is primarily controlled by soil hydraulic characteristics, soil profile layering, and tubing placement. Irrigations can be scheduled whenever an allowable water use depletion level has occurred, or to replace estimated or measured crop water use, commonly called evapotranspiration (ET), each day. Alternatively, a preset amount of water can be automatically applied whenever the soil water potential (tension) in the wetted volume drops to a predetermined critical level as measured by sensors.

The estimated crop water use or plant water status, combined with the percent of the area irrigated, will determine the total amount of irrigation to be distributed by the microirrigation system. The irrigated area, in general, is taken as the total area, even row crops and high density tree plantings, considering that eventually most of the area is shaded when the crop matures. However, for low density or very young plantings, applications and schedules should be based on the actual canopy size or only the affected irrigated area.

The available soil water may be very limited by drip irrigated row crops such as vegetables with high ET rates with small root zones or on sandy soils, thus requiring irrigation two to ten times daily. Conversely, the irrigated root zone available water capacity might be much larger for tree crops on heavier soils allowing for less frequent irrigations. Daily microsprinkler applications may be required to increase the wetted volume and avoid leaching on light, highly permeable soils. Conversely, on heavier soils with high water holding capacities or poor drainage, optimal microsprinkler irrigations might be only every second or third day.

For more information contact Bob Evans at WSU-Prosser (509) 786-9281 or through the internet at revans@tricity.wsu.edu

Appendix D

Proposed 1998 Section 303(d) List

A Suspended Sediment and DDT Total Maximum Daily Load Evaluation for the Yakima River

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

A Suspended Sediment and DDT Total Maximum Daily Load Evaluation Report for the Yakima River

Executive Summary

July 1997
Publication No. 97-321
Printed on Recycled Paper

Executive Summary

Purpose and Approach

The lower Yakima River basin is located in south-central Washington State. It is one of the most intensively irrigated and agriculturally diverse areas in the United States. Suspended sediment and persistent pesticide loads from irrigated agricultural areas of the lower Yakima River basin have long been recognized as serious impairments to water quality. Recent water quality evaluations by the US Geological Survey (USGS) have indicated that some improvements have been made, but beneficial uses are still impaired by sediment and sediment-borne pollutants like DDT from irrigation returns (Rinella *et al.*, 1992b, 1993).. Consequently, several reaches of the lower Yakima River and several of its tributaries do not meet numerous state water quality criteria and federal guidelines (Ecology, 1994a, 1995). As a result, these water bodies have been placed on the Washington State's 303(d) list.

The Clean Water Act directs Ecology to perform a total maximum daily load (TMDL) analysis for contaminated waters on the 303(d) list. Ecology had determined that turbidity and DDT represent key water quality impairments on the 303(d) list in the lower Yakima River basin. In response, Ecology conducted a TMDL study to evaluate controls of suspended sediment, the primary cause of the turbidity criteria violations, and a major source DDT transport in the lower basin during the irrigation season. Ecology believes the control of suspended sediment generation and transport during the irrigation season will result in far-reaching water quality and fish habitat improvements in the Yakima Basin.

In addition, the TMDL needed to be coordinated with the Yakama Indian Nation (YIN) since the Yakama Indian Reservation covers over forty percent of basin, but is outside of the state's jurisdiction. The Yakama Indian Nation and Ecology joined in a data-sharing and cooperative monitoring agreement for the project. Like Ecology, the YIN and the US Environmental Protection Agency (USEPA) share similar Clean Water Act and TMDL responsibilities on the Yakama Indian Reservation. They are developing plans, and are undertaking actions to address suspended sediment loads in drains and tributaries from the Reservation. Ecology, the YIN, and the USEPA will continue to coordinate their efforts to improve water quality in the Yakima River

The TMDL evaluation project was undertaken in two phases by the Environmental Investigations and Laboratory Services (EILS) program at Ecology. Phase I tasks included:

- water quality monitoring,
- a historical data review,
- suspended sediment criteria development based on beneficial use impairments, and

0 years (2017)
The DDT human health criteria in fish and water will be met.

'SS reductions necessary to meet the turbidity TMDL targets were estimated from the 994 and 1995 data. Main stem TSS concentrations in both years would have required eductions of approximately 50% to stay within the 5 NTU limit at Kiona. The main tem loading would be adequately reduced to meet the 5 NTU limit if project area and (akama Reservation tributaries complied with the recommended 25 NTU target. The TSS load from project area tributaries and drains to the Yakima River would have been educed by approximately 207 tons/day in 1995. The 25 NTU target will require the argest return drains to reduce TSS loads 13% to 93% in an irrigation season with normal water availability, like 1995. Under conditions of limited water availability like in 1994, some of these same return drains would have easily meet the target while others would still have needed reductions of 25% to 90%.

Based on the regression equation, the turbidity-related TMDL target of 56 mg/L TSS at mouths of drains could reduce t-DDT concentrations to 7 ng/L. That would reduce t-DDT loading to the Yakima River by more than 66%. The 7 mg/L TSS target for compliance with the 1 ng/L aquatic toxicity criterion for DDT will require substantial reductions of TSS loads in most tributaries --from 30% to 99%. However, model simulation results suggest the 1 ng/L DDT criterion might not be attained in the river, even if the TSS concentrations in the drains were reduced to the 7 mg/L TSS target. Background t-DDT residuals carried in the river from upstream or in resuspended sediment would become the dominant sources of t-DDT in the lower Yakima River. These inputs could continue to cause DDT concentrations to exceed the criterion. Instream and out-of-basin sources are more difficult to predict and control, and could likely prevent complete water quality compliance in the main stem.

The TSS to t-DDT regression developed from data collected to date shows a greater variability in the lower region of the regression where TSS concentrations are less than 70 mg/L. DDT data are lacking for the lower TSS concentration range. Therefore, as more DDT samples are collected from return drains and tributaries that approach compliance with the interim turbidity TMDL target of 25 NTU (56 mg/L TSS), the regression can be re-calculated.

The suspended sediment and turbidity reductions recommended in the TMDL evaluation provide direction to Ecology for planning, funding, and executing specific actions in priority subbasins. Ecology will hold public workshops in cooperation with conservation and agricultural outreach agencies to discuss all aspects of the TMDL with local growers, water purveyors, and other interested parties in the lower Yakima River basin. At that time, implementation plans and schedules for these recommendations (or alternatives that meet water quality standards, protect fish health and habitat, and protect designated uses) will be formulated.

Two very different irrigation season flow regimes were monitored during 1994 and 1995. Irrigation diversions were severely limited in 1994 because water availability for irrigation was the lowest on record. The 1995 season saw normal water availability. Water availability and use had a direct impact on suspended sediment loading from tributaries and irrigation return drains. Tributaries and drains associated with lands with senior water rights (*i.e.*, only minor reductions in water use) maintained elevated TSS concentrations and turbidities both years. For example, the median turbidities at Moxee Drain and Granger Drain exceeded 50 NTU, the level at which displacement of salmonids can occur, in 1994 and 1995. However, tributaries and return drains from lands affected by lower water use in 1994 resulted in lower mean TSS concentrations and turbidities. In 1994, Sulphur, Spring, and Snipes creeks had median turbidities below 25 NTUs. Salmonid feeding and growth are affected at turbidities above 25 NTUs. In 1995, the median turbidities of Sulphur Creek and Spring Creek were above 25 NTU, while the 90^{th} percentile turbidities for Sulphur, Spring, and Snipes creeks exceeded 50 NTU. In turn, main stem concentrations of TSS and turbidity increased between 1994 and 1995 as TSS loading from tributaries increased. Median and 90^{th} percentile turbidities at main stem sites monitored in 1994 remained below 25 NTU. In 1995, 90^{th} percentile turbidities of the four sites below the Yakima River at Parker exceeded 25 NTU. In both years, turbidity increased by more than 5 NTUs between the confluence of the Yakima and Naches River and Benton City.

A TSS loading balance was calculated from the data collected during the 1995 irrigation season. The cumulative impact of tributary and drain loadings on reaches of the lower Yakima River was clearly seen. For example, in the later part of the irrigation season, the Moxee Drain TSS load (35 tons/day) exceeded the Naches River's load (27 tons/day), even though the average water volume of the Naches River was 14 times that of Moxee Drain. Granger Drain contributed an average 60 tons of TSS /day. The TSS load from Sulphur Creek was 110 tons/day, and Spring and Snipes Creeks' combined TSS load was 46 tons/day. The combined TSS load from the Yakama Reservation drains and tributaries was 75 tons/day. Approximately 1.5 tons/day came from municipal or industrial sources. Ungaged tributaries and instream sources also accounted for substantial loads during the irrigation season.

Using 1994 and 1995 monitoring data generated in this TMDL evaluation, a regression was developed of turbidity as a function of TSS. The following linear regression equation was based on 646 data pairs from river, canal, drain, and tributary sites with TSS concentrations less than 1000 mg/L:

$$\log_{10} \text{Turbidity} = 0.871 * \log_{10} \text{TSS} - 0.145$$

The equation had a coefficient of determination (r^2) of 0.956, which means 96% of the data variability is explained by the TSS data. Such a high correlation is somewhat unusual, but it may be because a ratio turbidimeter was used for all analyses, and because the geographic and seasonal scope of the data was more focused than other studies of this kind.

Pesticides

Nonionic pesticides have been used extensively on the agricultural crops of the Yakima Valley since at least the 1950s. In general, the organochlorine compounds, such as DDT, dieldrin, and endosulfan, have been the most frequently detected pesticides in basin waters, sediments, and biota due to their persistence in the environment and heavy use in the past. Concentrations of total DDT in the water were highest in the early 1970s. In the mid-1970s and early 1980s, DDT was not detected in samples routinely collected by the USGS, most likely because of the higher detection limit. Samples collected by USGS during the NAWQA survey indicate that DDT is still present in the main stem at concentrations above criteria. There is some indication that t-DDT burdens in fish tissues are declining, although there are not enough data to confirm this trend. Fish in the lower Yakima River still have one of the highest concentrations of DDT in the country (Rinella *et al.*, 1993). These findings resulted in a Washington State Department of Health advisory in 1993 recommending that people eat fewer bottom fish from the lower basin (Department of Health, 1993).

In 1995, whole water samples were analyzed for 46 pesticides at Granger Drain, Spring Creek, Sulphur Creek, and the Yakima River at Euclid Bridge as part of the TMDL evaluation. Organochlorine, organophosphate, and nitrogen-containing pesticides were frequently detected at all sites. Total DDT was detected above the human health and aquatic life chronic toxicity criteria at all sites on three or more sampling dates. The t-DDT samples analyzed had concentrations from 0.004 μg/L to 0.357 μg/L, and a median of 0.0083 μg/L. The median concentration, and most sample results, were similar to what has been reported in recent years for these sites. However, one sample collected at Granger Drain contained 0.357 μg/L t-DDT. It was twice the previously highest concentration of t-DDT detected since 1968.

Additional pesticides detected in water at concentrations above criteria or guidelines were: azinphos-methyl, chlorpyrifos, malathion, diazinon, and propargite. Both azinphos-methyl and chlorpyrifos are highly toxic insecticides used on many fruit and vegetable crops. Preventing seasonal entry of these newer pesticides into basin waters deserves further investigation.

The t-DDT concentrations in the small mouth bass and carp tissue samples collected in 1995 from the Yakima River at Euclid exceeded the Ecology screening guideline by an order of magnitude. The bass sample had a higher concentration than bass previously analyzed in the lower basin, and the carp sample was at the higher end of the range of values observed. Dieldrin was also detected in the bass and carp samples at concentrations exceeding the 0.7 μg/kg screening guideline by an order of magnitude.

The carp sample's 15 μg/kg total chlordane concentration exceeded the human health screening level of 8.3 μg/kg. Total PCBs (polychlorinated biphenyls) in both the carp and bass also exceeded the screening guideline for human health risk. Other pesticides detected, but below guideline concentrations, were: heptachlor expoxide, hexachlorobenzene, and trifluralin.

The three largescale sucker composite samples collected from the Yakima River at Euclid in 1995 contained from 2,276 μg/kg to 3,728 μg/kg t-DDT. Dieldrin and total PCB concentrations in the 1995 samples also exceeded wildlife guidelines. These data indicate that pisciverous wildlife are still likely at risk from exposure to t-DDT, dieldrin, and other pesticides in Yakima River fish.

Using 1995 monitoring data generated in this TMDL evaluation and previous USGS and Ecology data, a regression was developed of t-DDT as a function of TSS. The best linear regression equation based on 71 data pairs from river and tributary sites with detectable t-DDT concentrations (expressed as nanograms per liter, or ng/L) was:

$$\log_{10} \text{t-DDT} = 0.953 * \log_{10} \text{TSS} - 0.820$$

The equation had a coefficient of determination (r^2) of 0.747. Data collected in 1995 were not significantly different from previously collected data, and tributary data were not significantly different from main stem data, so all data were grouped. Other pesticides either had too few data, or no significant association with TSS was found.

Total Maximum Daily Load Recommendations

Since suspended sediment and DDT are two of the most significant pollutants in the Yakima River Basin, it is necessary to set nonpoint source reduction targets through load allocations in the study area. Three approaches were used to recommend TSS and DDT targets and nonpoint source load allocations for the Yakima River and its tributaries in the study area:

1. ***Turbidity criterion*** -Using the correlation of TSS concentrations to turbidity values, TSS targets on the main stem Yakima River will be based on the turbidity standard of 5 NTU above background.
2. ***Fisheries (aquatic biota) support*** - Using the narrative criteria to protect aquatic life, a 25 NTU turbidity or 56 mg/L TSS target will apply to irrigation return drains and tributaries as a fish health threshold consistent with the scientific literature.
3. ***Pesticides criteria*** - Based on the correlation of TSS to t-DDT, long-term TSS reduction goals will be set for return drains and tributaries to achieve the t-DDT water quality criterion for protection of aquatic life from chronic toxicity. Targets to meet human health criteria will be assessed as progress to the aquatic life criterion is made.

The TMDL-related activities include re-evaluation work and further target development. The targets based on aquatic community effects should be met in 15 years so that an evaluation of ways to meet DDT human health criteria can be done within 20 years. Limiting DDT uptake by aquatic organisms may require an entirely different approach, but that will be difficult to know until substantial reductions in TSS and associated DDT loadings are accomplished. These are necessary components of the phased-TMDL approach. The effectiveness of individual control measures to reduce soil erosion in irrigated agricultural areas is fairly well understood, but the overall effectiveness of all measures implemented in the basin, and the rate at which they will be adopted under current economic and political conditions is uncertain. The scheduling of targets and TMDL-related activities are proposed as follows:

5 years (2002)

- Yakima River main stem will comply with the turbidity target of not more than a 5 NTU increase between the confluence of the Yakima and Naches Rivers (RM 116.3) and the Kiona gage at Benton City (RM 30).
- All drains and tributaries within the project area will comply with the 90 th percentile turbidity target of 25 NTU at their mouths, especially Moxee Drain, Granger Drain, Sulphur Creek, and Spring Creek.
- The efficacy of using TSS load targets for tributaries and drains where the 25 NTU target is not representative of total load reductions will be evaluated.
- Agreements between the State of Washington, Yakama Indian Nation, and the U.S. Environmental Protection Agency that sets load allocations for the Yakama Reservation, and management of basin water quality will be completed.

10 years (2007)

- The mouths of all tributaries and drains, and all points within all basin tributaries and drains will comply with the 90 th percentile turbidity target of 25 NTU.
- The 7 mg/L TSS target developed to meet the DDT chronic aquatic toxicity criterion will be re-evaluated using additional data and historical pesticide use analysis.
- Target controls and a strategy to meet the DDT human health criteria in fish and water will be developed.
- Yakima River main stem will comply with the turbidity target of not more than a 5 NTU increase between the confluence of the Yakima and Naches Rivers and the Van Geisan Road bridge at West Richland (RM 8.4).

15 years (2012)

- All tributaries and drains, and the Yakima River main stem will comply with the 1 ng/L DDT chronic aquatic toxicity criterion by the 7 mg/L TSS target or its modified form (see 10 year);
- A control strategy to meet DDT human health criteria using TSS or other targets will be established.

20 years (2017)

- The DDT human health criteria in fish and water will be met.

TSS reductions necessary to meet the turbidity TMDL targets were estimated from the 1994 and 1995 data. Main stem TSS concentrations in both years would have required reductions of approximately 50% to stay within the 5 NTU limit at Kiona. The main stem loading would be adequately reduced to meet the 5 NTU limit if project area and Yakama Reservation tributaries complied with the recommended 25 NTU target. The TSS load from project area tributaries and drains to the Yakima River would have been reduced by approximately 207 tons/day in 1995. The 25 NTU target will require the largest return drains to reduce TSS loads 13% to 93% in an irrigation season with normal water availability, like 1995. Under conditions of limited water availability like in 1994, some of these same return drains would have easily meet the target while others would still have needed reductions of 25% to 90%.

Based on the regression equation, the turbidity-related TMDL target of 56 mg/L TSS at mouths of drains could reduce t-DDT concentrations to 7 ng/L. That would reduce t-DDT loading to the Yakima River by more than 66%. The 7 mg/L TSS target for compliance with the 1 ng/L aquatic toxicity criterion for DDT will require substantial reductions of TSS loads in most tributaries --from 30% to 99%. However, model simulation results suggest the 1 ng/L DDT criterion might not be attained in the river, even if the TSS concentrations in the drains were reduced to the 7 mg/L TSS target. Background t-DDT residuals carried in the river from upstream or in resuspended sediment would become the dominant sources of t-DDT in the lower Yakima River. These inputs could continue to cause DDT concentrations to exceed the criterion. Instream and out-of-basin sources are more difficult to predict and control, and could likely prevent complete water quality compliance in the main stem.

The TSS to t-DDT regression developed from data collected to date shows a greater variability in the lower region of the regression where TSS concentrations are less than 70 mg/L. DDT data are lacking for the lower TSS concentration range. Therefore, as more DDT samples are collected from return drains and tributaries that approach compliance with the interim turbidity TMDL target of 25 NTU (56 mg/L TSS), the regression can be re-calculated.

The suspended sediment and turbidity reductions recommended in the TMDL evaluation provide direction to Ecology for planning, funding, and executing specific actions in priority subbasins. Ecology will hold public workshops in cooperation with conservation and agricultural outreach agencies to discuss all aspects of the TMDL with local growers, water purveyors, and other interested parties in the lower Yakima River basin. At that time, implementation plans and schedules for these recommendations (or alternatives that meet water quality standards, protect fish health and habitat, and protect designated uses) will be formulated.

Implementation of the TMDL will remove turbidity, DDT, DDE, and DDD from the list of contaminants impairing water quality in the lower Yakima River and several of its tributaries. Other pesticide and nutrient-caused impairments on the 303(d) list may be eliminated by implementing this TMDL. For example, future monitoring may show that concentrations of endosulphan, heptachlor, endrin and other chlorinated pesticides similar to DDT are reduced by measures set-up for suspended sediment and DDT removal.

The YIN and USEPA have similar Clean Water Act responsibilities on the Yakama Indian Reservation. They are developing plans, and are undertaking actions to address suspended sediment loads in drains and tributaries from the Yakama Reservation. Ecology, the Yakama Indian Nation, and the USEPA will continue to coordinate their efforts to improve water quality in the Yakima River. Some TSS load allocations in the lower Yakima River will need to be negotiated between these governments and agencies as part of the public process.

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

A Suspended Sediment and DDT Total Maximum Daily Load Evaluation Report for the Yakima River

July 1997
Publication No. 97-321
Printed on Recycled Paper

Boating and swimming opportunities in the lower Yakima River and its tributaries also are limited by poor water quality. High turbidities reduce visibility for safe boating and swimming, and reduce the water's aesthetic appeal.

Cultural resources

Salmon and other fish are important cultural resources and food sources for members of the Yakama Indian Nation. Therefore, protection of aquatic community health and habitat on the reservation and on ceded lands, which include the study area, is a key water quality concern for the Yakama People.

Irrigation

Although the lower Yakima River is highly managed for irrigation use, elevated suspended sediment concentrations can interfere with obtaining full use of the water for these purposes. High concentrations of TSS carried in source water and supply canals can create impermeable crusts that reduce water infiltration, plant emergence, and soil aeration. Elevated TSS concentration can damage spray nozzles and clog micro-irrigation system emitters (e.g., drip, trickle, sprayer, or fogger), or increase the cost for spray and micro-irrigation systems by requiring extensive pre-filtration or treatment. Sedimentation in canals, return drains, and reservoirs increases maintenance costs to irrigation or drainage improvement districts for dredging and vegetation control.

Factors/Causes

During the irrigation season, 50% to 75% of the incoming water into the lower valley is diverted for irrigation and power generation. The water in many irrigation return drains and tributaries is highly turbid, and quickly degrades the portion of the Yakima River running at reduced flows. Eroded soils from surface irrigated agricultural areas adsorb elevated concentrations of DDT and other organochlorine pesticides, nutrients, and bacteria. Erosion also occurs along banks or in riparian areas with heavy livestock use. Some soil particles settle in the return drains, but others are transported by return drains and field drains, raising the turbidity of the river. The portion of sediments carried downstream in the water column, characterized by elevated TSS and turbidity measurements, interferes with aquatic organism's feeding, oxygen exchange, homing, mating, and other behaviors. The portion of sediments that settle allows adsorbed pesticides like DDT to be available for uptake into the food chain, eventually posing a health risk to aquatic and terrestrial organisms including humans. Sedimentation where salmon spawn directly interferes with emergence and survival of fry by blocking water circulation in redds and reducing the oxygen available to developing eggs.

Erosive soils under intense cultivation, past pesticide application practices, and inadequate soil and water management practices have contributed to the TSS and DDT problems in the lower Yakima Valley. Tooley (1995) used a geographical information system (GIS) land use analysis to demonstrate that large portions of the agricultural regions of the lower Yakima study area were susceptible to soil erosion. Rinella *et al.* (1993) have documented the history and lingering problem of DDT in the Yakima River Valley. Several reports by NRCS, CD, and Cooperative Extension have demonstrated the advantages of improved water and soil conservation techniques for Yakima Valley conditions (SCS, 1978; South Yakima Conservation District, 1982; King *et al.*, 1984; North Yakima Conservation District, 1993).

Economic factors and water policy also have played a role in reducing incentives to practice better soil and water conservation techniques (Pfeiffer and Whittlesey, 1976; Dawson and Domka, 1987; Meuer, 1992). Lack of regulatory standards and a low agricultural community recognition of the TSS problems have delayed implementation of solutions.

Point sources and non-agricultural nonpoint sources appear to have insignificant roles in the TSS and DDT water quality problems during the irrigation season. Data evaluations in this TMDL study suggest that municipal wastewater treatment plants and industrial discharges are not significant sources of turbidity, TSS, and DDT. Timber and range activities, urban run-off and other nonpoint sources may be more significant sources of TSS and turbidity during other seasons when precipitation is a driver.

Suspended Sediment and Pesticide Targets and Goals

Since suspended sediment and DDT are two of the most significant pollutants in the Yakima River Basin, it is necessary to set nonpoint source reduction targets through load allocations in the study area. Data from this TMDL evaluation have demonstrated that reduction targets for TSS can be established based on Washington State water quality criteria despite the lack of a specific TSS criterion. Three approaches are used to determine TSS and DDT targets and nonpoint source load allocations for the Yakima River and its tributaries in the study area:

1. ***Turbidity criterion*** -Using the correlation of TSS concentrations to turbidity values, TSS targets on the main stem Yakima River will be based on the turbidity standard of 5 NTU above background.
2. ***Fisheries (aquatic biota) support*** - Using the narrative criteria to protect aquatic life, a 25 NTU turbidity or 56 mg/L TSS target will apply to irrigation return drains and tributaries as a fish health threshold consistent with the scientific literature.
3. ***Pesticides criteria*** - Based on the correlation of TSS to t-DDT, long-term TSS reduction goals will be set for return drains and tributaries to achieve the t-DDT water quality criterion for protection of aquatic life from chronic toxicity. Targets to meet human health criteria will be assessed as progress to the aquatic life criterion is made.

Each of these approaches and their application are discussed in detail below.

Turibidity Criterion

Suspended sediment can be addressed through the state turbidity criterion because of a strong correlation found between turbidity and TSS in the lower Yakima River Basin. Using 1994 and 1995 monitoring data generated in this TMDL evaluation, a regression was developed of turbidity as a function of TSS (Figure 22). The details of the relationship are discussed in Appendix 2. Briefly, the best linear regression equation based on 646 data pairs from river, canal, drain, and tributary sites with TSS concentrations less than 1,000 mg/L was obtained on logarithmic (base 10) transformed data:

$$\log_{10} \text{Turbidity} = 0.871 * \log_{10} \text{TSS} - 0.145$$

The equation had a coefficient of determination (r^2) of 0.956, which means 96% of the data variability is explained by the TSS data. Data from various source water (e.g., main stem, canals, return drains, and tributaries) were not significantly different enough to exclude from grouping. A better TSS to turbidity relationship may have been obtained than previous research because a ratio turbidimeter was used, and because the geographic and seasonal scope of the data was more focused.

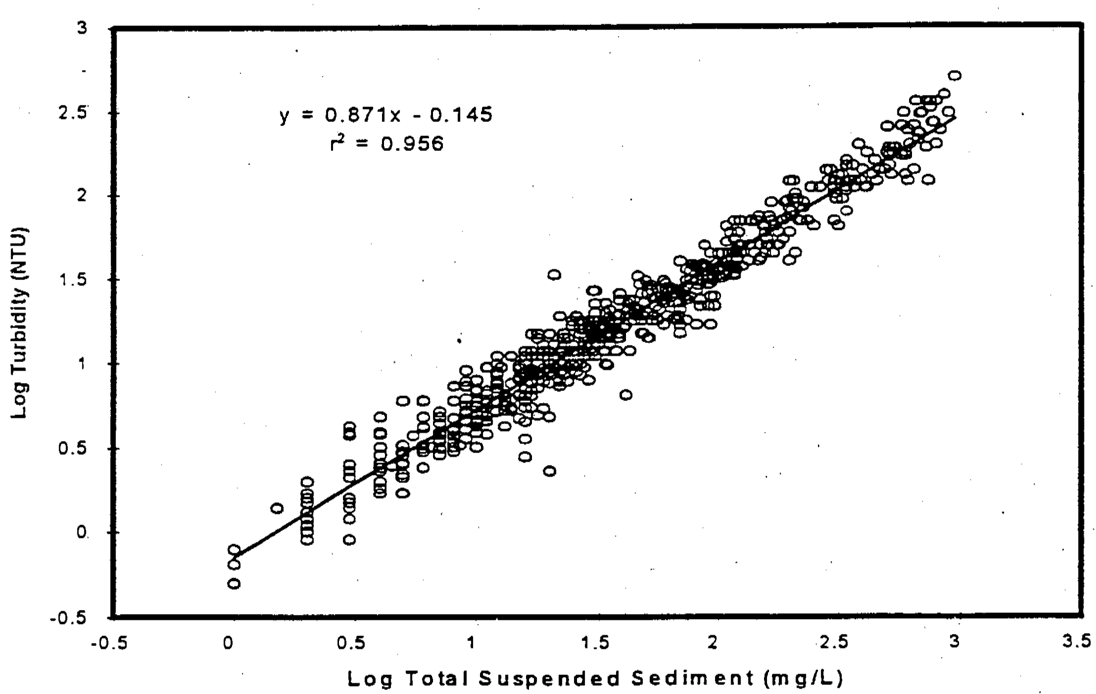


Figure 22. TSS and turbidity regression developed using TMDL data collected 1994 and 1995.

As stated earlier, Washington's turbidity water quality criteria for Class A waters [WAC 173-201A-030(2)(vi)] are:

> "turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background is more than 50 NTU."

Under the TMDL recommendation, the 5 NTU criterion will be applied to the main stem Yakima River between the confluence of the Naches and Yakima Rivers (RM 116.3) and the Kiona gage at Benton City (RM 29.9) during the irrigation season. In a sense, most of the lower Yakima River basin irrigation project will then be treated as a single source of turbidity and TSS. The application of the state turbidity criterion in this way addresses the cumulative effect from multiple irrigation return discharges. Water quality under the Clean Water Act should be met if the cumulative effect of suspended sediment loads are limited to less than a 5 NTU turbidity increase. The state narrative criteria for protection of sensitive biota is also relevant. It is fairly obvious that water quality would be degraded and beneficial uses would be lost if background were defined as upgradient from each discharge, and if a 5 NTU increase were allowed for each irrigation return in the study area.

The confluence is the most logical control site for measuring the effect of irrigation return drains in the study area because few return drains or sources of consequence enter the lower basin above that point. Although the TSS and turbidity effects in the lower valley occur with greatest intensity between the SVID diversion at Parker (RM 103.7) and Kiona (RM 29.9), diversions, tributaries, return drains, and point sources between the confluence and Parker have a measurable effect during the irrigation season and require control. The Kiona gage is a logical compliance point at this time because it is positioned below a majority of the irrigation returns, and because it continues to be a significant monitoring site for several agencies and programs. Detailed recommendations for other monitoring points between these two sites, and general monitoring guidelines are provided later (see Monitoring Results/Adjusting Controls).

Table 13 outlines the results of this approach for 1994 and 1995 data. As the table indicates, the TSS concentrations in both years would have required reductions of approximately 50% at Kiona.

Table 13. TSS targets for the mainstem Yakima River at Kiona based on the Washington State turbidity criterion, and a regression equation relating turbidity to TSS. Background established at confluence of Naches and Yakima Rivers.

Year	Background Turbidity	Background + 5 NTU	TSS Goal Yakima at Kiona*	90th% TSS Yakima at Kiona	Percent TSS Reduction Needed
1994	5 NTU	10 NTU	20 mg/L	39 mg/L	49%
1995	9 NTU	14 NTU	29 mg/L	62 mg/L	53%

* Calculated as $\log_{10}$ turbidity= 0.871($\log_{10}$ TSS) - 0.145

There was a slight variation between years. In years of low water availability and use, like 1994, storm-generated background values, and agriculture-generated turbidity and suspended sediment concentrations tend to be lower. Under these conditions, the TSS reductions needed to meet the turbidity target in the river in some subbasins may be also lower. However, as 1994 data suggested, main stem turbidity levels may peak upstream of the Kiona gage during lower flow years (Figure 10). The 5 NTU criterion would apply to all points in the main stem between the control and compliance sites.

The irrigation season 90th percentile turbidity value calculated for the confluence of the Naches and Yakima River was used as the background control value. The 90th percentile turbidity was used because it allows for background seasonal variability while still fully supporting uses under USEPA policy (USEPA, 1995), and it is adequate for background definition under Ecology policy (Ecology, 1994c; Ecology, 1996). Background turbidity was based on data from Yakima at Terrace Heights for 1994 (5 NTU) and the flow-weighted average data from Yakima at Harrison Bridge and the Naches River for 1995 (9 NTU). The TSS concentrations at these 90th percentile turbidity values are 9 mg/L and 18 mg/L, respectively. The background values for 1994 and 1995 are below the 25 NTU criterion suggested earlier, and at the lower end of the range that could potentially harm aquatic life (see *Turbidity and TSS Criteria*).

As previously shown in Figure 12, the 1994 and 1995 TSS concentrations were not unusually low compared to past years. However, years that had high water events in March through May (or catastrophic events like the May 1980 eruption of Mt. St. Helens), and six or less sampling points yielded 90th percentile TSS concentrations unacceptably high as background controls. The TSS concentrations at the higher end of this range are usually still reasonably protective for most aquatic life uses since they are from short duration events during the early part of the season. To avoid this type of problem, future monitoring at control and target sites should be performed at the frequency and interval described later (see Monitoring Results/Adjusting Controls).

Fisheries (Aquatic Biota) Support

Tributaries in the study area provide habitat for fish, especially salmon species: Spring Creek and Snipes Creek. Other tributaries, such as Ahtanum Creek, Moxee Drain, Granger Drain and Sulphur Creek, have historically supported fisheries, and require varying levels of restoration. They also discharge to reaches of the main stem with important fish habitat (Figure 20 & 21). Since TSS and turbidities at many return drains and tributaries are constantly discharged at elevated concentrations over the entire 200 days of the irrigation season, TSS reduction targets shall be established in the TMDL to protect aquatic organisms from the chronic effects (*i.e.*, injury or death from long periods of exposure) of suspended sediment.

As discussed earlier, the scientific literature has documented that turbidities and TSS concentrations become detrimental, or lethal, to aquatic life at varying concentrations, depending upon the species of organism, and the duration of exposure (see *Turbidity and TSS Criteria*). A TMDL target of 25 NTU (or 56 mg/L TSS based on the turbidity/TSS regression) for the mouths of tributaries and return drains was chosen as the most appropriate initial action for the following reasons:

- avoids most chronic effects of suspended sediment to aquatic organisms, (e.g., reduced fish growth from poor sight feeding, habitat avoidance, and effects on territorial behavior),
- located at the mid-point of the turbidity range for achieving a moderate fishery that sustains most habitat requirements,
- consistent with technical data used to develop a Idaho's cold water fishery criterion,
- will substantially reduce sediment loading from key tributaries to salmon spawning and aquatic habitat areas on the main stem Yakima River
- will assist in compliance with the main stem turbidity target of not more than a 5 NTU increase over background,
- evidence that it will be an achievable target using conventional soil and water conservation practices for irrigated agriculture, and
- practical for compliance monitoring.

Total suspended solids load targets were not set for project area tributaries and drains because water availability is so variable. A critical discharge condition on which a load could be calculated could not be confidently established. Tributary loading targets may be an optional TMDL compliance measure as soil and water conservation practices are implemented, and the effectiveness of the practices is observed. It may be that a tributary where implementation has reduced overall TSS loads substantially will be allowed an allowance for more frequent excursions of the concentration target.

The 25 NTU target will be applied to the 90th percentile turbidity value of the irrigation season to measure compliance with the TMDL. In this way, only ten percent of the turbidities should exceed the target over the irrigation season, and the average turbidity should be below 25 NTU, which would provide better protection to aquatic life.

In Table 14, estimated TSS reductions for each tributary in the TMDL project area are shown using the 1994 and 1995 data sets. The percent TSS reduction required to meet the TMDL was calculated by comparing the 25 NTU target to the 90th percentile TSS concentrations for each year. Those tributaries which would have required TSS reduction, and are likely candidates for future TMDL compliance monitoring, are highlighted. Tributaries and drains with 1994 or 1995 turbidities lower than 25 NTUs will be monitored as part of the TMDL, and will be expected to remain lower than 25 NTUs.

Most tributaries generally would have required less TSS reduction in 1994 than in 1995 to meet the TMDL target. It may be because of the lower water availability and better water conservation practices in 1994. However, Moxee Drain appeared to have responded to different influences. At Moxee, the lower TSS reduction required for 1995 may have been related to efforts by NYCD and hop growers to convert from furrow to drip irrigation. The next few years of monitoring by NYCD should indicate whether the conversions make significant water quality improvements, or if the difference between the two years was just a reflection of data variability.

Table 14. TSS targets for the tributaries and drains of the Yakima River project area based on support of fisheries compared to data collected in 1994 and 1995. Highlighted sources failed to meet target, and estimated reductions have been calculated.

			90th % TSS		Percent Reduction Needed	
Tributary	Turbidity Goal	TSS Goal	1994	1995	1994	1995
WideHollow Cr.	25 NTU	56	10		0%	
Ahtanum Cr.	25 NTU	56	6		0%	
Moxee Drain	25 NTU	56	343	285	84%	80%
Granger Drain	25 NTU	56	408	748	86%	93%
DID #7	25 NTU	56	23		0%	
Sulphur Creek	25 NTU	56	57	215	2%	74%
Grandview Drain	25 NTU	56	75		25%	
Spring Creek	25 NTU	56	45	299	0%	81%
Snipes Creek	25 NTU	56	10	64	0%	13%

The TSS reductions required for Spring Creek and Sulphur Creek to meet the TMDL target changed dramatically from 1994 to 1995. In 1994, Spring Creek was in compliance with the target, and Sulphur Creek would have been only about 2% over the target. Both subbasins are heavily influenced by returns from the Roza Irrigation District that received less than half of its normal water allocation in 1994. In response, all districts urged their growers to exercise extra water conservation efforts. In contrast, both subbasins would have needed over 70% in TSS reductions to meet the turbidity target in 1995, an average year for water availability when conservation measures were relaxed. Moxee and Granger were the only two subbasins monitored in both years that would have required at least an 80% TSS reduction in each year. Consequently, both should be given a high priority for implementing erosion controls.

TSS load reductions stated in Table 14 may be underestimated. The average turbidity of individual drains may need to be in the range of 6 to 14 NTU to meet the 25 NTU target value. The daily variability, calculated on the lognormal distribution of TSS and turbidities collected at individual sites in 1995, can be expressed as a coefficient of variation (CV). For example, a site with a high CV will require a lower seasonal average turbidity to ensure the 90^{th} percentile turbidity meets the 25 NTU target value. As measures are introduced by growers in subbasins to reduced TSS concentrations, the variability in seasonal turbidities may drop (*i.e.*, the data may yield a lower CV). Subbasin drain TSS concentrations with a lower CV may then be able to maintain a higher average turbidity value with less risk of the 90^{th} percentile exceeding the TMDL target.

The 1995 TSS mass balance for the study area was recalculated after reducing the TSS loads from the five "overloaded" tributaries identified in Table 14 to meet the target concentration. The cumulative effect of the load reductions on the river would have been substantial. Had the five tributaries met the 25 NTU turbidity target, the TSS load to the Yakima River would have been

been reduced by approximately 207 tons/day. For example, the daily average load from Moxee Drain would have been reduced from 31 tons/day to 5 tons/day. In the reach from Parker to Kiona, the cumulative contribution to the river from Granger Drain, Sulphur Creek, Spring Creek and Snipes Creek would have been reduced from 213 tons/day to 32 tons/day (Figure 23). These four tributaries would have accounted for 9% of the TSS load to the reach instead of 37%.

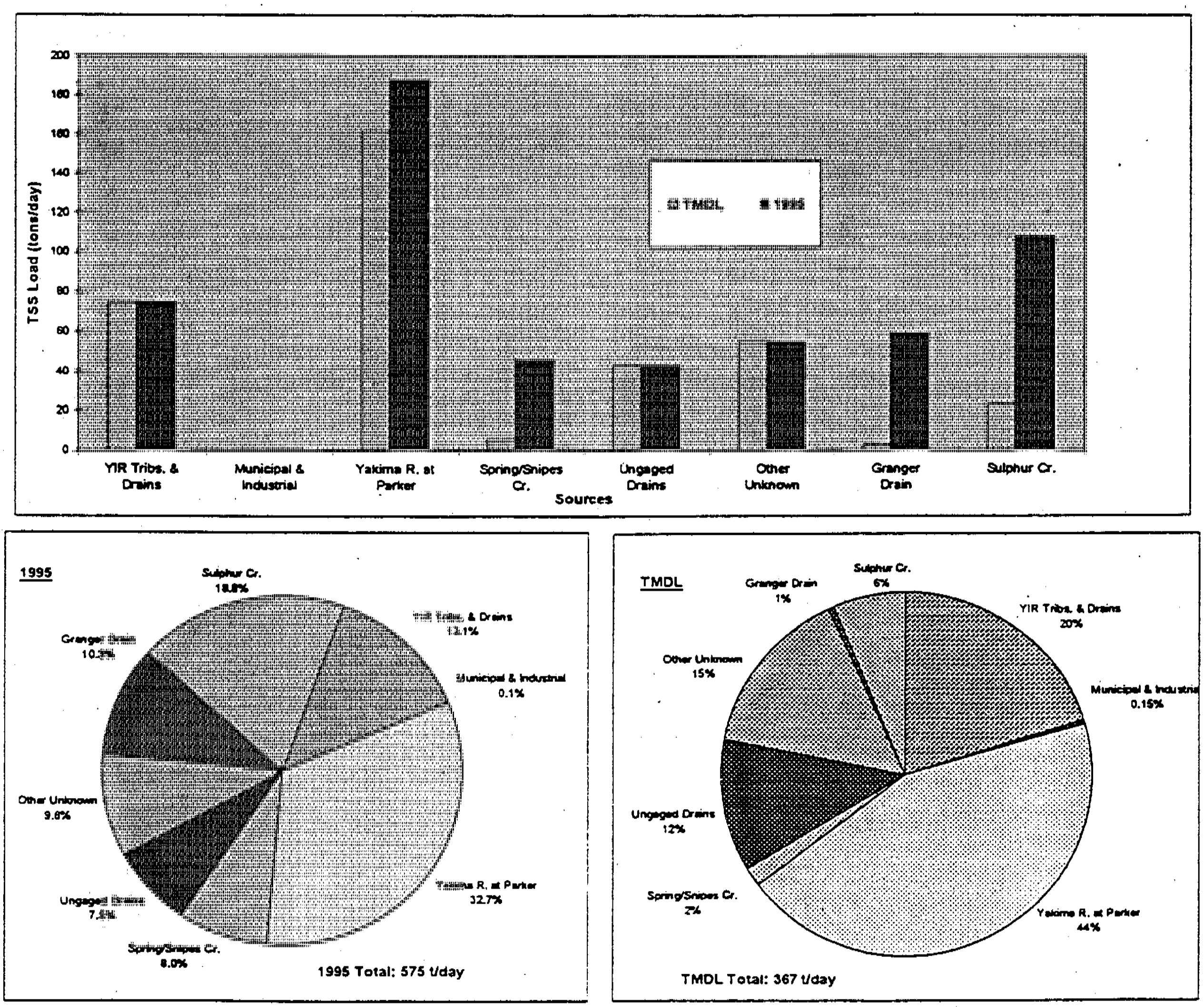


Figure 23. 1995 TSS loads from tributaries in the Parker to Kiona reach of the lower Yakima River compared to loads with TMDL project area tributaries at recommended targets of 25 NTU turbidity or 56 mg/L TSS.

A series of simple computer modeling simulations was performed as another measure of the potential effect of the tributary and drain TMDL targets on main stem turbidities and TSS concentrations. Twelve tributary TSS loads to the Yakima River between East Toppenish Drain (RM 86) and Prosser (RM 47) were used in the model. Simulations were run using the USEPA model, SMPTOX3, with qualitative sedimentation rates estimated from 1988 and 1995 data. A variety of instream flow and sedimentation conditions were used to assess main stem response while tributary loads were set at 90th percentile critical loading situations (Appendix 4, Table 4A; Appendix 4, Figures 4A-4B).

Base simulations were run for the following conditions:

1. May - June high flow (3320 cfs) in the river at Parker, low river sedimentation rates, and 90th percentile TSS loading from gaged and Reservation tributaries.
2. July - October low flow (420 cfs) in the river at Parker, high sedimentation rates, and 90th percentile TSS loading from gaged and Reservation tributaries.
3. July - October low flow (420 cfs) in the river at Parker, low sedimentation rates, and 90th percentile TSS loading from gaged and Reservation tributaries.

For each of these base simulations, another simulation was run with the 25 NTU target imposed on Granger Drain and Sulphur Creek (Appendix 4, Figures 4C-4E). These two drains represented 64% of the combined tributary TSS load in the May-June period and, 77% of the July-October loading period. TSS loads from eight tributaries from the Yakama Reservation were not changed. Two tributaries from the TMDL project area with 90th percentile TSS concentrations below the 56 mg/L (25 NTU) target in 1995 were not changed either. Also, the background TSS concentration in the river (22- 23 mg/L) was kept consistent with 1995 data.

The simulations suggest the 25 NTU target at the mouths of Granger Drain and Sulphur Creek is adequate to maintain the main stem TMDL turbidity target below 5 NTU over background under most, but not all, irrigation season conditions represented in 1995 (e.g., a main stem turbidity in 1995 less than 14 NTU or 29 mg/L TSS). The combined TSS tributary load was reduced by 50% in the May-June scenario, and 64% in the July-October scenario. Under lower river flow conditions with normal sedimentation rates, the turbidity target will be met. This appears to be the most common hydrologic condition in the river in July through October.

However, if sedimentation rates are too low, then instream turbidities may rise to unacceptable levels. Other sources will need limits to meet the main stem turbidity target during this type of critical condition. For example, the river under high flow conditions in April to June may have enough dilution to assimilate the reduced tributary loads from Granger Drain. But, the cumulative loading from all drains and tributaries upstream of Sulphur Creek, combined with high retention of sediments in the water column, will cause main stem turbidities to exceed the target (Appendix 4, Figure 4C). This situation could also happen at lower flow conditions. If fine silts and clays dominated the suspended sediment discharged by the drains and tributaries, they could resist settling (Appendix 4, Figure 4E).

The model simulations reveal that TSS load reductions will be necessary in most return drains below Union Gap to meet the main stem TMDL target during some critical conditions, especially in the reach upstream of Sulphur Creek. An agreement will need to be negotiated with the Yakama Indian Nation and USEPA to provide for adequate protection of the main stem through Reservation tributary load reductions. If project area and reservation loads can be reduced, simulations suggest that main stem target turbidities will be met more often during the higher flow periods of the irrigation season (Figure 24a). In addition, fewer areas may exceed the target during lower flow periods with low sedimentation rates (Figure 24b)

Other controls will be needed. The ungaged and unknown sources in the critical reach between Parker and Prosser during higher flow conditions, which were not modeled in the simulation, could also periodically bring turbidities over the target. Moxee Drain and other upstream sources will need to be controlled so background TSS concentrations for the Parker to Prosser reach are kept at a minimum. Return drains and tributaries that had low turbidities in 1994 and 1995 will be expected to remain below the target. Lower instream turbidities, and a better margin of safety against exceeding the turbidity criterion may be possible when TSS loads from ungaged drains on both sides of the river are placed under control. Unknown sources of TSS will need identification and reduction. However, complete reduction during higher flows may not be feasible if the TSS source is instream resuspension.

Once suspended sediment transport to the main stem Yakima River is controlled, it will be necessary to protect water quality within the subbasins. tributaries will be expected to meet the 25 NTU target at all points within their system to protect aquatic resources. An implementation strategy for each subbasin will be established through coordination with local resource agencies and the Yakima River Enhancement Project.

Pesticides Criteria

State water quality standards and USEPA guidelines provide chronic and acute criteria for DDT and other toxic substances to protect aquatic life (Chapter 173-201A-040 WAC; USEPA, 1986). The USGS demonstrated that DDT and suspended sediment concentrations in the Yakima River basin were highly related (Rinella *et al.* 1992a; Rinella *et al.*, 1993). Using 1995 monitoring data generated in this TMDL evaluation and previous USGS and Ecology data, a regression was developed of t-DDT (t-DDT = DDD+DDE+DDT) as a function of TSS (Figure 25).

The details of the relationship are discussed in Appendix 2. Briefly, the best linear regression equation based on 71 data pairs from river and tributary sites with detectable t-DDT concentrations (expressed as nanograms per liter, or ng/L) was obtained after logarithmic transformation (base 10) of the data:

$$\log_{10} \text{t-DDT} = 0.953 * \log_{10} \text{TSS} - 0.820$$

Impaired and Threatened Surface Waters Requiring Additional Pollution Controls

Proposed 1998 Section 303(d) List

The Washington State Department of Ecology (Ecology) is required under Section 303(d) of the federal Clean Water Act to prepare a list every two years containing surface waters not expected to meet state water quality standards after implementation of technology-based controls.

Ecology uses guidance provided by the U.S. Environmental Protection Agency (EPA) and policies established by our Water Quality Program in preparing new lists. Ecology staff have reviewed new information to revise the last list approved by EPA in 1996, and the proposed list in this report incorporates this new information. The list is organized by Water Resource Inventor Areas (WRIA). Waters in the Puget Sound that share WRIA boundaries and the Columbia appear near the end of the list. A map with WRIA and county boundaries is included in the report.

Information on many waters and water quality parameters were considered and some were excluded from the proposed list for various reasons. The basis for all decisions made to prepare this list is included in this report.

Ecology is currently accepting comments on the proposed list. The comment period ends on October 31, 1997. Information received in the comment period will be assessed against the criteria described in this report. Based on the comments received, Ecology will modify the list, prepare a responsiveness summary, and submit the list to EPA for approval. Comments received after the close of the comment period will be addressed in the year 2000 list.

If you have questions about the listing process, please contact Steve Butkus at (360) 407-6482 or Steve Saunders at (360) 407-6481.

Comments must be postmarked or received by October 31, 1997.
Submit comments to:

Steve Butkus
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

FAX: (360) 407-6426
EMAIL: stbu461@ecy.wa.gov

WA-37-1024	GRANGER DRAIN	pH	5 excursions beyond the criterion between 4/92 and 3/94 at USBR statioN YAV137.		[illegible]	[illegible]
WA-37-1024	GRANGER DRAIN	Temperature	9 excursions beyond the criterion between 8/91 and 9/93 at USBR statioN YAV137.;4 excursions beyond the criterion at USGS station 12505450 in1991.		Yes	TMDL
WA-37-1025	MARION DRAIN	4,4'-DDE	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1025	MARION DRAIN	Dieldrin	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1025	MARION DRAIN	Parathion	1 excursion beyond the chronic criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1030	SULPHUR CREEK WASTEWAY	4,4'-DDD	5 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12508850 in 1988.	These old data likely represent current conditions and the segment continue to be listed based on these data per the 8/97 judgement of Bob Barwin and Joe Joy (Dept. of Ecology). This judgment is based on the fact that DDT metabolites continue to be found throughout the basin in the Yakima TMDL study (unpublished).	Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	4,4'-DDE	Davis and Johnson, 1994. , excursions beyond the criterion inedible fish tissue.; 22 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12510500 between 1968 and 1989.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509050 on 7/28/88.; 15 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 between 1969 and 1971.; Johnson, et al. 1986. , excursions beyond the criterion of edible tissue in Largescale Suckers, Northern Squawfish, Smallmouth Bass, and Channel Catfish in 1985.;	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Yes	TMDL
WA-37-1010	YAKIMA RIVER	Aldrin	3 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 in 1970 and 1971.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Exclude	None

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Ammonia-N	Mellor, 1981b. , excursions beyond the criterion shown between 1970 and 1974.	Based on the data cited and other studies, the Richland wastewater discharge was diverted to the Columbia River in 1985. A TMDL was submitted to EPA based on the diversion on 8/25/92. EPA determined that the TMDL was incomplete on 4/8/93. A memo from EPA dated 3/11/97 stated the segment should never have been listed or considered as a TMDL. Ecology withdrew the TMDL from consideration on 4/29/97.; Data Collected from Ecology ambient monitoring station 37A090 (just upstream of original discharge location) show that Ammonia criteria are being.met. Since there are no major sources of ammonia downstream of this station, it is likely that ammonia criteria are me for the entire reach downstream. The activity meets EPA guidance for excluding water under federal regulations 40 CFR 130.7(b)(1).	Exclude	None
WA-37-1010	YAKIMA RIVER	Arsenic	Fuhrer, et al. 1996. , 15 samples collected at station 50 (Kiona) exceeded the National Toxic Rule criterion between 1987 and 1990.; Fuhrer, et al. 1996. , 6 samples collected at station 56 (RM 55) exceeded the National Toxic Rule criterion between 1987 and 1990.;		Yes	TMDL
WA-37-1010	YAKIMA RIVER	Cadmium	Fuhrer, et al. 1996. , 4 samples collected at station 19 (Umtanum) exceeded the criterion between 1987 and 1990.;		Yes	TMDL
WA-37-1010	YAKIMA RIVER	Copper	Fuhrer, et al. 1996. , 2 samples collected at station 19 (Umtanum) exceeded the criterion between 1987 and 1990.;		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	DDT	Rinella, et al. 1992. , excursions beyond the criterion at Klona(RM 29.8) on 5/7/88 and 3/8/89.; Johnson, et al. (1986) which showed 1 excursion beyond the criterion at Klona (RM 29.8) on 6/24/85.; 19 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12510500 between 1968 and 1989.; 11 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 between 1989 and 1972.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 04A015 on 6/24/85.; Johnson, et al. 1986. , excursions beyond the criterion of edible tissue in Largescale Suckers, Northern Squawfish, Smallmouth Bass, and Channel Catfish in 1985.;	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Yes	TMDL
WA-37-1010	YAKIMA RIVER	Dieldrin	19 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12510500 between 1968 and 1988.; 9 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 between 1969 and 1972.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 04A015 on 8/5/85.; Johnson, et al. 1986. , 1 excursion beyond the criterion on6/24/85.; Rinella, et al. 1992 ; 3 excursions beyond the criterion at Klona(RM 29.8) on 6/1/88, 7/29/88, and 8/31/88.; Davis and Johnson, 1994. , excursions beyond the criterion inedible fish tissue.; Johnson, et al. 1986. , excursions beyond the criterion of edible tissue in Largescale Suckers, Northern Squawfish, and Channel Catfish in 1985.;	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Dissolved Oxygen	1 excursions beyond the criterion out of 10 samples (10%) at Ecology ambient monitoring station 37A095 between 9/91 and 9/96;; Data collected by City of Prosser (as a condition of their NPDES permit and submitted by Phelps Freeborn at CRO) show 9 excursions beyond the criterion out of 23 samples (39%) in 1995 and 1996.	A single excursion beyond the criterion does not meet the Water Quality Program Policy for listing.	Yes	TMDL
WA-37-1010	YAKIMA RIVER	Endosulfan	USGS Report: Rinella et al., 1992.		Yes	TMDL
WA-37-1010	YAKIMA RIVER	Endrin	2 excursions beyond the chronic criterion at USEPA station 543005on 12/2/70 and 1/20/71.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Exclude	None
WA-37-1010	YAKIMA RIVER	Fecal Coliform	0 excursions beyond the criterion out of 33 samples (0%) at Ecology ambient monitoring station 37A090 between 9/91 and 9/96;; 0 excursions beyond the criterion out of 9 samples (0%) at Ecology ambient monitoring station 37A095 between 9/91 and 9/96;; 0 excursions beyond the criterion out of 11 samples (10%) at Ecology ambient monitoring station 37A100 between 9/91 and 9/96; 4 excursions beyond the criterion out of 11 samples (36%) at Ecology ambient monitoring station 37A130 between 9/91 and 9/96;; Embrey, 1992., excursions beyond the criterion at Grandview.		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Heptachlor	3 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 in 1970 and 1971.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Exclude	None
WA-37-1010	YAKIMA RIVER	Heptachlor Expoxide	3 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 543005 in 1970 and 1971.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Exclude	None

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Instream Flow	U.S. Bureau of Reclamation (1994) , measured flows below Prosser(RM 47); U.S. Fish and Wildlife (1990);Parametrix and Hardin Davis (1984); Yakima River Subbasin Plan (1990);U.S. Bureau of Reclamation (1990);SASSI, 1993;Nehlson, et al. 1991;The lower two segments of the river meet all the Water Quality Program Policy criteria for inadequate instream flow and have been added to the 303d list. The USFWS did an IFIM study and gave minimum flow levels needed by fish. (Simmons 1983 Court Testimony). Parametrix and Hardin Davis (1984) did a review for the Bureau of Reclamation and suggested minimum flows based on the IFIM and water the Bureau could possibly release for instream flows. The hydrograph for below Prosser in 1994 shows that even the minimum flows needed by fish are not being met. The 1990Yakima/Klickitat Production Report states that, low summer flows below Sunnyside Diversion Dam are a problem in most years because all but about 200 cfs of the Yakima River flow above Sunnyside is diverted out of thousands of cfs at RM 103.8. And the flows below the Prosser Diversion Dam at RM 47 are usually 50 to 200cfs when 800-1000 cfs is needed for spawning and rearing (1990Yakima/Klickitat Production Report). These flows also severely hinder up migration of adult salmon and out migration of smolts causing high mortalities The spring chinook and summer steelhead stocks are listed as depressed (SASSI, 1993).		Yes	Other Control
WA-37-1010	YAKIMA RIVER	Mercury	Fuhrer, et al. 1996. , 6 muscle tissue samples out of 7 for largescale sucker samples collected 10/91 exceeded the National Toxic Rule criterion.; Fuhrer, et al. 1996. , 3 samples collected at station 19 (Umtanum) exceeded the criterion between 1987 and 1990.; Fuhrer, et al. 1996. , 3 samples collected at station 50 (Kiona) exceeded the criterion between 1987 and 1990.;		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Parathion	1 excursion beyond the chronic criterion at USGS station 12510500on 3/30/73.; 1 excursion beyond the chronic criterion at USGS station 12509050on 7/28/88.	These old data do not represent current conditions and the segment not be listed based on these data per the 8/97 judgement of Bob Barwin and Joe Joy (Dept. of Ecology). Parathion use was discontinued in 1991. Ecology did not find any detectable parathion in the river basin in the sampling for the Yakima TMDL study (unpublished).	Exclude	TMDL
WA-37-1010	YAKIMA RIVER	PCB-1254	Davis and Johnson, 1994. , excursions beyond the criterion inedible fish tissue		Yes	TMDL
WA-37-1010	YAKIMA RIVER	PCB-1260	Davis and Johnson. 1994. , excursions beyond the criterion inedible fish tissue,; Johnson, et al. 1986. , excursion beyond the criterion of edible tissue in Channel Catfish on 5/20/85.;		Yes	TMDL
WA-37-1010	YAKIMA RIVER	pH	1 excursion beyond the criterion out of 36 samples (3%) at Ecology ambient monitoring station 37A090 between 9/91 and 9/96;;; 1 excursion beyond the criterion out of 12 samples (8%) at Ecology ambient monitoring station 37A100 between 9/91 and 9/96;; 10 excursions beyond the criterion at USGS station 12510500 between 7/1/87 and 7/1/91		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1010	YAKIMA RIVER	Temperature	4 excursions beyond the criterion out of 35 samples (11%) at Ecology ambient monitoring station 37A090 between 9/91 and 9/96;;; 1 excursions beyond the criterion out of 9 samples (11%) at Ecology ambient monitoring station 37A095 between 9/91 and 9/96;; 1 excursions beyond the criterion out of 11 samples (9%) at Ecology ambient monitoring station 37A100 between 9/91 and 9/96;; 1 excursions beyond the criterion out of 12 samples (8%) at Ecology ambient monitoring station 37A130 between 9/91 and 9/96;; 21 excursions beyond the criterion at USGS station 12510500between 7/1/87 and 7/1/91; Data collected by City of Prosser (as a condition of their NPDES permit and submitted by Phelps Freeborn at CRO) show 4 excursions beyond the criterion out of 23 samples (17%) in 1995 and 1996..		Yes	TMDL
WA-37-1010	YAKIMA RIVER	Turbidity	Joy and Patterson, 1995. Yakima River TMDL Study. Unpublished data collected form 7/94 to 10/94.		Yes	TMDL
WA-37-1012	SNIPES CREEK	4,4'-DDD	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509820 on 7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509829 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None
WA-37-1012	SNIPES CREEK	4,4'-DDE	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509820 on 7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509829 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None
WA-37-1012	SNIPES CREEK	DDT	Rinella, et al. 1992 , 1 excursion beyond the criterion on7/29/88.;Johnson, et al. 1986 , 1 excursion beyond the criterion on 8/5/85.		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1012	SNIPES CREEK	Dieldrin	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509820 on 7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509829 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None
WA-37-1012	SNIPES CREEK	Dissolved Oxygen	2 excursions beyond the criterion at USBR station YAV139 on5/20/92 and 7/25/94.		Yes	TMDL
WA-37-1012	SNIPES CREEK	Temperature	6 excursions beyond the criterion between 8/90 and 8/93 at USBR station YAV139.		Yes	TMDL
WA-37-1014	SPRING CREEK	4,4'-DDD	1 excursion beyond the criterion at USGS station 12509700 on7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509710 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None
WA-37-1014	SPRING CREEK	4,4'-DDE	1 excursion beyond the criterion at USGS station 12509700 on7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509710 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None
WA-37-1014	SPRING CREEK	DDT	Rinella, et al. 1992 , 1 excursion beyond the criterion on7/29/88.;Johnson, et al. 1986 , 1 excursion beyond the criterion on 8/5/85.		Yes	TMDL
WA-37-1014	SPRING CREEK	Dieldrin	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509700 on 7/29/88.; 1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509710 on 7/29/88.	Excursions beyond the criterion at multiple stations on a single day does not meet the Water Quality Program Policy for listing.	Exclude	None

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1020	YAKIMA RIVER	4,4'-DDE	Johnson, et al. 1986. , excursions beyond the criterion of edible tissue in Mountain Whitefish, Suckers, and Northern Squawfish in1985.	These old data likely represent current conditions and the segment continue to be listed based on these data per the 8/97 judgement of Bob Barwin and Joe Joy (Dept. of Ecology). This judgment is based on the fact that DDT metabolites continue to be found throughout the basin in the Yakima TMDL study (unpublished).	Yes	TMDL
WA-37-1020	YAKIMA RIVER	Ammonia-N	Glenn, 1993. , potential for ammonia toxicity in the receiving water from the Mabton and Sunnyside discharges.		Yes	TMDL
WA-37-1020	YAKIMA RIVER	Chlorine	Glenn, 1993. , potential for chlorine toxicity in the receiving water from the Mabton discharge.		Yes	TMDL
WA-37-1020	YAKIMA RIVER	DDT	Johnson, et al. 1986. , excursions beyond the criterion of edible tissue in Mountain Whitefish, Suckers, and Northern Squawfish in1985.; 2 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 04A013 on 6/24/85 and 8/5/85.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	.ction Planned
WA-37-1020	YAKIMA RIVER	Dieldrin	Johnson, et al. 1986. , excursion beyond the criterion of edible tissue in Mountain Whitefish on 8/20/85.;1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12509050 on 7/28/88.		Yes	TMDL
WA-37-1020	YAKIMA RIVER	Instream Flow	U.S.G.S. flow data from gage near Parker; U.S.. Fish and Wildlife, 1990;Parametrix and Hardin Davis, 1984;Yakima River Subbasin Plan, 1990;U.S. Bureau of Reclamation, 1990;SASSI, 1993 , Spring Chinook and Summer Steelhead stocks are depressed; Nehlson, et al. 1991 , Summer Chinook, Coho, and Sockeye Salmon are extinct.; The lower two segments of the river meet all the Water Quality ProGram Policy criteria for inadequate instream flow and have been added to the 303d list. The USFWS did an IFIM study and gave minimum flow levels needed by fish. (Simmons 1983 Court TestiMony). Parametrix and Hardin Davis (1984) did a review for the Bureau of Reclamation and suggested minimum flows based on the IFIM and water the Bureau could possibly release for instream flows. The hydrograph for below Prosser in 1994 shows that even the minimum flows needed by fish are not being met. The 1990Yakima/Klickitat Production Report states that, low summer flows below Sunnyside Diversion Dam are a problem in most years because all but about 200 cfs of the Yakima River flow above Sunnyside is diverted out of thousands of cfs at RM 103.8. And the flows below the Prosser Diversion Dam at RM 47 are usually 50 to 200cfs when 800-1000 cfs is needed for spawning and rearing (1990Yakima/Klickitat Production Report). These flows also severely hinder up migration of adult salmon and out migration of smolts causing high mortalities The spring chinook and summer steelhead stocks are listed as depressed (SASSI, 1993).		Yes	Other Control

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1020	YAKIMA RIVER	PCB-1260	Johnson, et al. 1986.., excursion beyond the criterion of edible tissue in Mountain Whitefish on 8/20/85.	These old data do not represent current conditions and the segment not be listed based on these data per the 8/97 judgement of Bob Barwin (Dept. of Ecology).	Exclude	TMDL
WA-37-1020	YAKIMA RIVER	Temperature	Embrey, 1992., 1 excursion beyond the criterion at two separate locations on different dates (at Zillah on 7/27/88 and at Granger on 7/29/88).		Yes	TMDL
WA-37-1024	GRANGER DRAIN	4,4'-DDD	4 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505460 in 1988.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	4,4'-DDE	7 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505460 in 1988 and 1989.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	Ammonia-N	5 excursions beyond the criterion between 11/91 and 2/94 at USBR statioN YAV137.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	DDT	Rinella, et al. 1992., 8 excursions beyond the criterion collected between 5/88 and 6/89 at the mouth near Granger.; Johnson, et al. 1986., 2 excursions beyond the criterion on6/24/85 and 8/5/85.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	Dieldrin	Rinella, et al. 1992., 6 excursions beyond the criterion collected between 5/88 and 11/88 at the mouth near Granger.; Johnson, et al. 1986., 2 excursions beyond the criterion on6/24/85 and 8/5/85.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	Dissolved Oxygen	13 excursions beyond the criterion between 3/91 and 10/93 at USBR statioN YAV137.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	Endosulfan	Rinella, et al. 1992.; 4 excursions beyond the criterion collected between 6/88 and 8/88 at the mouth near Granger.		Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1024	GRANGER DRAIN	Fecal Coliform	Embrey, 1992.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	pH	5 excursions beyond the criterion between 4/92 and 3/94 at USBR statioN YAV137.		Yes	TMDL
WA-37-1024	GRANGER DRAIN	Temperature	9 excursions beyond the criterion between 8/91 and 9/93 at USBR statioN YAV137.;4 excursions beyond the criterion at USGS station 12505450 in1991.		Yes	TMDL
WA-37-1025	MARION DRAIN	4,4'-DDE	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1025	MARION DRAIN	Dieldrin	1 excursion beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1025	MARION DRAIN	Parathion	1 excursion beyond the chronic criterion at USGS station 12505510 on 7/28/88.	This waterbody is entirely on the Yakima Indian Nation Reservation and does not fall under the jurisdiction of the state.	Exclude	None
WA-37-1030	SULPHUR CREEK WASTEWAY	4,4'-DDD	5 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12508850 in 1988.	These old data likely represent current conditions and the segment continue to be listed based on these data per the 8/97 judgement of Bob Barwin and Joe Joy (Dept. of Ecology). This judgment is based on the fact that DDT metabolites continue to be found throughout the basin in the Yakima TMDL study (unpublished).	Yes	TMDL

Segment ID Number	Waterbody Name	Parameter	Basis for Consideration of Listing	Rationale for Not Listing	Place on List?	Action Planned
WA-37-1030	SULPHUR CREEK WASTEWAY	4,4'-DDE	8 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USGS station 12508850 between 1976 and 1989.	These old data likely represent current conditions and the segment continue to be listed based on these data per the 8/97 judgement of Bob Barwin and Joe Joy (Dept. of Ecology). This judgment is based on the fact that DDT metabolites continue to be found throughout the basin in the Yakima TMDL study (unpublished).	Yes	TMDL
WA-37-1030	SULPHUR CREEK WASTEWAY	Arsenic	Fuhrer, et al. 1996. , 15 samples collected at station 52 (near Sunnyside) exceeded the National Toxic Rule criterion between 1987 and 1990.;		Yes	TMDL
WA-37-1030	SULPHUR CREEK WASTEWAY	DDT	Rinella, et al. 1992 , 7 excursions beyond the criterion collected between 5/88 and 6/89 near Sunnyside.; Johnson, et al. 1986 , 2 excursions beyond the criterion on6/24/85 and 8/5/85.; 2 excursions beyond National Toxics Rule (40 CFR Part 131) criterion at USEPA station 04N002 in 1985.	The EPA data downloaded from STORET were challenged as not meeting the quality assurance criteria of the Water Quality Program policy on listing. The listed STORET contact (Ray Peterson) was asked to verify that these criteria were met for the data used as a basis for listing. EPA did not verify that these data meet the quality assurance criteria. Therefore, these data from STORET should not be used as a basis for listing.	Yes	TMDL

APPENDIX 4

PROJECT: 1867

TITLE: Investigation of the Use of Polyacrylamide (PAM) in Hop Production

PERSONNEL:
Project Lead: R.G. Stevens, Extension Soil Scientist, WSU-Prosser
T.W. Ley, Extension Irrigation Engineer, WSU-Prosser

V.I. Prest, Agricultural Tech. III, WSU-Prosser

OBJECTIVE:

The objective of this project was to compare the use of PAM in irrigation water with standard furrow irrigation practices in hop production.

ACCOMPLISHMENTS:

Although complete data analysis has not been completed, the results of the August 14, 1996 irrigation demonstrates the effect of PAM on the measured irrigation parameters.

At comparable inflow rates PAM significantly increased the advance time (time for water to reach the end of the field) in individual furrows. Longer advance times can be related to increased infiltration during the advance phase.

Because of the increased infiltration with PAM, higher inflow rates are needed to obtain uniform distribution of water down the length of the furrow. The use of PAM at normal inflow rates leads to increased water application at the head of the field.

Water retention in PAM treated furrows measured 16 hours after the initiation of outflow expressed as percent of total applied water was equal to or better than control furrows.

Furrow inflow rates greater than twice the conventional rate achieved desirable advance times but showed evidence of excessive furrow scouring even with PAM.

The use of PAM reduced the sediment load leaving the field by as much as 90%.

The concentration of total phosphorus in the outflow stream was decreased by 92% through the use of PAM. Soluble phosphorus was decreased by 63%.

PROCEDURES:

Research was conducted in a commercial hop yard at Prosser WA. The soil was a Warden silt loam with 37.8% sand, 48.2% silt, and 14.0% clay. The soil had a pH of 7.5, 1.1% organic matter, and 44 ppm sodium bicarbonate STP. Treatments were replicated four times in an area with a 3.9% average slope and 565 ft average furrow length. Data reported here were collected on an August irrigation following cultivation and establishment of new furrows.

Irrigation treatments were established to deliver 2.5 gpm (av. rate 2+) without PAM, 3.0 (av. rate 2.5 - 2.8) and 4.0 gpm (av. rate 4) with PAM. A stock solution of 5000 ppm PAM (Superfloc A-836, Cytec) was injected into the irrigation stream to provide a 10 ppm PAM application rate. The PAM application was stopped when the wetting front reached the end of the row. The 2.5 and 3.0 gpm flow rates were maintained throughout the 16 hours following the initiation of outflow. The 4.0 gpm rate was reduced to 2.0 gpm (av. 1.6) rate when the wetting front reached the end of the row and PAM application stopped.

Outflow from individual furrows was measured using small v-notch weirs. Individual furrow stream flow samples were taken on a time interval for determination of sediment and P concentration in outflow. Sediment loss was estimated using an Imhoff cone. Soluble P was determined on filtered samples. Total P and bioavailable P was determined on unfiltered samples. Bioavailable P is an estimate of P that would be readily available for plant or microbial use in a receiving water.

RESULTS:

As expected both inflow rate and the addition of PAM had a significant effect on wetting front advance (Table 1). A comparison of PAM vs no PAM at 2.0 gpm inflow rate in the July 25th irrigation showed a doubling of the time required for water to reach the end of the average furrow from 801 to 1675 minutes. In the August 14th irrigation 2.5 gpm without PAM was compared to 3.0 gpm with PAM and the increased inflow rate with PAM produced a more comparable advance time to the no PAM treatment. These results demonstrate the increased infiltration with PAM treated water and the need for increased inflow rates if advance times are to be maintained to improve application uniformity down the furrow.

Individual furrow dynamics had more of an effect on furrow outflow (gpm) than did inflow rate or PAM application (Fig. 1). Greater inflow rates with PAM application are needed because of the increased infiltration rate maintained in the PAM treated furrows. Outflow rates were slightly higher with the 3.0 gpm with PAM rate than with the 2.5 gpm control flow rate. This indicates that increased infiltration rate was less than 0.5 gpm. The 4.0 gpm inflow rate plus PAM was reduced to 2.0 gpm when the advance reached the end of the furrow. For a short time the 2.0 gpm inflow rate was not able to supply infiltration and outflow stopped (Fig 1).

During the 16 hrs following the initiation of outflow in each furrow more water was retained in the yard with the 3.0 gpm plus PAM treatment than the other two treatments (Table 2.). However, both the 3.0 gpm plus PAM and the 2.5 gpm control treatment retained 78% of the water applied. The highest water retention as a percentage of total water applied was obtained with the 4.0 to 2.0 gpm cutback treatment (86%). However, less total water was retained with this treatment than with the 3.0 gpm plus PAM constant inflow, due to less total water being applied. The cutback treatment will be the most effective treatment once the cutback rate that will keep the furrows wet is determined.

Sediment load estimated as milliliter (ml) of sediment per liter (L) of outflow (Imhoff cone measurement) was affected by furrow dynamics as well as by treatment (Fig. 2). Both irrigation rates with PAM reduced sediment load significantly when compared to the control treatment (Table 2). Higher sediment loads with the 4.0 gpm PAM treatment prior to the cutback of inflow rate supports results indicating that too high inflow rates can overcome the effectiveness of PAM. The average sediment loss from a furrow during the 16 hr period was reduced by over 90% by both PAM treatments (Table 2). Less total outflow with the 4.0 to 2.0 gpm cutback treatment led to less total sediment loss.

The concentration of all three P components was significantly decreased in the outflow with the use of PAM (Fig. 3). The average total P concentration over time was decreased by 92%, from 19.4 to 1.56 ppm, with the application of PAM during the advance phase with 3.0 gpm irrigation. The average soluble P concentration over time decreased from 0.73 in the no PAM treatment to 0.27 and 0.41 ppm with the 3.0 and 4.0 gpm inflow rates with PAM respectively. Bioavailable P was also decreased from a control level of 1.70 to 0.32 and 0.39 ppm in the same PAM treatments.

The decrease in soluble and bioavailable P concentration in outflow may be related to PAM's ability to maintain aggregate stability. By maintaining aggregate stability and flocculating clay and silt particles out of the irrigation stream, PAM may reduce the total contact of particulate P with the irrigation solution, thus reducing movement of P into the solution phase. Soluble and bioavailable P deceased with time over the first 2 hrs of outflow (Table 3).

Data analysis on the results of several irrigations is continuing and a final report and PAM use recommendations will be produced.

Table 1. The effect of inflow rate and PAM application on advance time.

Treatment	Nominal Flow Rate (gpm)	Actual Flow Rate (gpm)	Ave. Advance Time (min)
July 25, 1996			
No-PAM	2.0	~ 1.6-1.7	801
PAM	2.0	~ 1.6-1.7	1675
PAM	4.0 / 2.0	~ 3.9 / 1.6-1.7	252
August 14, 1996			
No-PAM	2.5	~ 2.0	297
PAM	3.0	~ 2.5-2.8	353
PAM	4.0 / 2.0	~ 4 / 1.6-1.7	201

Table 2. Total inflow, outflow and sediment loss comparison by inflow rate / PAM treatments during the first 16 hrs of tailwater runoff.

Irrigation Rate Gal/Min	Inflow	Outflow	Retention	Retention %	Sediment Ft^3/Furrow
		Gal/Furrow			
2.5	4,293 b	928 a	3,365 b	78	4.91 a
3.0 + PAM	4,948 a	1,091 a	3,857 a	78	0.49 ab
4.0 / 2.0 + PAM	3,963 b	559 b	3,404 b	86	0.32 b

Means with same letter within a column are not significantly different ($P \leq 0.05$) according to the LSD test.

Table 3. Outflow concentrations of soluble P, bioavailable P and total P in the first 16 hrs of tailwater runoff.

Time min	Soluble	Bioavailable	Total
		ppm	
0	0.78 a	1.35 a	9.09
30	0.62 b	0.94 a b	6.91
60	0.47 b c	0.84 a b	5.83
120	0.46 c	0.68 b	10.22
240	0.40 c d	0.78 b	9.23
480	0.24 d	0.63 b	5.49
960	0.33 c d	0.64 b	9.85

Means with same letter within a column are not significantly different ($P \leq 0.05$) according to the LSD test.

Fig 1. The effect of inflow rate and PAM treatment on tailwater volume during the first 16 hrs of outflow from treated furrows.

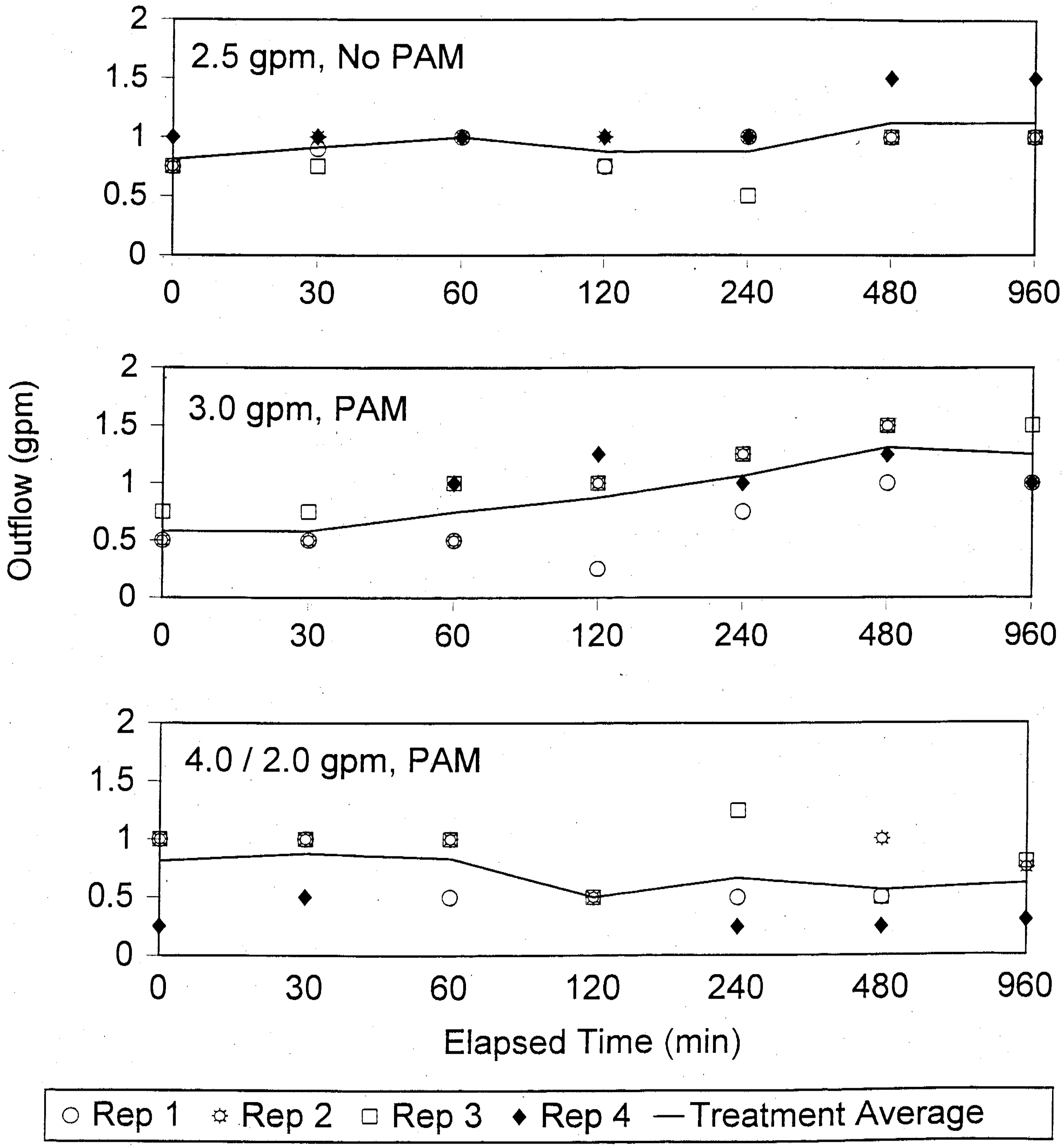


Fig 2. The effect of inflow rate and PAM treatment on sediment concentration in tailwater during first 16 hrs of outflow from treated furrows.

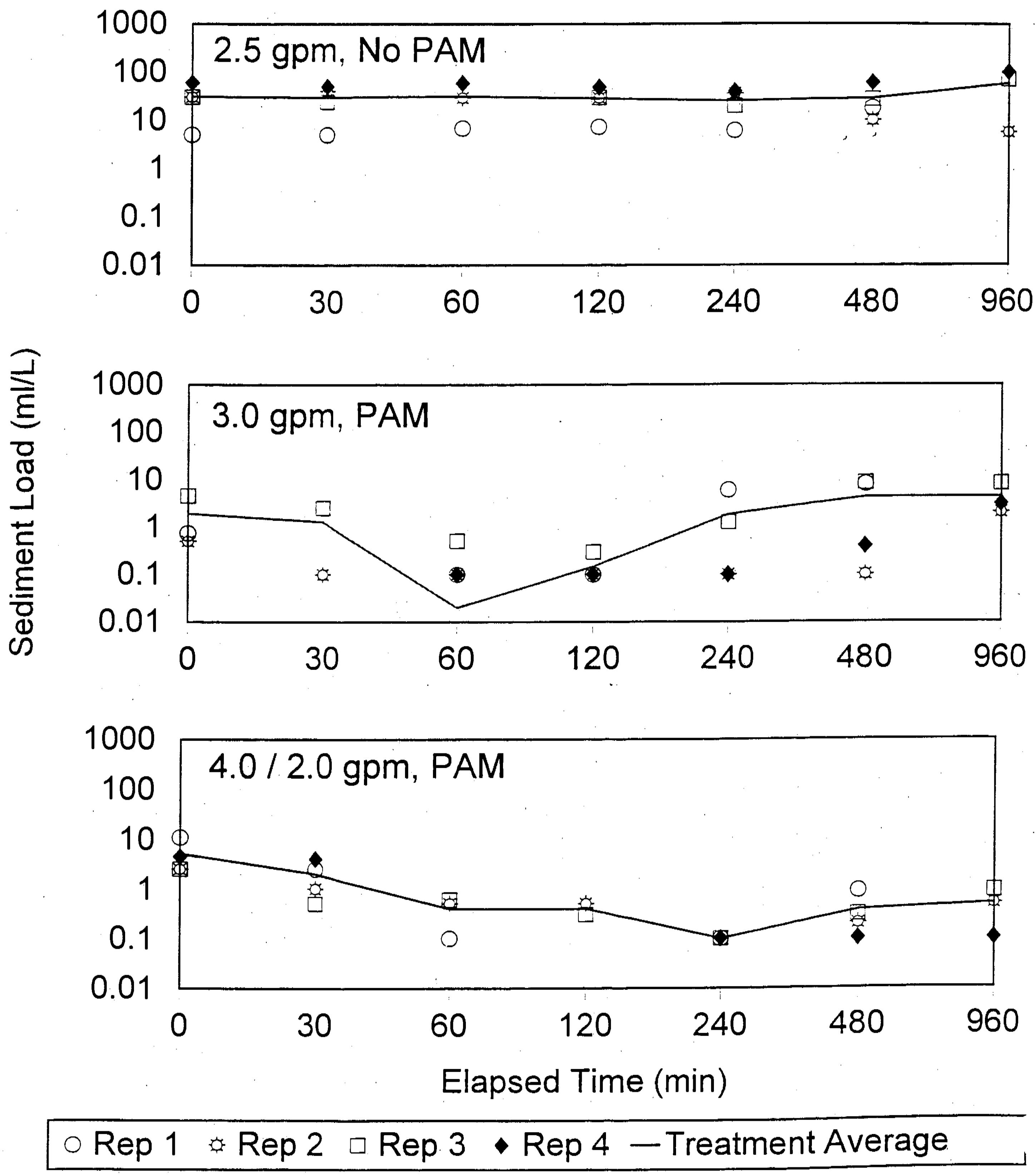
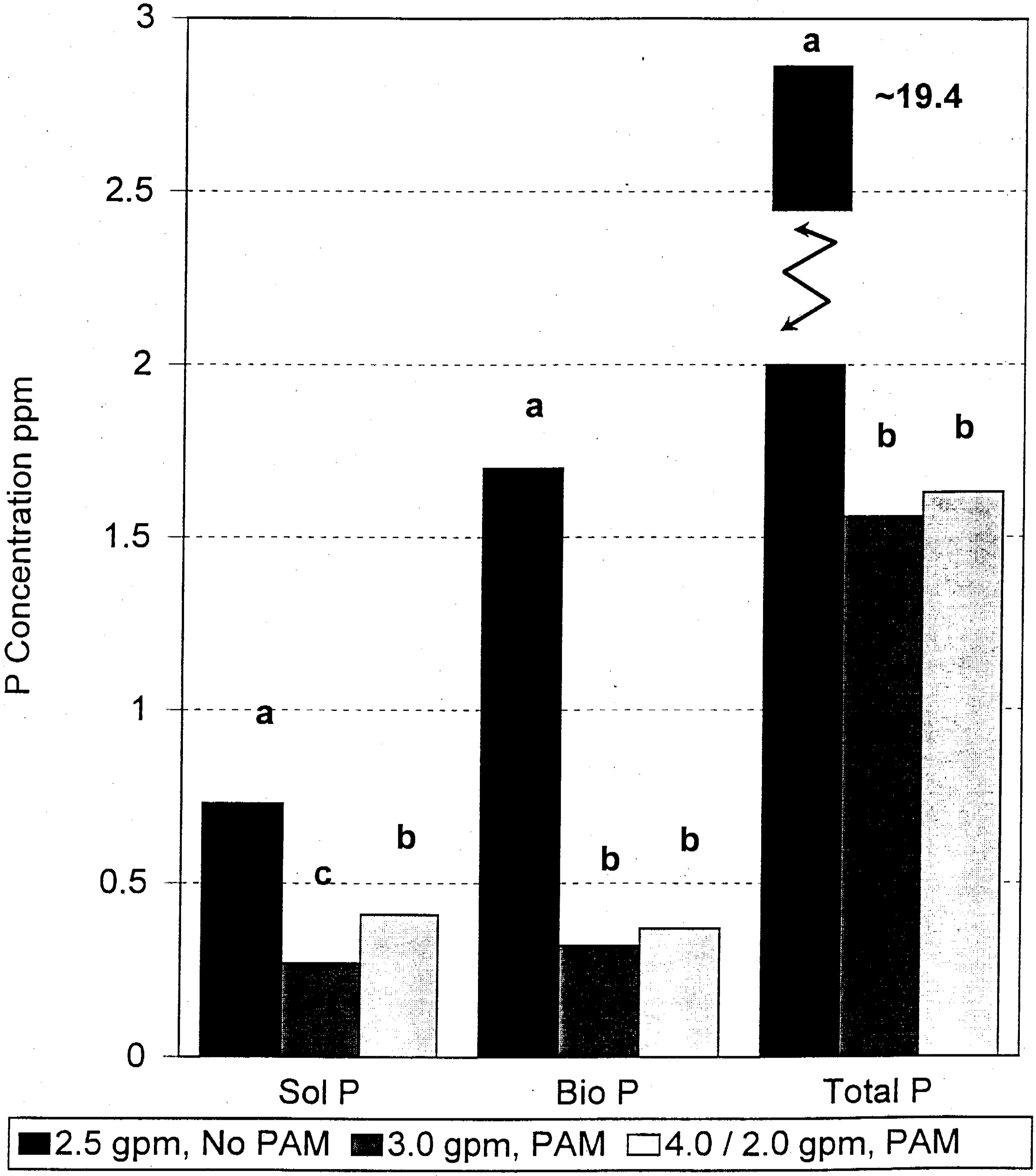


Fig 3. The effect of inflow rate and PAM treatment on the concentrations of soluble P, bioavailable P and total P in tailwater during first 16 hrs of outflow.



APPENDIX 5

SPRING CREEK WATER QUALITY and GIS MAPPING PROJECT

By

Pat Daly

BENTON CONSERVATION DISTRICT

For

WASHINGTON STATE DEPARTMENT OF ECOLOGY
CENTENNIAL CLEAN WATER FUNDS
Grant No. G9600119

JUNE 1998

Benton Conservation District Board of Supervisors

Dave Roseberry, Chairman
Frank Anderson
Mike Duncan
Frank Berg
Mike O'Brien

TABLE OF CONTENTS

TABLE OF CONTENTS........1

LIST OF FIGURES........2

LIST OF TABLES........2

1. SETTING, GOALS, PREVIOUS STUDIES AND SUMMARY........1

1.1 Setting........1
1.2 Project Goals........1
1.3 Previous Studies........4
1.4 Project Summary........5

2. WATER QUALITY MONITORING........7

2.1 Sampling Sites........7
2.2 Sampling Methods........8
2.3 Water Quality Data........10
Stream Flow........*10*
Suspended Sediment........*12*
Sediment Discharge........*12*
Storm Events........*15*

3. AGRICULTURE MAPPING........17

3.1 Methods........17
3.2 Yearly Results / Changes........17
Crops and Irrigation Methods........*17*
Cover Crops and Slope........*25*

4. STREAM RESTORATION........28

5. EDUCATIONAL EFFORTS........30

5.1 Annual Irrigated Agriculture Tour........30
5.2 Student Information and Education........30
5.3 Grower Contacts and Presentations........30

6. FURTHER STUDY........31

LIST OF FIGURES

Figure 1.1 Lower Yakima River Watershed in Benton County 2
Figure 1.2 Spring Creek Watershed – Hydrology, Roads and Sampling Sites 3
Figure 2.1 Spring Creek Profile 7
Figure 2.2 Photographs of Spring Creek Sampling Sites 9
Figure 2.3 Stream Flow Distributions for 1996 and 1997 11
Figure 2.4 Suspended Sediment Concentrations, 1996 and 1997 11
Figure 2.5 Median Suspended Sediment Concentrations, Irrigation and Non-Irrigation Seasons 13
Figure 2.6 Spring Creek Sediment Discharge by Site and Time Period, 1996-97 14
Figure 3.1 Spring Creek Crop Types, 1996 Survey 18
Figure 3.2 Spring Creek Crop Types, 1997 Survey 19
Figure 3.3 Spring Creek Crop Types, 1998 Survey 20
Figure 3.4 Spring Creek Irrigation Methods, 1996 Survey 21
Figure 3.5 Spring Creek Irrigation Methods, 1997 Survey 22
Figure 3.6 Spring Creek Irrigation Methods, 1998 Survey 23
Figure 3.7 Spring Creek Cover Crops, All Surveys 26
Figure 3.8 Spring Creek Slopes, All Surveys 27

LIST OF TABLES

Table 2.1 Mean Stream Flow Distributions 10
Table 2.2 Sediment Discharge By Sample Site And Time Period 13
Table 2.3 Data Collected During Storm Events 16
Table 3.1 Summary Of Gis Map Survey Information Collected For Crop And Irrigation System 24
Table 3.2 Summary Of Gis Map Survey Information Collected For Cover Crops 25

1. SETTING, GOALS, PREVIOUS STUDIES AND SUMMARY

1.1 Setting

The Yakima River basin, located in south central Washington, drains 6,155 square miles of highly diverse agriculture, forested, and range land. The first major diversions of river water to support irrigated farming in the valleys began in 1891, and continued development of canals has transformed the lower Yakima basin (below its confluence with the Naches), from grassland to one of the most valuable farmlands in Washington.

Agriculture impacts to water quality conditions in the Yakima River, documented through numerous federal, state and local studies[1], include stream sedimentation due to soil loss on irrigated farmland, and pollution inputs from farm runoff. The Washington Department of Ecology's (WDOE), Total Maximum Daily Load Evaluation[2], completed in 1997, identified several parameters, including temperature, fecal coliform, ammonia-N, and DDT that have excessive levels in tributaries, drains and the main stem of the river.

The Yakima watershed drains approximately 40 percent of Benton County, the jurisdiction of the Benton Conservation District (Figure 1.1). Spring Creek, which joins Snipes Creek one-quarter mile from their drain into the Yakima River, is a major tributary, carrying runoff from approximately 32 square miles. The top of the drainage is at approximately 2900 feet in elevation, while the lower end of the drainage, at Spring Creek's confluence with Snipes Creek, is at 565 feet. This is over a distance of approximately 16 miles, for an average slope of three percent.

Depending on irrigation demands and/or winter rain and snow events, Spring Creek is intermittent above the small stream, which flows into it from the north, ½ mile west of Crosby Road (6 miles above its confluence with Snipes Creek, Figure 1.2). Spring Creek is perennial below this. Because the stream serves as a source of irrigation water, and receives runoff from irrigated fields and irrigation drains, the flows are greater in the spring and summer than they are when irrigation is not running. The Roza Irrigation District uses Spring Creek to receive excess flow from an irrigation drain where the creek passes under the south side of Snipes Road. This usually runs at the beginning of irrigation season in April, and then is turned off as that water is directed to fields for irrigation later in May or June.

1.2 Project Goals

In 1995, the District began the Spring Creek project with the following primary goals:

1) Determine the condition of Spring Creek in terms of water quality parameters;
2) Identify and map the location and number of irrigated acres, the major crops and irrigation methods used within the watershed;
3) Compile both water quality and farm data into a data base; and
4) Evaluate the impacts of agriculture to the water quality of Spring Creek.

Benton County & Lower Yakima River Watershed

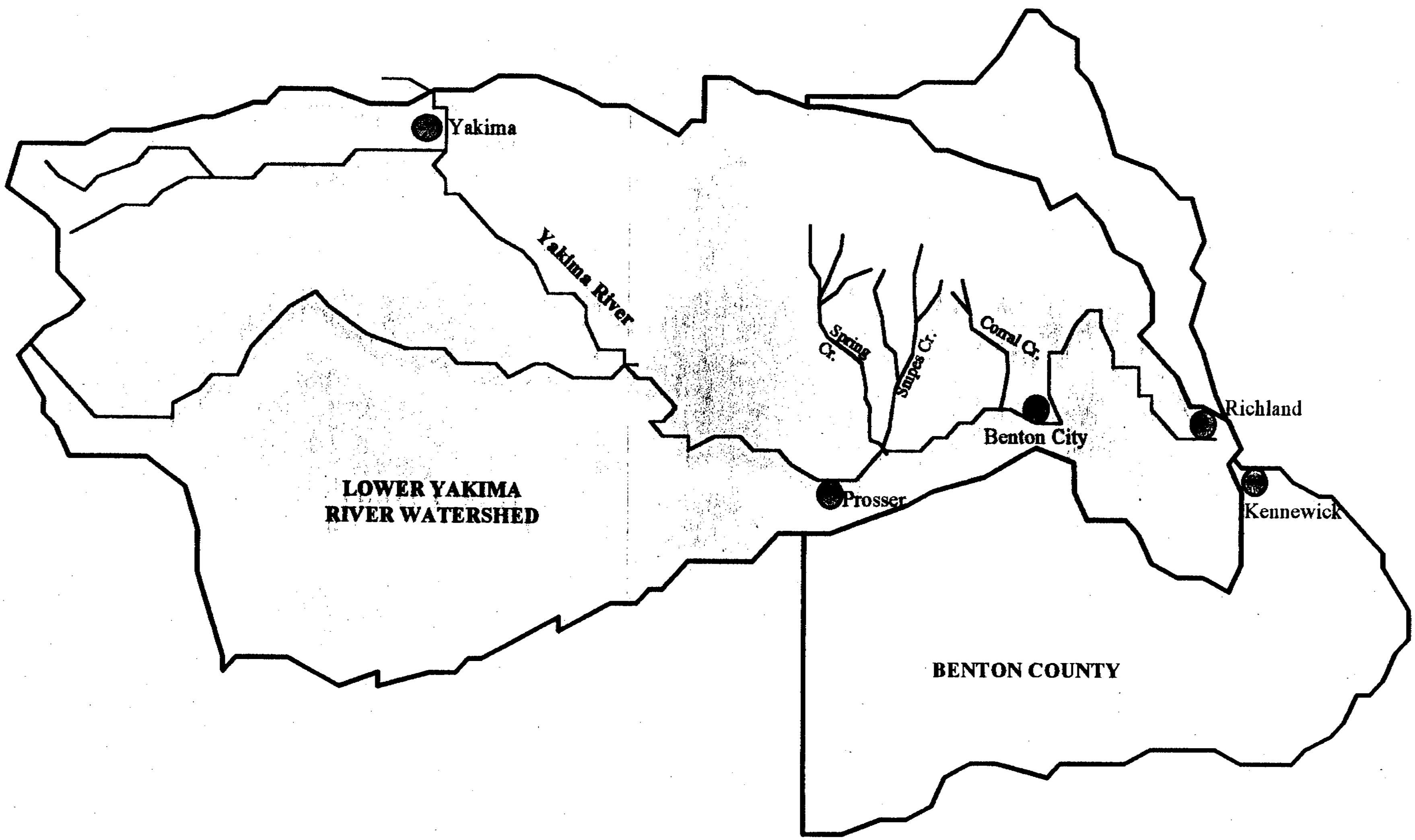
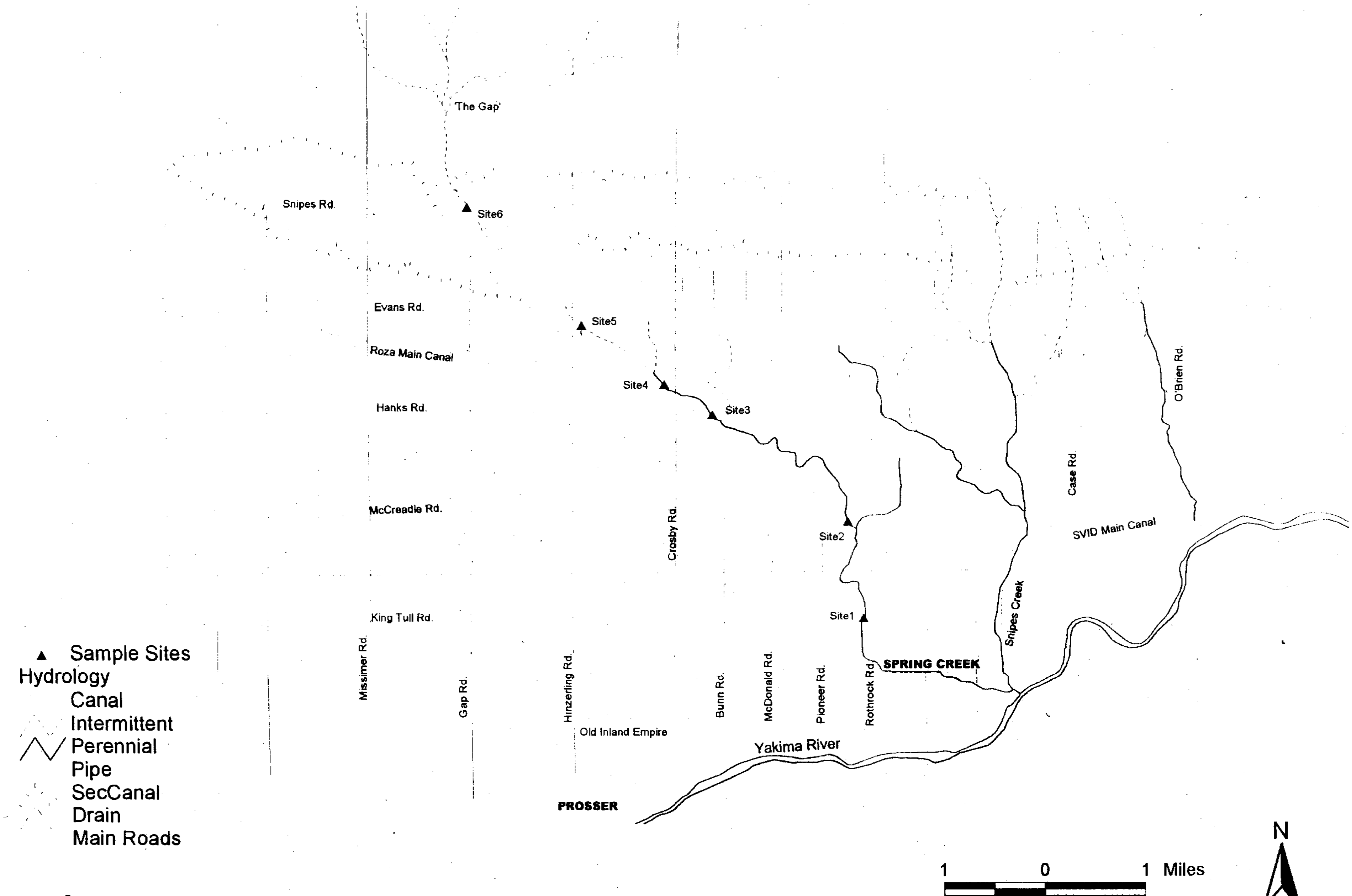


Figure 1.2 Spring Creek Watershed - Hydrology, Roads and Sample Sites



Secondary goals of the project included:
1) Educate the grower community and general public of agriculture's impacts to Spring Creek's water quality and conservation measures to reduce these impacts;
2) Demonstrate a stream restoration project along a section of Spring Creek; and
3) Provide opportunities for local students to work with the District on water quality issues.

1.3 Previous Studies

Previous studies had identified problems in the Yakima's main stem and at tributary confluences, however, no specific data on water quality or irrigated agriculture existed for Spring Creek watershed above its confluence with Snipes Creek. Water quality monitoring by the US Geological Survey (USGS), and the US Bureau of Reclamation, documented by the USGS[3], was done on Spring and Snipes Creeks, but only within one-half mile of their confluence with the Yakima. No data was available upstream on either creek to indicate the conditions closer to agricultural influences.

Analysis by the USGS of this data provided indications of potential water quality concerns within the two creeks:
- Sixteen percent of dissolved-solid and sulfate measurements at Spring Creek, and 23% of these measurements at Snipes Creek, exceeded the US Environmental Protection Agency's guidelines for irrigation or the criterion for drinking water.
- A positive trend of seven percent of median per year for flow-adjusted specific conductance was determined at Snipes Creek during the water years of record, 1975-1980.
- The median value of nitrite-plus-nitrate as N at Spring Creek was 1.4 mg/l during water years 1974-1981 (concentrations greater than 1 mg/l are sufficiently large enough to support eutrophication).
- The sampling sites at Snipes and Spring Creeks showed significant positive time-trend results for total ammonia as nitrogen from 1974-1981 water years.

Observations in the USGS report not specific to Snipes and Spring Creeks, but of concern to agriculture's impact to water quality included:
- Peak concentrations of suspended sediment were observed during the start of irrigation season when soils are freshly tilled and canals and ditches are layered with sediment from recent cleaning, contrasting with the smallest concentrations occurring after the irrigation season.
- Below Union Gap, median concentrations of nutrients increase by a factor of two or more and continue to increase downstream to Kiona.
- Five percent of the instantaneous stream temperature measurements at the class A streams (the Yakima main stem and tributaries except Sulphur Creek Wasteway downstream from the national forest), exceeded the 21°C standard. Most of the exceedences were during the warm July-August period.

The Yakima Valley Council of Governments' Yakima River Basin Water Quality Plan[4], summarizes basin water quality problems and provides recommendations for improvements. The Plan divides the region in to several subbasins, and most of the recommendations for the lower portion of the Yakima River, including Benton County, emphasize the need for improvements to agriculture practices. Best Management Practices (BMPs), are recommended for fertilizer application, agriculture sediment control, and reduction of chemical inputs. The Plan also recommends providing technical assistance for implementation of BMPs.

Of note in this plan was the lack of specifics on the number of acres and types of cropping patterns that needed improvements. The District found this was also the case when looking for information about conditions in the Spring and Snipes Creeks watersheds from Benton County Extension, the Washington State Agriculture Statistics Service, and farm agencies.

The Washington Department of Ecology did additional monitoring of Spring and Snipes Creeks during the period of this project, again at the tributaries' confluence with the Yakima main stem. Data taken included temperature, pH, TSS, turbidity, flow, and conductivity and is available for the period April 1995 through October 1995.

1.4 Project Summary

The Spring Creek project began in November 1995 by initial selection of water quality monitoring sites (described further in Section 2.1). Sampling began in November 1995, with a total of six sites established. Two of those sites have intermittent flows so sampling was done only when water was available.

Agriculture mapping began in winter 1996, when the USDA provided the District with a Global Positioning System (GPS) receiver. This allowed an electronic survey of individual fields and electronic entry of data on crop type, irrigation method, the use of a cover crop and an estimate of field slope. Approximately 3100 acres were mapped the first winter, with an additional 15,950 acres added through the course of the project. Not all of these acres drain directly to Spring Creek; the hydrology is quite complex due to the numerous field, road and irrigation drains. The additional mapping of acres in the Spring Creek vicinity provides information on the concentration and type of crops and irrigation.

In October 1997, the Benton County Planning Department provided the District with orthophotos of most of the sections of interest within the Spring and Snipes Creek Watersheds. Towards the end of the project, these were used to speed the process of mapping the agriculture acres.

During the course of the project, the data being collected was entered into spreadsheets and Geographic Information System (GIS) programs. Analysis of the data was ongoing throughout the project, and occasional presentations were made of selected data portions at both grower and public meetings. This report contains all collected data, analysis and summaries.

The District produced 10 newsletters, offered 5 workshops on irrigation methods for growers, and discussed this project at 4 grower meetings during the 28 months of the project. Many of these discussions focussed on the obvious problems of field soil loss resulting in stream sedimentation, the location of sediment inputs, and the continuing changes of field irrigation practices.

The District began an Annual Irrigated Tour with this project, as a means of communicating to the non-farming public the issues of irrigated agriculture in the Yakima Valley. The first tour was in September 1996, and the following year the second tour was nearly at capacity. This tour has become an annual event for the District, and is discussed further in section 5.1.

A major portion of time was spent during the first year of this project with the fence construction and vegetation planting along a one-quarter mile section of Spring Creek. The purpose of this task was to demonstrate the effectiveness of stream vegetation on reducing the impacts of soil runoff from nearby fields, and potential water quality improvements. Local students assisted with the vegetation planting and growth of this vegetation has been significant. This task is also described later in greater detail.

This project has led to additional projects, which are currently in progress by the District. The mapping has allowed the District to identify both locations and landowners where additional efforts have been successful with encouraging irrigation management changes. Cost-share dollars available to provide financial assistance, and salary dollars for on-farm technical assistance have also increased both the awareness and actions of growers toward improved methods.

2. WATER QUALITY MONITORING

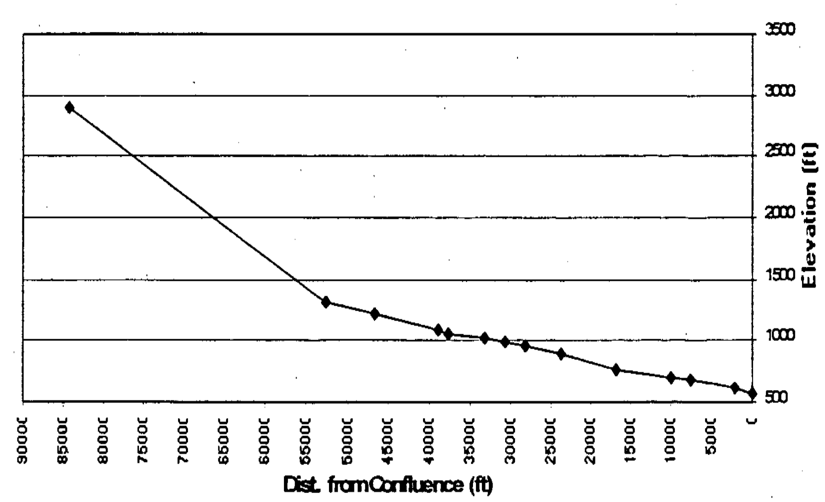
2.1 Sampling Sites

Financial and practical constraints limited selection to six sampling sites along the 10 miles of creek chosen for the project study area. The first point selected for sampling is approximately 1.9 miles above the point Spring Creek enters Snipes Creek. Below this point, most of the land is either pasture or residential, and not subject to a significant amount of soil runoff.

Considerations used to select a sampling site included accessibility, the potential of the stream characterizations at the site to shift and change, the minimum and maximum water depth at the site, and potential receipt of runoff based on surrounding fields. The sampling sites are shown in Figure 1.2, and Figure 2.1 shows the stream profile with the sampling sites.

Figure 2.1 Spring Creek Profile

Stream Location	Feet from Confluence	Elevation (feet)
Snipes	0	565
Rothrock Road	7458	678
Sample Site 1	10032	701
Sample Site 2	16767	760
McDonald Rd.	23763	885
Sample Site 3	28185	955
Crosby Rd.	30825	985
Sample Site 5	37689	1050
Sample Site 6	46731	1210
The Gap	52671	1320
Top of Drainage	84351	2900



2.2 Sampling Methods

A water quality-monitoring plan (Attachment A), was written and approved by the WDOE during the initial phases of the project. This plan outlines the methods to be used and data to be collected throughout the project. Stream sampling was done according to WDOE's Surface Water Monitoring guidelines. The equipment used included a Teledyne Gurley #625 Pygmy current meter, a standard 30' tape with one-tenth markings, a Hanna 8314 pH and temperature meter, and plastic water sample bottles provided by US Ag, the lab doing the suspended sediment analysis.

A stake was placed on either side of the stream bank to mark each sampling site. A water sample was collected at the beginning of each sampling event and then a tape was stretched across from each stake. Velocity readings were made at regular intervals across the stream and at several depths at each interval. The number of intervals and depth measurements varied depending on stream width, bottom variability and water depth. Finally, temperature and pH measurements were taken and recorded.

Flow calculations were made using the velocity measurements taken over the width of the stream, i.e., depth times width times velocity equals volume (area in square feet times velocity in feet per second equals flow in cubic feet per second).

Stream gages were initially placed at each sampling location with the anticipation that a correlation could eventually be made between water depth and total flow. However, regular sediment deposits and scouring at sampling locations prevented accurate measurements of water depth from the gages. They were subsequently used to support more accurate measurements, and as reference during runoff periods when velocity was beyond the equipment's ability.

A small portion of the collected a water sample was used to measure turbidity at the District's lab, and the remaining was delivered to commercial lab for suspended sediment analysis. The District used a Hach 2100N turbidometer, as directed by WDOE to measure turbidity. WDOE had shown this equipment to provide a better correlation between total suspended sediment and turbidity. This correlation is useful to reduce the cost of determining suspended sediment levels, in that turbidity measurements are easier and less expensive to make.

The sampling schedule was initially set as twice weekly during irrigation season, and every other week during non-irrigation season. That schedule was maintained from November 1995 through June 1996, when the irrigation season sampling was reduced to once per week. Sampling terminated at Sites 5 and 6 during non-irrigation season when water no longer ran through the sites. This usually occurred in early November, with sampling beginning in early April as flow increased.

There were occasions when mid-winter rain and snow events caused significant runoff, and additional samples were taken as possible. This usually did not include flow measurements because the velocities were well beyond available equipment. Water samples were collected as possible, and analyzed for total suspended sediment.

Figure 2.2 are photographs of some of the sampling sites, and the District's technician doing sampling.

2.3 Water Quality Data

Water quality data is listed in Appendix 1. The following discussion presents a summary of the method of analysis, and significant findings and trends. Water years for purposes of this project are considered November 1 through October 31, to coincide with irrigation patterns. Irrigation season runs from late March to late October; non-irrigation season is from November through March.

<u>Stream Flow</u>

Stream flow distributions for all sampling sites were reviewed by calculating the minimum, maximum and 10th, 25th, 50th, 75th and 90th percentiles, for each site. These were also broken down for each water year and by irrigation and non-irrigation seasons.

Two years of data is not sufficient to state how the calculated stream flows for these years compare to a 'normal' year. Figure 2.3 shows the stream flow distributions by site and year. Stream flow between the two years was not significantly different at any one site, with the exception of Site 5, where the median flow was 3.73 cfs in 1996 and 5.22 cfs in 1997.

Seasonal differences in stream flow are significant, because of the hydrologic pattern of the creek receiving irrigation flows during the summer months. Table 2.1 shows the median stream flow measurements for both 1996 and 1997 water years, and breakdowns for the irrigation and non-irrigation seasonal periods. Site 1, for example, had a median 1996 irrigation flow of 32.68, while its median non-irrigation flow for 1996 was 2.69 cfs.

Again, the differences between years for the same season, are not significant except at Site 5 (where the irrigation season values are the same as the yearly values since there is no flow during non-irrigation – this is true at Site 6 also.) There is no ready explanation for the increase flow at Site 5.

A few storm events were sampled at some locations. In early February 1996, a major rain-on-snow event caused significant mid-winter flows. Limited equipment and access prevented flow readings at all but Site 1, where the flow measured 22.80 cfs and 31.92 cfs on February 7th and 8th, respectively. This compares to readings of 1.72 cfs on Feb. 6 and 2.68 cfs on Feb. 12. The resulting sediment discharge for these storms is discussed below.

Instanteous Mean Stream Flow in cfs, per time period							
Sample Site	Total Flow		Irrigation		Non-Irrigation		
	1996	1997	1996	1997	1996	1997	
S1	28.11	29.18	32.68	34.75	2.69	3.98	
S2	9.99	10.54	11.99	11.22	2.97	4.56	
S3	6.14	5.90	7.58	6.49	1.07	1.33	
S4	5.13	5.90	5.59	6.91	0.41	1.01	
S5	3.73	5.22	3.73	5.22	0.00	0.00	
S6	1.74	1.83	1.74	1.83	0.00	0.00	

Table 2.1 Mean Stream Flow Distributions
Figure 2.3 Stream Flow Distributions for 1996 and 1997

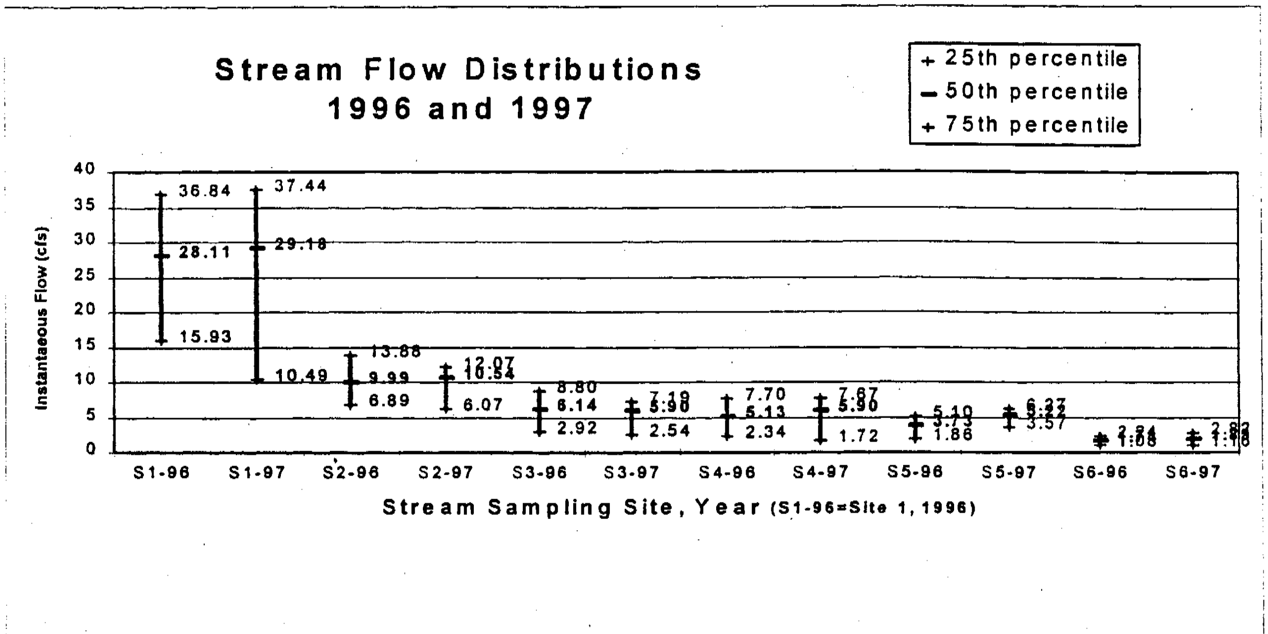
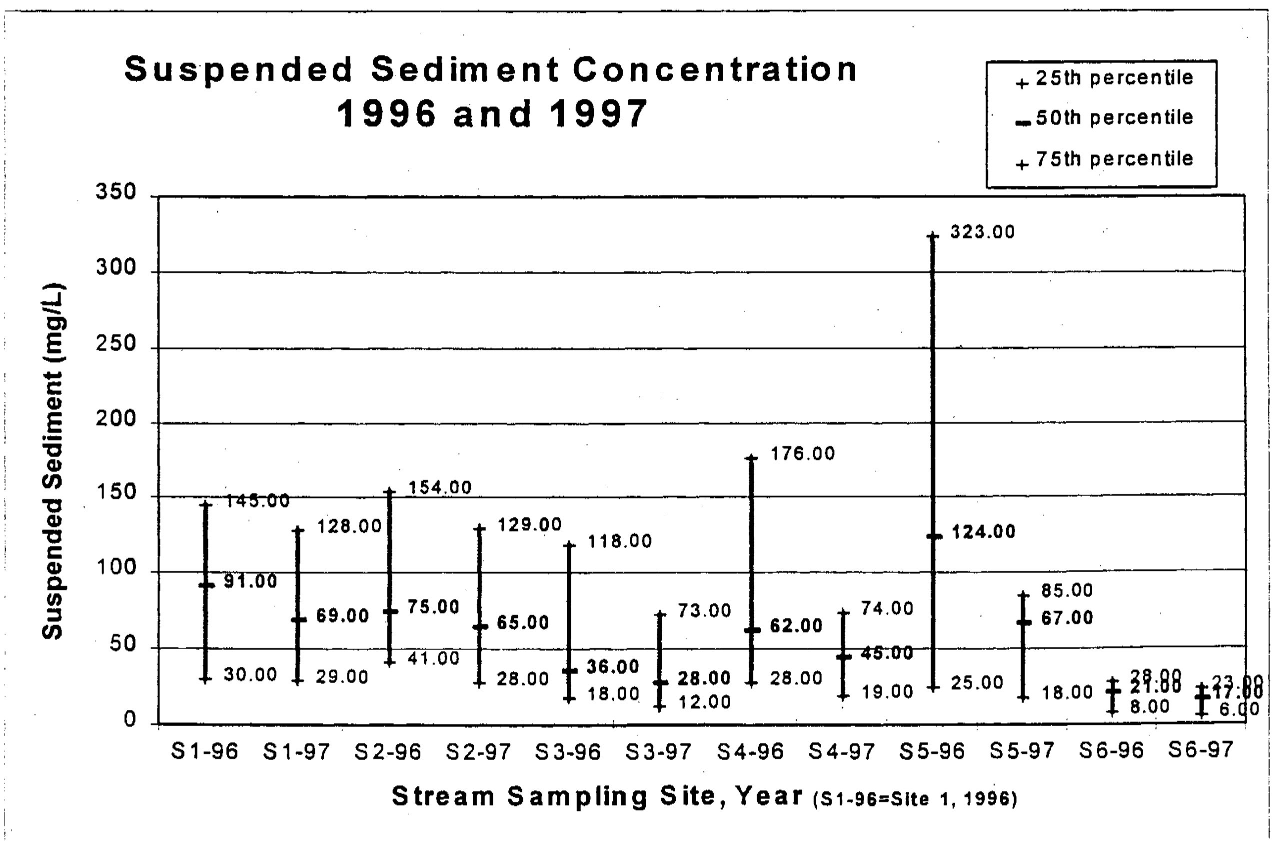


Figure 2.4 Suspended Sediment Concentrations, 1996 and 1997



Suspended Sediment

Measurements of suspended sediment are instantaneous readings of the current amount of non-settable solids traveling with the stream flow. In the relatively small flows of Spring Creek, which is receiving drainage from nearby cultivated fields, these amounts can change dramatically in short time periods, and it becomes important to look at both data trends and individual data points.

The same calculations of minimum, maximum and percentiles were made for suspended sediment measurements, including the yearly and seasonal breakdowns.

Figure 2.4 shows the Total Suspended Sediment Concentrations for 1996 and 1997. At all sampling sites, suspended sediment levels decreased between water years 1996 and 1997, at all percentiles. Site 5 showed a significant decrease in suspended sediment, with its median value decreasing from 124 mg/l to 67 mg/l. District personnel frequently observed the creek's surroundings when taking samples, to assist interpretation of these changes. There are several hop fields above Site 5 that were furrow irrigated in 1996 and converted to drip irrigation prior to the 1997 irrigation season. Since there are no flows during non-irrigation season at Sites 5 and 6, these in-field changes are very likely contributing to the decrease in sediment.

In addition to changes made above Site 5, there were many other fields within the drainage that had on-farm improvements to irrigation systems (discussed in Section 3.2). Although two years' data is not enough to speak to long-term trends, it is anticipated the continual on-farm changes will result in steady decreases in sediment concentration levels.

Figure 2.5 shows the median suspended sediment values during irrigation and non-irrigation seasons for 1996 and 1997. This shows the significant difference in sediment concentrations between irrigation and non-irrigation periods. The chart also reflects the overall changes between 1996 and 1997, showing a decrease in concentrations during both seasons from one year to the next. The decrease is more pronounced during the irrigation season, but the decrease during non-irrigation season might reflect a decrease in the amount of sediment in the water column available for suspension.

Sediment Discharge

Sediment discharge was calculated by multiplying the mean flow by the mean instantaneous suspended sediment concentration, for a given time period (hours), by the time period. Since samples were taken every two weeks during non-irrigation season, the time periods are somewhat long, but changes during this period was, in most cases, minimal. Weekly sampling during irrigation season may also not be short enough to catch all changes, but the data should be viewed as indications of stream conditions during various periods only. Sediment discharge values are in tons per time period.

Table 2.2 and Figure 2.6 show sediment discharge for each sampling site, computed for several time periods: total discharge for each of 1996 and 1997 water years; total during irrigation seasons of 1996 and 1997; and total during non-irrigation seasons for the two years.

Figure 2.5 Median Suspended Sediment Concentrations, Irrigation and Non-Irrigation Seasons

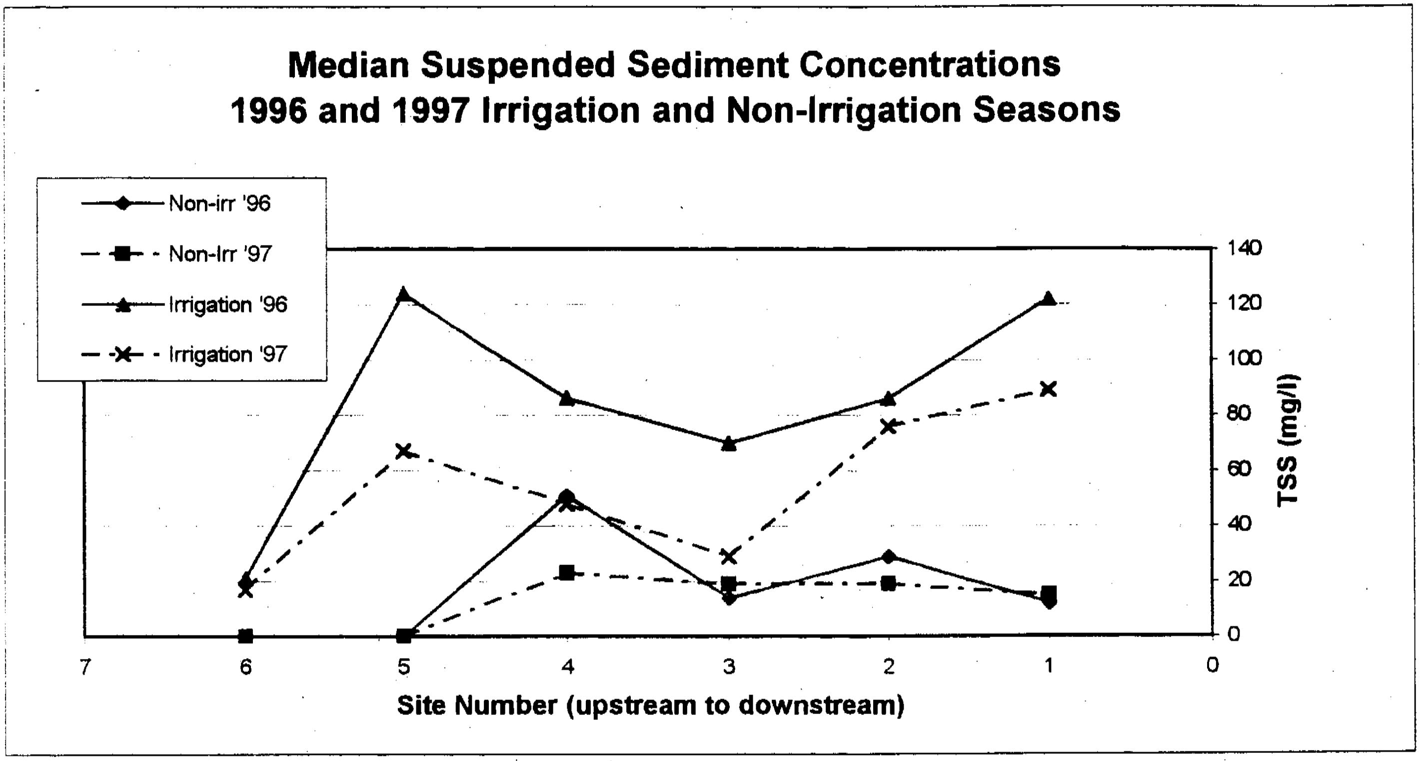


Table 2.2 Sediment Discharge by Sample Site and Time Period

Sample Site	Total 1996	Total 1997	Irrigation 1996	Irrigation 1997	Non-Irrigation 1996	Non-Irrigation 1997
S1	2589.22	2159.16	2377.33	1931.76	211.89	227.40
S2	1007.52	914.48	936.35	757.99	71.17	156.48
S3	301.48	210.30	295.61	186.49	5.86	23.81
S4	343.81	230.34	316.58	213.88	27.23	16.46
S5	438.68	218.29	438.68	218.29	0.00	0.00
S6	26.60	38.73	26.60	38.73	0.00	0.00

(Discharge values in tons per time period)

A decrease in discharge was measured at each site between 1996 and 1997, except at Site 6, where there was an increase in total discharge from 26.60 tons/year to 38.73 tons/year. The difference is primarily due to a significantly larger suspended sediment concentration measured at the start of the 1997 irrigation season. Measurements of 375 mg/l and 107 mg/l were measured on April 3 and 10, respectively (the first two measurements at this site after the irrigation water was turned on). Measurements at the same time the previous year were 6 and 3 mg/l.

The suspended sediment levels at Site 5 were also higher on these two sampling events in 1997 than in 1996, although not to the extent as at Site 6, and the yearly total for Site 5 was considerably less at other times of the year.

These measurements are likely due to Roza Irrigation District discharging directly to the creek just above Site 6. The canals at the beginning of the season carry a significant amount of sediment that has been stored through the winter. Until the desired capacity and sealing of canal walls have been achieved, these early flows are inordinately swift and, therefore, turbid. The stored sediment accumulation, in addition to any soil loosened during the annual routine canal maintenance, causes elevated levels of suspended solids and turbidity. Additionally, it is not unusual for growers to discharge water from on-farm water storage facilities in the spring, thereby contributing even more sediment to these early canal flows.

Table 2.2 shows an increase in the sediment discharge between 1996 and 1997 during the non-irrigation season at Sites 1-3. Site 4 shows a decrease for this period. Most of the non-irrigation season discharge is due to storm events and the difference between the years is likely more a function of data taken during storm events (see next section), than major changes in the water resource. Stream flow measurements were not taken at Sites 2-4 during the storm event of 1996, nor during the storm event in late January 1997. However, measurements were taken during a smaller event on January 2 1997, and were used in calculating stream discharge.

Storm Events

There were several storm events that occurred during the thirty months of this project. Storm events occur in this watershed when heavy winter rains fall with warm conditions, when there has been some snow at the higher elevations. Although Spring Creek runs dry most of the year above Site 4, a rain-on-snow event can cause significant flows for short periods, several miles above Snipes Road (Site 6).

A major event occurred February 6, 7 and 8, 1996. District personnel drove four miles north of Site 6 and measured the flow in Spring Creek using sixteen measurement stations across 17.5 feet. Water depths at this point reached a maximum of 1.3 feet. Total flow was 30.82 cfs.

Water samples were collected at the regular sampling sites on February 7 and 8, and at an additional site approximately 300 feet downstream of Site 6, due to access problems at Site 6 on February 7. Flow levels made it difficult to take accurate flow measurements at most sites during the event, but flow was measured at Site 1, which was 22.8 and 31.9 cfs on February 7 and 8 respectively. For comparison, flow measurements were 1.72 cfs on February 6 and 2.68 cfs on February 12 at Site 1.

Suspended sediment levels at these sites ranged from 334 mg/l at Site 3 on February 7, to 2584 mg/l at Site 4 on February 8. Suspended sediment levels were significantly greater at most sites the second day of the event, due to the amount of soil stirred and carried with the flows. Table 2.3 shows the data collected during this event.

Two events occurred in late January and early February 1997. Flow readings were not possible, and event collecting water samples was difficult during the February event. Water samples collected at Sites 2 and 6 on January 31, 1997, produced suspended sediment levels of 9,144 and 12,656 mg/l, respectively, while a sample collected at Site 5 on February 12, 1997, had a suspended sediment reading of 24,908.

The creek was well over its banks throughout the length of the stream during the February 1997 event. Again, the events are quite short, and by February 13 (the next day), there was no water at Site 5 to take a sample of, and the suspended sediment reading for Site 4 was down to 51 mg/l.

The sediment flowing with the creek during a storm event is generated from several sources, including surface runoff from dryland areas well upstream of irrigated fields, and re-suspension of soils that have settled in the stream. Velocities are much greater during a storm event, which stirs up much of the particles that have previously settled in the stream.

Table 2.3 Data Collected During Storm Events

	Flow (cfs)		TSS (mg/l)		Turbidity (ntu)	
Site	2/7/96	2/8/96	2/7/96	2/8/96	2/7/98	2/8/98
10a	30.82	NA	1656	NA	632	NA
S7	NA	NA	1556	2772	772	2952
S6	NA	NA	NA	2284	NA	2381
S5	NA	NA	420	2552	406	2237
S4	NA	NA	736	562	428	2584
S3	NA	NA	592	1132	334	1924
S2	NA	NA	978	1112	431	1839
S1	22.8	31.92	770	1372	348	1910

3. AGRICULTURE MAPPING

3.1 Methods

The District began mapping efforts in spring, 1996. A Trimble Global Positioning System (GPS) unit ProXRS was used to map individual farm fields by driving or walking around each field with the unit on. This surveying via satellite worked well in terms of accurately getting locational information on all fields, although it was fairly time-consuming. A database in the unit was also used to create a record of crop type, irrigation method, the use of a cover crop, and the slope for each field.

Data from the GPS unit was downloaded into the District's Geographic Information System (GIS), ArcInfo and ArcView. These programs allow the information to be edited, viewed by selection of information, and printed. This system was then used to print maps of cropping, irrigation, and other patterns.

Hydrologic, transportation and point data was also entered into this program. The hydrologic data came from the US Geological Survey's digital Land Use and Land Cover at the 1:100,000 scale. Major roads were mapped with the GPS unit for the same area as the fields. Point data included the sampling sites, major intersections, and major irrigation discharge points to Spring Creek.

Mapping was done primarily during the winter months, due to availability of the equipment and personnel. Approximately 4500 acres were mapped prior to irrigation season 1996, and an additional 6550 acres were mapped prior to irrigation season 1997. In 1998 the District received orthophotos of the North Prosser area, from which fields were directly drawn. Field checks identified crop type, irrigation and other information for the newly mapped acres. An additional 9,400 acres were mapped this way prior to the 1998 irrigation season.

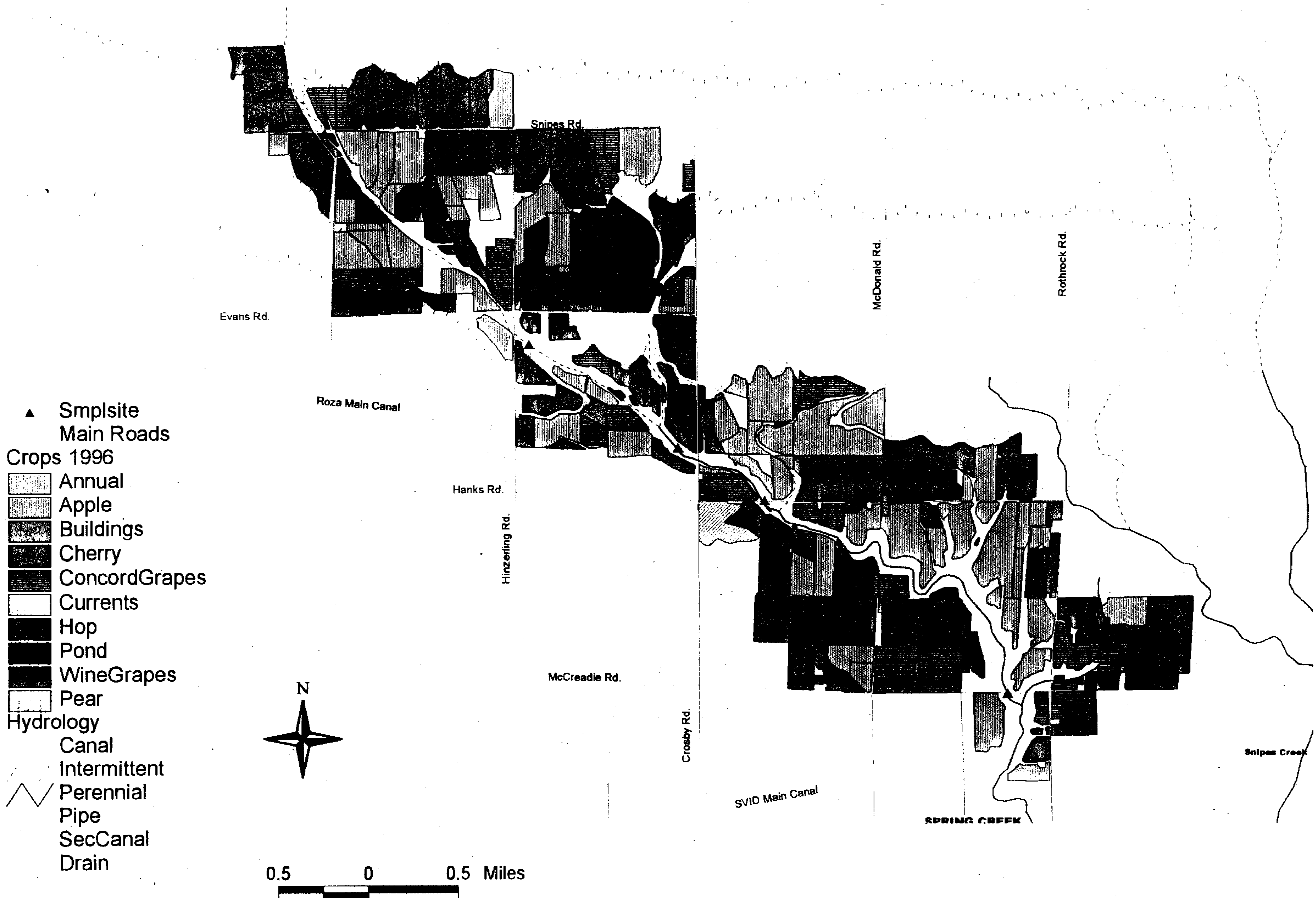
3.2 Yearly Results / Changes

Crops and Irrigation Methods

The maps on Figures 3.1through 3.6 show the crop and irrigation maps produced over the course of the project. Table 3.1 gives a breakdown of the acres for these maps by specific crop and irrigation method. The maps visually show the changes on a particular field from on year to another, but it is difficult to pull changes out of the acreage numbers since new fields were added each year. To provide additional information, percentages of total acres mapped to date were calculated for specific crop and irrigation method.

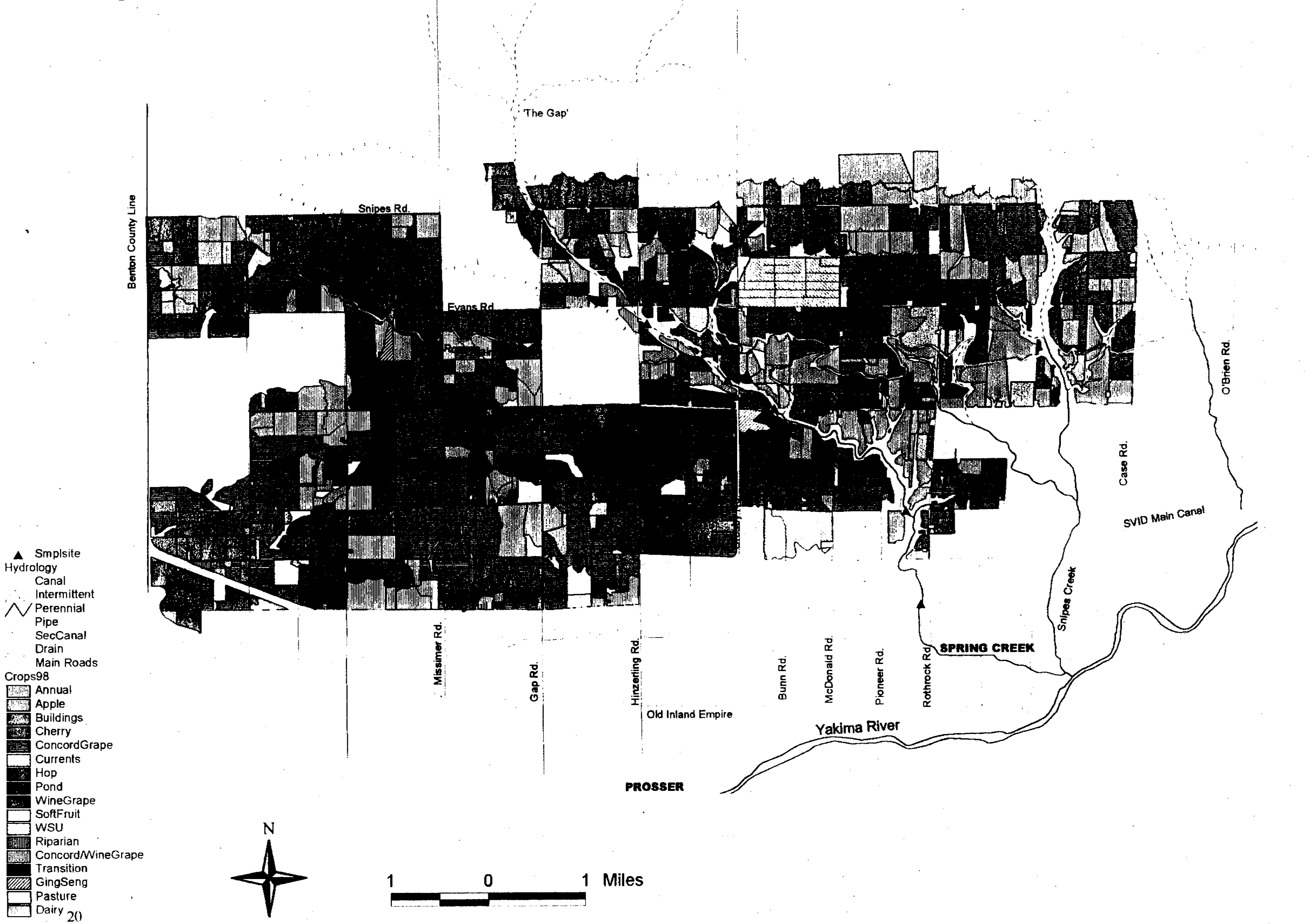
As expected in an area of dense permanent crops, there was not a significant change in cropping patterns from one year to the next. However, irrigation methods did change between 1996 and 1997, and between 1997 and 1998. Of the 4500 acres mapped in 1996, approximately 120 acres were converted from sprinkler to drip irrigation, 47 acres were converted from rill to sprinklers, and 90 acres were converted from rill to drip systems, prior to the 1997 irrigation season. An additional 123 acres that were mapped during the winter of 1996-97, were converted from rill to either drip or sprinkler systems between the time they were mapped and prior to the 1997 irrigation season.

Figure 3.1 Spring Creek Crop Types, 1996 Survey



F ıre 3.2 Spring Creek Crop Types, 1997 Surve

Figure 3.3 Spring Creek Crop Types, 1998 Survey



F[illegible]re 3.4 Spring Creek Irrigation Methods, 1996 [illegible]rvey

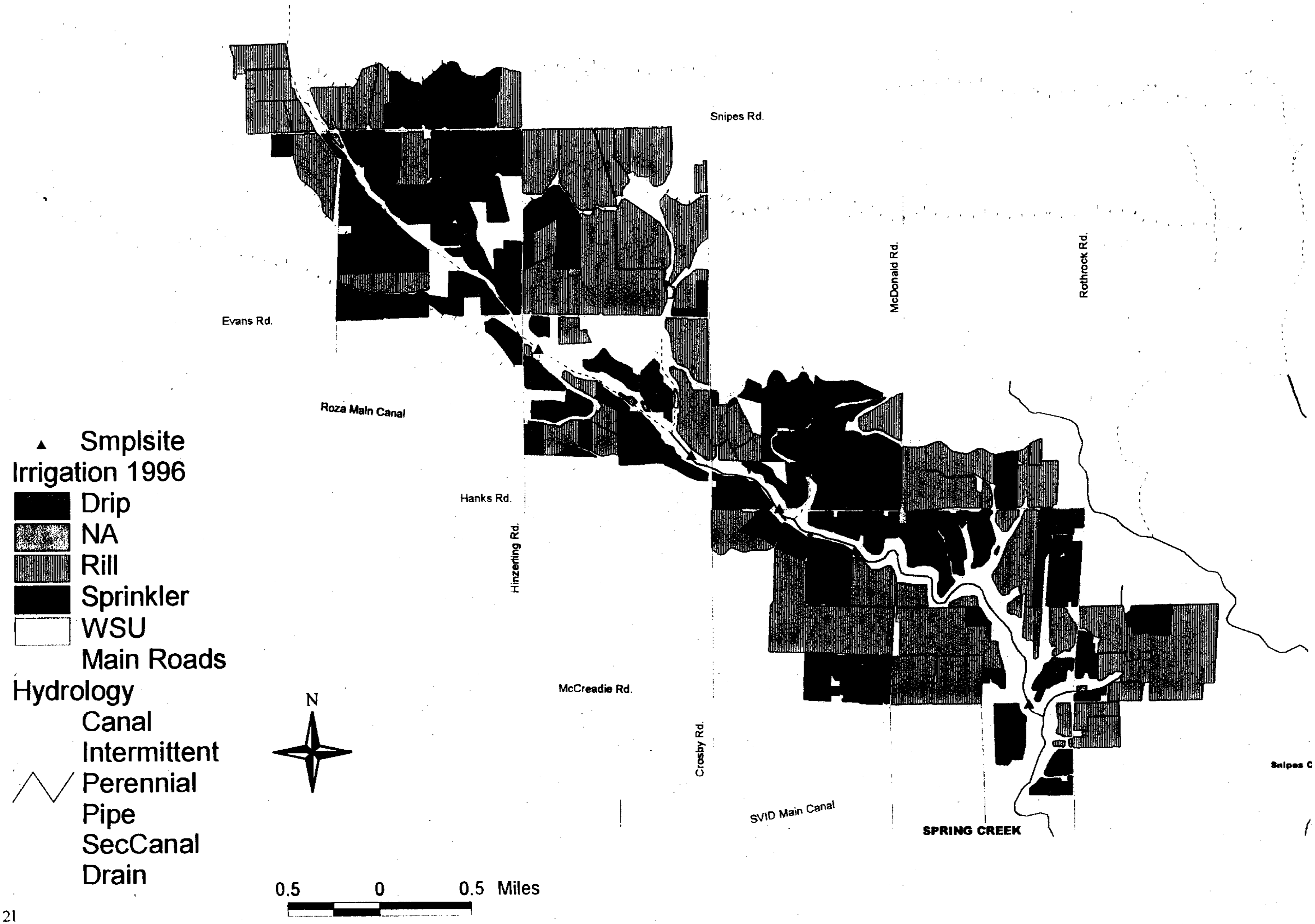


Figure 3.5 Spring Creek Irrigation Methods, 1997 Survey

Figure 3.6 Spring Creek Irrigation Methods, 1998 Survey

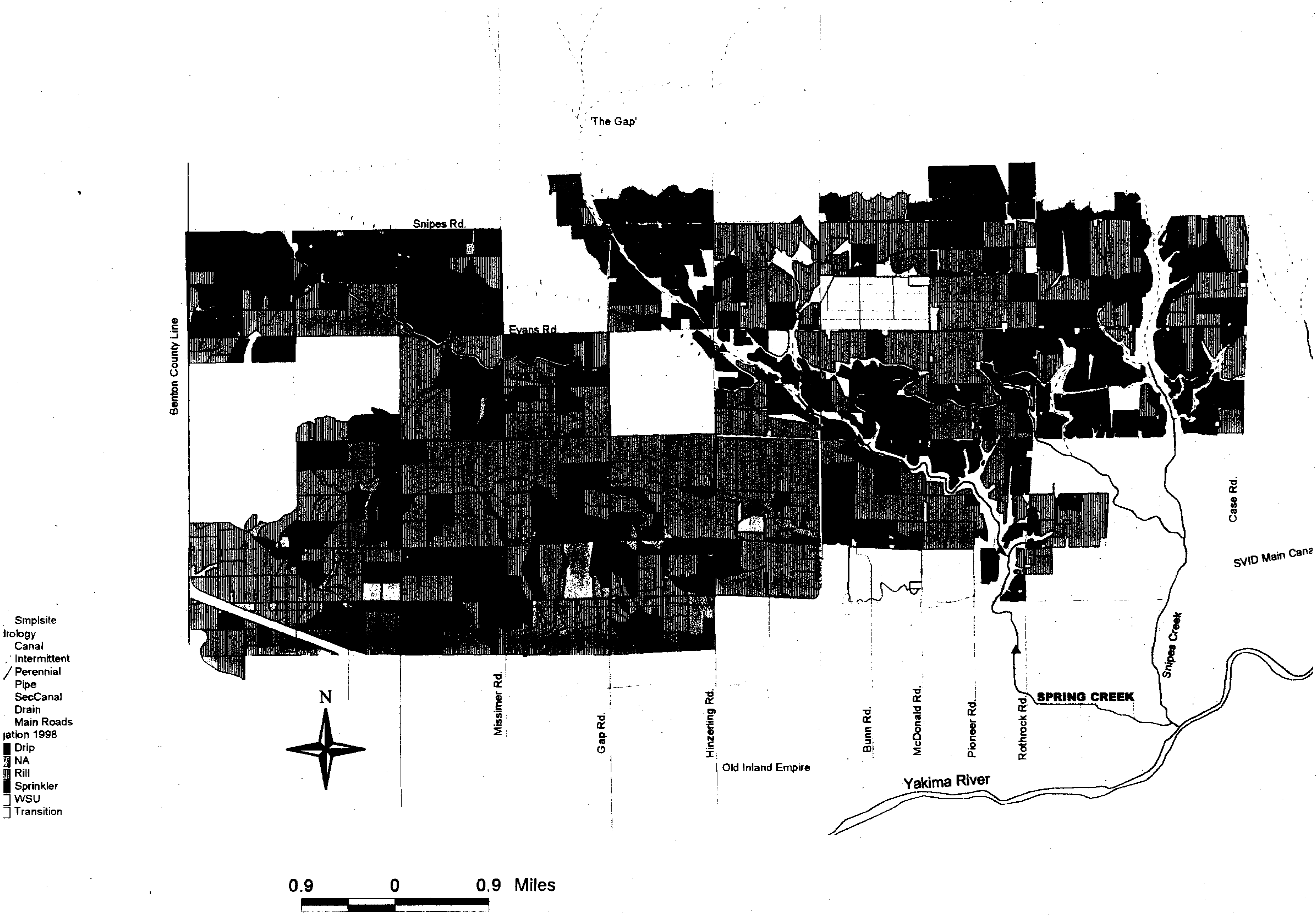


Table 3.1 Summary of GIS Map Survey Information Collected for Crop and Irrigation System

YEAR	April, 1996		April, 1997		April, 1998	
Acres Mapped To Date	**4491.65**	**% of Total**	**11044.54**	**% of Total**	**20462.39**	**% of Total**
By Crop:						
Annual	172.10	3.83	665.04	6.02	1060.76	5.18
Apple	1224.62	27.26	3232.05	29.26	4488.97	21.94
Cherry	149.53	3.33	259.62	2.35	523.50	2.56
ConcordGrape	598.48	13.32	1700.71	15.40	3908.25	19.10
Currents	43.64	0.97	43.64	0.40	43.64	0.21
Hop	1115.18	24.83	2288.97	20.72	4446.08	21.73
WineGrape	1162.39	25.88	1879.46	17.02	3950.15	19.30
OtherFruit	0.00	0.00	250.65	2.27	673.80	3.29
Misc. (Pond, WSU, Bldg)	25.72	0.57	724.42	6.56	1367.24	6.68
By Irrigation:						
Rill	2427.73	54.05	4486.53	40.62	8788.93	47.25
Sprinkler	1890.77	42.10	4739.37	42.91	7404.52	39.81
Drip	147.42	3.28	1094.24	9.91	2406.18	12.94

The calculated percentages reflect these irrigation changes as the percent of rill-irrigated acres decreasing from 54 to 40 and the percent of drip-irrigated acres increasing from 3% to nearly 10% of mapped acres.

Irrigation changes continued to occur between 1997 and 1998. Of the fields in the 1997 maps, 238 acres were converted from rill to either sprinkler or drip, and 207 acres were converted from sprinkler to drip. Table 3.1 shows rill irrigation increasing as a percent of total between 1997 and 1998, but that is due more to the type of acres added to the map data than to on-the-ground changes. The percent of drip irrigated acres continued to show a steady increase, which is substantiated by field work showing an increase in the number of growers installing drip systems.

The cover crop information was not available for the 1998 survey at the time the report was written. The District is continuing to update the map database.

Cover Crops and Slope

Crop, irrigation method, personal preference and other factors determine the use of a cover crop by a particular grower. Figure 3.7 is a map of the cover crops identified when each field was mapped (cover crops changes were not updated through the course of the project). The final percentage of the use of cover crops is shown in Table 3.2.

Slope was noted for each field during field surveys, although it was difficult to assign a single slope value to many of them. Fields at the edge of canyons can be quite steep over a large portion of the field. Slope was generalized over an entire field as one of the following:

- <1 percent
- 1-2 percent
- 2-3 percent
- 3-4 percent; or
- >4 percent.

Figure 3.8 shows a map of the slopes identified for each field. In general the steeper fields follow the line of the canyons, while fields with shallower slopes are either up on the flats between Spring and Snipes Creeks.

Table 3.2 Summary of GIS Map Survey Information Collected for Cover Crops

YEAR	**April, 1996**		**April, 1997**		**April, 1998**	
Acres Mapped To Date	**4491.65**	**% of Total**	**11044.54**	**% of Total**	**20462.39**	**% of Total**
By Cover Crop:						
None	1162.39	25.88	2888.10	26.15	Not Available	
Permanent	1248.02	27.79	3413.49	30.91		
Seasonal	2055.52	45.76	3469.14	31.41		
NA			549.40	4.97		

Figure 3.7 Spring Creek Cover Crops, 1998 Survey

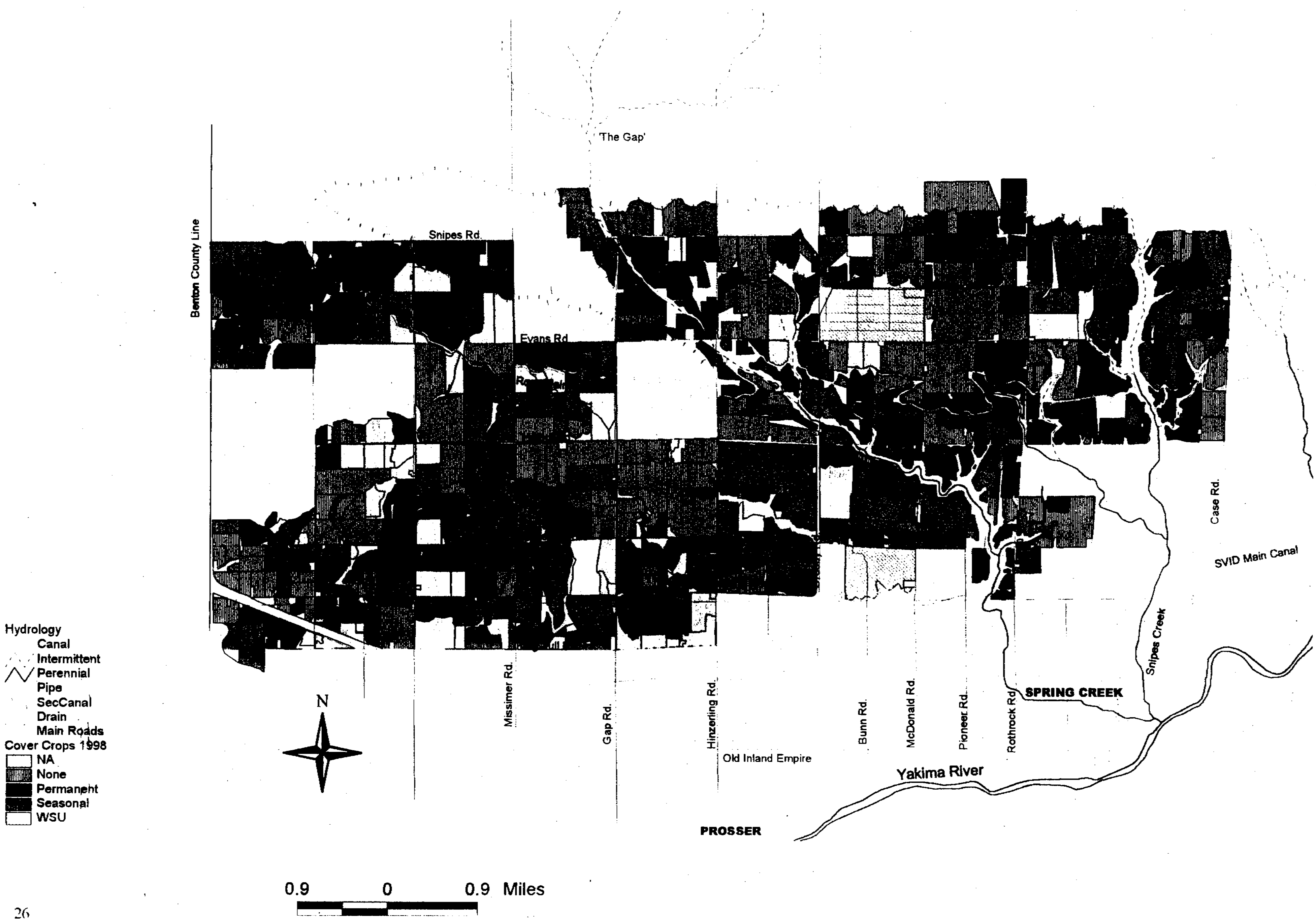
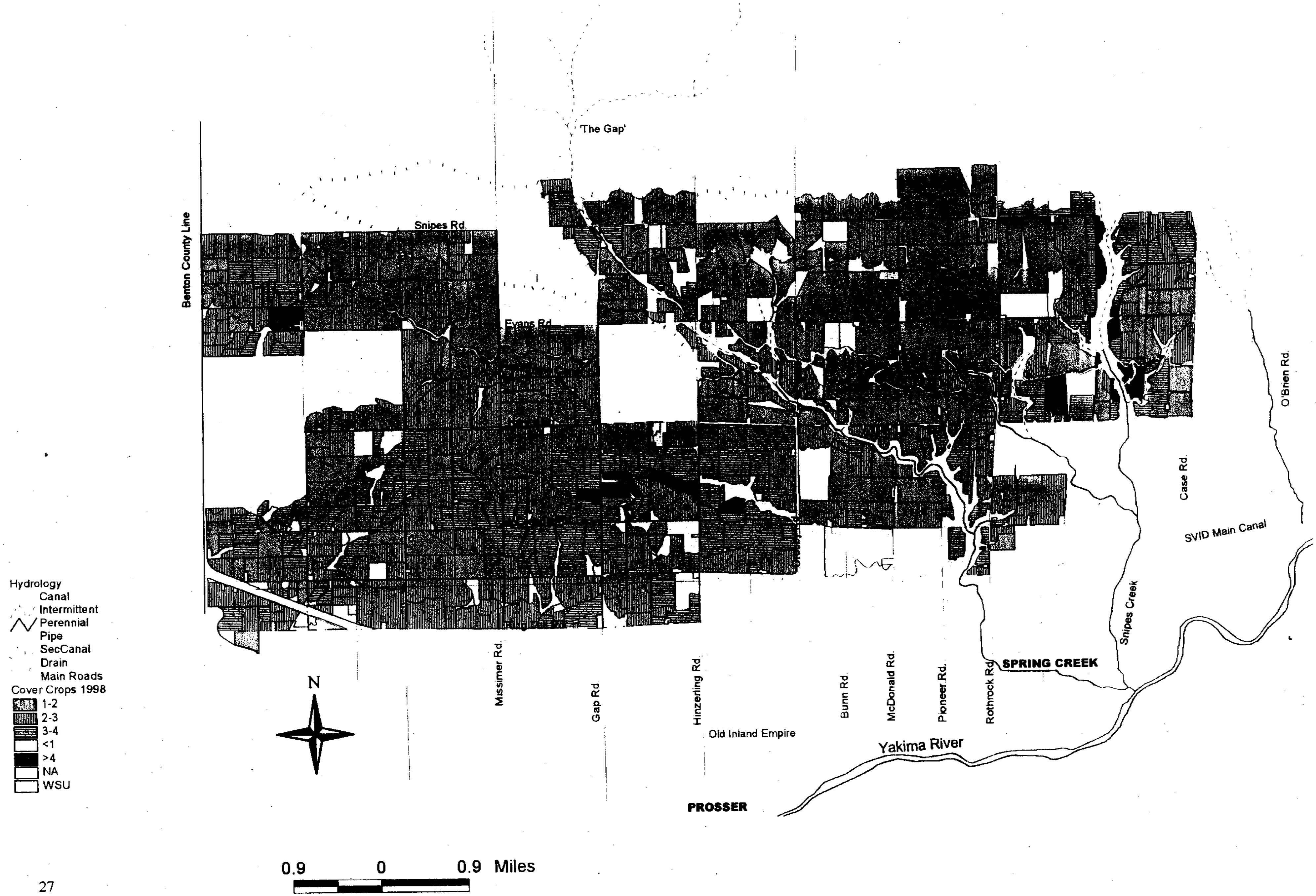


Figure 3.8 Spring Creek Slope, 1998 Survey



4. STREAM RESTORATION

As part of this project, a one-half mile section of the canyon along Spring Creek (approximately 5 acres), was improved from a grazing area to a grass/brush covered area. The section had been heavily grazed for several years, and the landowner was interested in improving the condition of the stream riparian area. The District was interested in this both for the riparian improvements, and to determine water quality benefits from this type of improvement.

In the spring of 1996 a fence was erected at approximately 30 feet on either side of the creek for the entire half-mile section. The fence was designed to allow the landowner to continue grazing a reduced number of cows, so stream crossings were built at two locations, providing access to either north or south portions of the canyon along the stream.

The 'New Zealand' style fence was constructed of three strand wire, fiberglass poles, and wooden posts every 100 feet. The first and third wires of the fence were electrified from a source initially at the southeast corner of the property. The fence was later proven not to be 'hot' enough, and an additional source of electricity was added at the northwest corner the following summer.

Local boy scouts and a high school activity group were recruited to plant trees along the stream bank inside the fenced area in early April, 1996. Two hundred willows and red osier dogwood were planted in approximately three hours, followed by a picnic provided by the landowner. The trees were purchased seedlings approximately two-to-three feet long, and planted along the creek edge.

During the months following the fence construction, the vegetation along the stream bank increased dramatically. The loss rate for the planted trees was fairly low, approximately 10 percent did not take root. This may have been due to being planted too far from the stream bank. At the time of planting, the irrigation water had not yet been turned on so the creek was running quite low and it was difficult to judge how high the water was going to flow.

There were several problems with the fence in the months following its construction, including the low electricity mentioned above. The landowner had greater difficulty than expected reducing the number of cattle grazing on the 30 acres, and new calves remained in the section as well. The calves quickly learned they could get under the lowest wire of the fence and there were enough adults to cause additional damage after the fence had been weakened. Because the grass was growing so well, the field along the edges of the fence had to be cleaned with a mechanical weed cutter and sprayed with herbicide on a regular basis.

These problems were addressed as possible between District personnel and the landowner. By late fall 1996, an additional electricity source, regular maintenance and periodic checks were keeping problems to a minimum. The number of cattle was finally reduced in late fall, from over 35 head to about 10. This number has been maintained and has greatly improved the fence maintenance.

In the winter of 1996-97 flooding occurred during the storm events discussed in section 2.3. This caused some damage to the planted dogwood and willow, but had little effect on the grass and stream banks. The floods were high and fast for very short periods, and most plants recovered within a short period. The fence was under water to the second wire at some places during the flooding, and a few repairs were necessary, but it was generally undamaged.

The vegetation grew very well during the summer of 1997. In many places it became difficult to know where the stream bank was, even when running full. The planted willows and dogwood have firmly established themselves, and native grasses and native willows have also become prominent.

The District maintained a sampling location on the restoration piece at Site 4 (approximately 800 feet upstream of Crosby Road), from the start of the project through the end of October 1997. The next sampling site downstream (Site 3), was at the intersection with Hanks Road, approximately 2700 feet downstream of the fence project. Monitoring at Site 3 began in November 1995, and is continuing as part of additional District projects.

The stream flow and suspended sediment data for Sites 3 and 4 do not differ significantly from the changes identified at the other sites between sampling years or seasons. The flows increased or slightly decreased at both sites during irrigation and non-irrigation seasons, which is true for the other four sampling sites. The mean suspended sediment concentration at both sites also decreased, as it did at the other sites.

The major difference in water quality findings in the vicinity of the stream restoration site was a decrease in the sediment discharge during the non-irrigation season at Site 4 between 1996 and 1997 sampling years. The other three sites that have year round flow showed increases in sediment discharge between those periods (Table 2.2).

This difference may be due to recordings of suspended sediment measured on February 6 and February 12, 1996. These samplings occurred just before and shortly after a storm event, but Site 4 had considerably higher suspended sediment values on these days than any of the other flowing sites (Sites 1-3). This was prior to the fence construction, and may have been due to an unused irrigation pond, which was filling and draining at the time.

5. EDUCATIONAL EFFORTS

5.1 Annual Irrigated Agriculture Tour

The District held the first of what has become an annual event in September 1996. The Irrigated Ag Tour takes non-farm community members on a bus tour to various farms in the North Prosser area. The first year there were five stops: an apple orchard, a hop field, a Roza Irrigation District Re-regulating reservoir, the stream restoration site described above, and a PAM demonstration field near WSU-Prosser.

At each stop speakers discussed methods of growing the crops, how irrigation water is used, the problems associated with irrigated agriculture and how growers are working to reduce their impacts on water and soil resources. For example, Mike O'Brien of C&M Orchards discussed their application of pest management techniques in an orchard certified as 'organic'. The installation and use of drip irrigation in a hop field was another discussion stop. A highlight of the trip in September 1997 was a tour of a hop processing plant.

The tour has been received very well the two years it has been running, with excellent feedback and comments from those participating. There were over 20 participants the first year, and about 30 the second year. The District is planning to continue this tour, expanding the scope to include stops at locations beyond the north Prosser area.

5.2 Student Information and Education

One of the objectives of this project was to get students involved in water quality issues in the Spring Creek and/or Yakima River watersheds. The District was successful in getting over 30 students to participate in the tree planting held at the stream restoration site, but has been unsuccessful in other attempts to generate student involvement.

One of the problems encountered is the logistics of taking students out of school for over an hour at a time and transporting them to a stream site. Once the students are gone for over a single class period, additional teachers, substitute teachers and other students become affected. Attempting to arrange a single event may be possible, but arranging for a series of visits to a stream to examine water quality became much more of a challenge with local schools.

The District made several contacts with local teachers and had some participation on the ag tour, but did not organize any specific events (other than the tree planting), specifically for student groups. The District has hired a person under a new grant who has the responsibility of working local schools to establish some educational events for students that discuss water quality issues.

5.3 Grower Contacts and Presentations

One of the more valuable educational results of this project was the regular contact the District had with local growers as a consequence of being out in the field regularly doing water quality sampling and field mapping. This one-on-one contact provided numerous opportunities to discuss both the method and findings of the project, and to talk about methods the grower could apply to reduce their impacts. In some cases, it provided the best opportunity to educate a grower specifically on how his practices were impacting the creek.

There were also several presentations made to grower groups during the course of the project, primarily at the annual meeting the District holds each year. Much of the information was still being gathered, but growers were interested in seeing the mapping and noting that even as we attempted to identify changes in crops or irrigation methods, there is a constant transition and the information will continually need to be updated.

Additional presentations and discussions were made about the project at the annual ag tour, to smaller grower groups as part of other meetings, and to various resource agency groups during the course of the project.

6. FURTHER STUDY

The District has received two additional grants from the Washington Department of Ecology to continue and advance the work done on this Spring Creek Project. The first was designed to examine more closely the practice of irrigation scheduling and to educate growers on the use of this project. As part of that grant, several workshops were held for both growers and resource agency personnel on irrigation efficiency, scheduling and uniformity.

The second grant provides support to put technical assistance personnel in the field to educate and assist growers with irrigation management, installation of new systems, and the use of soil moisture monitoring equipment. The technical assistance also supports a grant from the Washington Conservation Commission that provided cost-share funding for growers installing improved irrigation systems.

Each of these two grants has water quality monitoring and educational activities as part of their objectives. This has enabled the District to continue doing water quality sampling at the sites established with the first Spring Creek project. This will provide a valuable source of continual information on the water quality conditions of Spring and Snipes Creek (where sampling has been expanded to), and the impacts of agriculture activities on these creeks.

The additional grants have also allowed the District to continue updating its agriculture mapping information and to identify changes. These maps will again assist in determining how educational and study efforts are being put into place to improve the use of the resources.

The District has a proposal out to WDOE to demonstrate the use of a management method, which incorporates differences in soil types and depths into the design of an irrigation system. The objective is to design an irrigation system that provides management zones based on the expected water requirements of the soil. For a high-value crop such as wine grapes, this method can allow the grower to reduce his inputs of water and fertilizer, while improving the quality of the crop. The District will be able to use its GPS/GIS equipment and software to work with a grower to help them identify these management zones.

Potential future grant requests will be for continued technical assistance for on-farm improvements, continued water quality monitoring, and an increase in educational efforts, both for high school and grade school students and for farm and non-farm community members.

APPENDIX 6

Conservation Review

A quarterly publication of the Benton Conservation District and Conservation Association

April, 1997

1997 EQIP Program - Deadline Announced for Cost-Share Dollars

The United States Department of Agriculture has announced that they are now accepting applications for the new Environmental Quality Incentives Program (EQIP). Sign up is taking place at the local Natural Resource Conservation Service office (NRCS). The deadline for applications is May 20th.

EQIP was established in the 1996 Farm Bill to provide a single, voluntary conservation program for farmers and ranchers to address significant natural resources needs and objectives. It combines the former Water Quality Incentives Program and the Agricultural Incentives Program.

Under the rules of EQIP, the maximum amount of cost-share dollars an individual producer can receive will not exceed $10,000 per year, and/or $50,000 for the duration of the five-to-ten year contract. All EQIP activities must be carried out according to a conservation plan in a five to ten year contract. Each farm plan will be put through a ranking process with other applications. Projects with the highest environmental benefits will have the best chance for funding.

Cost-sharing pays a percentage of certain conservation practices, such as sprinkler systems, manure management facilities, drip systems and other practices important to improving and maintaining the health of natural resources in this area.

Incentive payments may also be paid to encourage a producer to perform land management practices such as irrigation water management, nutrient management, manure management, integrated pest management and wildlife habitat management.

The NRCS has leadership for EQIP, with support from the Farm Service Agency (FSA) and the Conservation District.

For more information contact your local NRCS office. In Prosser the number is 786-1923. Other numbers: Zillah (829-3003), Yakima (454-5736), or Sunnyside (837-7911).

Scott Manley can be seen sampling Spring Creek regularly this summer.

District Begins Another Sampling Season

The District's water quality monitoring program is back into irrigation-season schedule. Scott will be sampling six sites along Spring Creek on a weekly basis for suspended sediment, turbidity, temperature and pH.

The District is in the second year of sampling at these locations so the data collected this summer will be compared with last year's numbers. We hope to see a change in sediment levels at some of the sites due to improvements being made on irrigation systems throughout the watershed. Several hop fields have been converted from rill to drip irrigation, so soil loss and resulting sediment inputs should be less than previous levels.

Scott will also be sampling soil loss on several fields as irrigation begins this spring, and occasionally throughout the summer. This information is useful to help growers understand how much soil is lost under various irrigation conditions and methods.

For more information about the District's sampling program, stop and ask Scott is you see him out in the field, or call Pat at 786-9230.

District Programs and Activities

Irrigation Management Workshops a Success

Two workshops in irrigation management, scheduling and evaluation were attended by over 45 participants in late February. Peter Canessa, an irrigation specialist from California led the workshops.

The first day was directed to irrigation consultants and discussion focused on system evaluations and design. Participants on the second day were growers and irrigators, and questions and discussion centered on drip irrigation use, applicability and design.

In addition to hopefully passing on lots of useful information, the workshops identified the need for additional information exchanges on irrigation system management. Pat Daly, District Manager is currently seeking funds to start a program of assisting growers with irrigation evaluations, perhaps through cost-share with consulting services.

Additional workshops on this and other topics are planned for next winter, perhaps beginning in fall of 1997, after field work has slowed. Watch the newsletter for more information as these workshops are organized.

Scholarships Available for Inland Empire Youth Camp - Deadline May 2

The District will once again be offering scholarships to youths ages 13 to 16 to attend the Inland Empire Natural Resources Youth Camp. This year's camp will be held June 15-21 on the east shore of Lake Coeur d'Alane. The camp is a fun-packed week for youths to participate in natural resource programs such as wildlife, soil and water quality.

The cost for the week is $190.00, with a limited number of scholarships available from the District for $150.00 of this expense. Applications for the camp and financial assistance can be picked up at the Natural Resources Conservation District office at 618 8th Street in Prosser, at the District office WSU-Prosser, or by calling 786-9230.

Frank Berg Joins District Board

The District welcomed Frank Berg to its Board of Supervisors at the Annual Meeting in February. Frank has been farming in the Horse Heaven Hills for 30 years, primarily in dryland wheat. Recently he has been converting a portion of his acreage to circle irrigation and will be growing potatoes and other crops in addition to continued what production.

Frank has already been helpful in working on a proposal for a project in the Glade Creek drainage, and we hope having Frank's input will increase the District's ability to assist growers in a wider portion of the county.

Farm Equipment For Sale/Rent

For Rent: Hesston Round Bale processor, for straw mulching areas prone to soil erosion. Processor is equipped with speed kit and PTO drive. Rental fee is $50./day. The District can help find straw. Contact Pat at 786-9230 or Scott at 786-9216 for information.

For Sale: Deutz four-cylinder, turbocharged, air-cooled diesel engine. Rated at 106HP at 2500 RPM. Includes instrument panel with safety shutdowns and 20 gallon fuel tank. Contact Scott at 786-9216.

Farm Classifieds....

The District is now accepting farm-related classified and display advertising for the Review. For rates and information, contact the District.

For Sale: Hobson two-row furrow mulcher for vineyard. $2500. Call 973-2009.

TMDL Update

by Chris Coffin, WA Department of Ecology

The Department of Ecology is continuing work on the suspended sediment TMDL for the lower Yakima River. "TMDL" stands for "Total Maximum Daily Load", which is an estimate of the amount of a specific pollutant that a waterbody can 'safely' take up without threatening the beneficial uses of the waterbody. This TMDL targets turbidity and DDT. Both turbidity and DDT can be associated with fine soil particles washed from agricultural fields in tailwater runoff and carried to the river in irrigation return drains. Although DDT was banned for use in 1972, its degradation in soil is slow and residual deposits can remain attached to soil particles for many years. Nutrients, fecal bacteria and other pesticides can also be transported by tailwater runoff. These pollutants are also found in the lower Yakima River at levels above state standards.

Ecology will soon be releasing its Draft-Suspended Sediment and DDT Total maximum Daily Load Evaluation Report for the Yakima River. This report is the result of two years of extensive monitoring, flow modeling and historical data review by Ecology. The findings in this document will be used to set enforceable limits on the amount of suspended sediment that can be discharged from irrigation return drains to the Yakima River. The draft report will be available for public review and comment prior to its final submission to USEPA.

The limits that this TMDL will set on suspended sediment may effect irrigation practices and water and crop management for some growers. Ecology is working with federal, state and local agencies, including the Conservation Districts, to encourage the adoption of 'best management practices' (BMPs) by growers. BMPs will help reduce soil erosion and thus reduce suspended sediment in the Yakima River. Many growers have already begun to adopt BMPs which eliminate tailwater runoff, conserve water and increase productivity. Technical assistance as well as limited financial assistance is available to help with the implementation of some BMPs.

Ecology is taking an approach to this TMDL process that relies on public participation in designing and implementing the activities necessary to meet the limits outlined in the Evaluation Report. Look for workshops and programs in your area discussing the TMDL and BMPs. We need your participation.

For technical assistance contact Pat Daly or Scott Manley at the Benton Conservation District, WSU Cooperative Extension or NRCS. For more information on the Suspended Sediment TMDL for the lower Yakima River contact Chris Coffin at the Dept. of Ecology, (509) 454-7860.

Weather Info Available on Web Site from WSU

PAWS (Public Agriculture Weather System) is Washington State University's agricultural weather service. Weather data are collected electronically at the 58 stations throughout the state and transmitted by radio signal to the base station in Prosser. PAWS is one of the few near real-time agricultural weather networks in the country, enabling it to provide up-to-the-hour information to growers. PAWS has traditionally supplied weather data and models for growing degree days, evapotranspiration, air stability, and pest and disease development. Major system changes have been instituted in the past few months, including high-speed model access on the 4 bulletin board phonelines, and a site on the World Wide Web (http://frost.prosser.wsu.edu).

PAWS has been essentially free to users in the past; however, with tightening university budgets, PAWS has been required to support itself through paid subscriptions. PAWS' new subscription structure is two-tiered, with corporate rates at $1065 per year, and individual rates of $130 per year. PAWS' policy is to charge an annual maintenance fee to weather station sponsors, but no additional charges for system access. Unfortunately, because of personnel time constraints, PAWS cannot add new stations at this time.

PAWS' future depends on your support. The PAWS system is actively seeking input from users on the new interface, services currently provided and services not provided that may be valuable to users. We appreciate the interest in PAWS and plan to improve the system to meet customer needs. For more information, please contact Dr. M.J. Hattendorf at (509) 786-9219, or Todd Elliott, (509) 786-9367.

Benton Conservation District
24106 N. Bunn Rd.
Prosser, WA 99350

NON-PROFIT
U.S. POSTAGE PAID
PROSSER, WA
PERMIT NO. 44

Address Correction Requested

MEMBERSHIP FORM - BENTON CONSERVATION ASSOCIATION

Yes, I would like to become a member of the Association and receive regular updates on local conservation issues and on-farm resources. (Individuals or businesses must reside in Benton County to be eligible for membership.)

Name______________________________ **Phone No.**________________

Address____

Dues:
- ☐ Regular Membership: $25/year (voting membership)
- ☐ Affiliate Membership: $26.00-$50.00/year (non-voting)
- ☐ Supporting Membership: $51.00-$500.00/year (non-voting)
- ☐ Sustaining Membership: $501.00 or more/year (non-voting)

Please enclose check and mail to: ***Benton Conservation Association, 24106 N. Bunn Rd., Prosser, WA 99350***

Thank you to everyone who have become members -- we appreciate your support!

Benton Conservation District

Supervisors: Dave Roseberry, Chairman; Frank Anderson,Vice-Chairman; Mike Duncan, Secretary-Treasurer; Mike O'Brien and Frank Berg, Members.
Employees: Pat Daly, District Manager; Scott Manley, Resource Technician.
District Phone Numbers: P.Daly: 786-9230 S.Manley: 786-9216

Benton Conservation Association

Board of Directors: Mike O'Brien, Chairman; Virginia Prest, Vice-Chairman; Dave Roseberry, Secretary-Treasurer; Frank Anderson and Keith Oliver (representing Olsen Brothers Inc.), Members.

Conservation Review

January, 1997

A quarterly publication of the Benton Conservation District and Conservation Association

Spring Creek Watershed - Project Summary

Project Overview

This project was designed to evaluate water quality conditions in Spring Creek and determine the potential sediment sources from agricultural practices in the watershed. Mapping ag activities was combined with stream monitoring to determine current conditions and develop future projects to reduce stream inputs from ag sources.

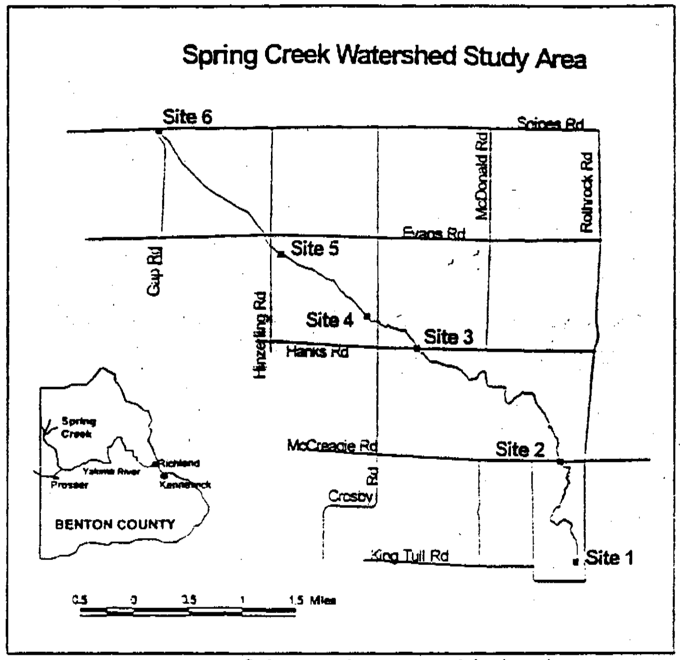
Geographic Positioning System/Geographic Information System (GPS/GIS) technology was used to map irrigated fields in the watershed. GPS was used by driving the perimeter of any field greater than ten acres, while recording information on crop type, irrigation method, cover crops and field slope. This information was transferred to the District's GIS program, edited, and used to produce maps showing fields differentiated by crop type, irrigation method, the use of cover crops or slope percentage.

Stream monitoring was done at six locations along a 6-mile stretch of the creek (see map), on a bi-weekly basis during non-irrigation season, and twice-weekly when irrigation was on. Monitoring began in October, 1995 and will continue through summer 1997. Flow, temperature and pH were recorded at each site, and a sample taken for suspended sediment analysis. The results of this are not only trends in instantaneous sediment levels at the six locations, but also computation of monthly and yearly sediment discharge at these locations.

The relationship between ag activities and stream sediment levels is being reviewed by comparing the monitoring results with map information, to determine possible sediment sources from fields draining to the creek. Potential runoff is based on crop type, irrigation, slope and other factors recorded.

GPS/GIS Results

The maps shown on page 3 reflect data taken January-March, 1996. Additional GPS/GIS work will be done in winter 1996-97 to include areas beyond the mainstem of Spring Creek. The maps depict the crops, irrigation methods, use of cover crops and slope for those fields which drain directly into Spring Creek.



A summary of the total crop and irrigation acres indicates most crops are irrigated either by sprinkler or rill (47.5% under sprinkler and 45% under rill irrigation). Only 232 acres were under drip irrigation during the 1996 season, although that number is slowly increasing as more fields are converted. Apples were the largest crop in 1996, in terms of acres, with 1024 acres. Hops and wine grapes were the next two large crops; hops were grown on 723 acres, and wine grapes on 710 acres. Other crops included concord grapes, cherries, and annuals.

Stream Monitoring Results

Stream sampling results showed the majority of sediment is transported through the stream between May and September, with July contributing the most at Sites 1 and 2, and May at Site 4. Sediment discharge for the period November 1995 through October 1996 was 2350 tons at Site 1, 1056 tons at Site 2 and 319 tons at Site 4.

More interesting to the project is the distribution of sediment levels along the stream, particularly during irrigation season. The charts on page 4 show the sampling sites (from upstream to downstream), versus instantaneous suspended sediment levels, taken on various dates. Chart 1 shows the difference in recorded sediment levels in March (prior to irrigation) and in June when irrigation is on. Chart 2 shows sediment levels on six dates with irrigation on;

...continued on Page 2

Spring Creek, continued:

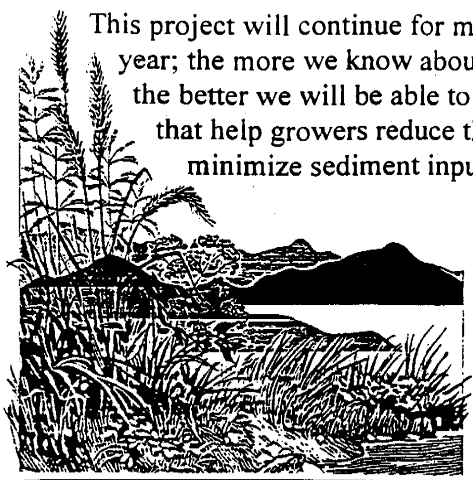
spikes in sediment levels at Sites 5 and 2 can be related to irrigation activities in rill-irrigated fields above these sampling points.

Field sampling of sediment loss was also done by the District this summer. In these tests, soil loss (with irrigation runoff) was measured from rill-irrigated hop fields during individual irrigation runs. The results showed a range of from 0.0053 tons/acre to 0.08 tons/acre lost during irrigation runs of 24 hours. If a field is irrigated a total of 15 days during an irrigation season, soil loss could range from 0.08 tons/acre to 1.3 tons/acre during the year. Studies from other areas show annual rates of from 9 to 45 tons/acre on rill-irrigated fields. (A ton is roughly equal to one cubic yard, so a determination of soil loss can be made in number of cubic yards, feet or inches for a given field.)

Conclusions / Continuing Work

There is no doubt rill-irrigation results in significant soil loss from fields, and sediment increases to nearby streams. This study provides a view of these loses in one watershed in terms of where, when and how much soil is moving through the system. Sampling Site 5, just below the corner of Evans and Hinzerling Roads, collects soil lost from hop and other rill irrigated fields with slopes of 2-4%, located above Evans. Some of this soil filters out or is caught in ponds as it moves downstream. More is picked up from other fields between Sites 4 and 2; again the maps show rill irrigated fields likely contributing soil runoff.

This project will continue for most of another year; the more we know about these drainages, the better we will be able to design programs that help growers reduce their soil loss and minimize sediment inputs to the streams.



Annual Meeting to Focus on CRP Takeout and Delaney Clause

Featured Speakers at the District's Annual Meeting will be Allen Schreiber from WSU-Tri-Cities, and Roger Veseth from the WSU and the University of Idaho. Their topics will be "Affect of New Regulations with the Delaney Clause Being Discontinued", and "Management Considerations for Returning CRP to Production in Low Rainfall Areas". Using PAM and pesticides in drip irrigation will also be discussed.

Three Pesticide Credits can be earned by meeting participants. The meeting will be February 5th from 8 am to 12:30 pm at the Barn in Prosser. The meeting is free and open to the public.

District Elections

The District will hold its annual elections at the Annual Meeting on February 5th. Two Supervisor positions are open; one elected and one appointed. The requirements for these positions are to provide direction to District staff by attending a 2-hour monthly meeting, and providing support as needed at other times. Supervisors must also be registered voters within Benton County and be owners of, or occupy land within Benton County. Although these are unpaid positions, the work is vital to keep the District operating and provides an opportunity for a landowner to play a role in improving agriculture in Benton County. For more information on applying for a position, contact Pat at 786-9230, or at the address on page 6.

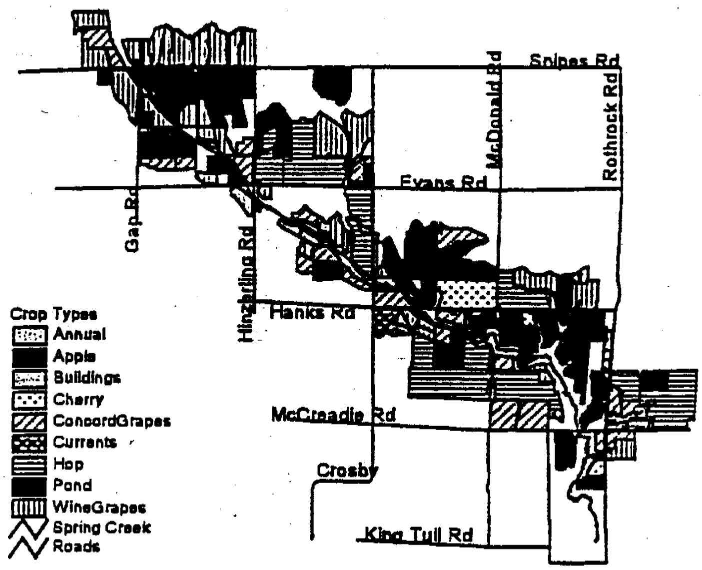
Irrigation Water Management Seminar Coming Up

The District and WSU Cooperative Extension will sponsor an Irrigation Water Management Seminar in February. Peter Canessa will be the featured presenter for the two-day workshop, which will be held both at WSU-Prosser and in fields north of the station. The workshop is designed for growers, irrigators and researchers working with IWM.

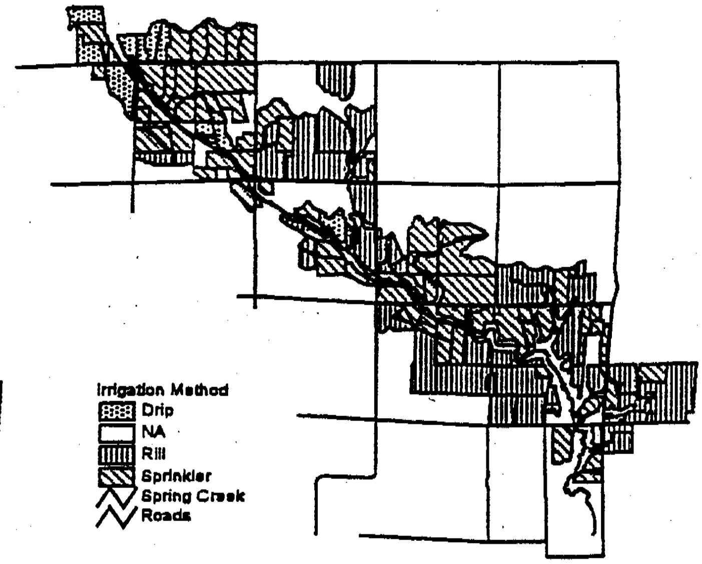
Tentative dates for the seminar are February 25th and 26th. To request further information as the workshop is finalized, please contact Pat at 786-9230.

Reminder -- Tree Orders need to be into the District by January 10th!

Fields Draining to Spring Creek

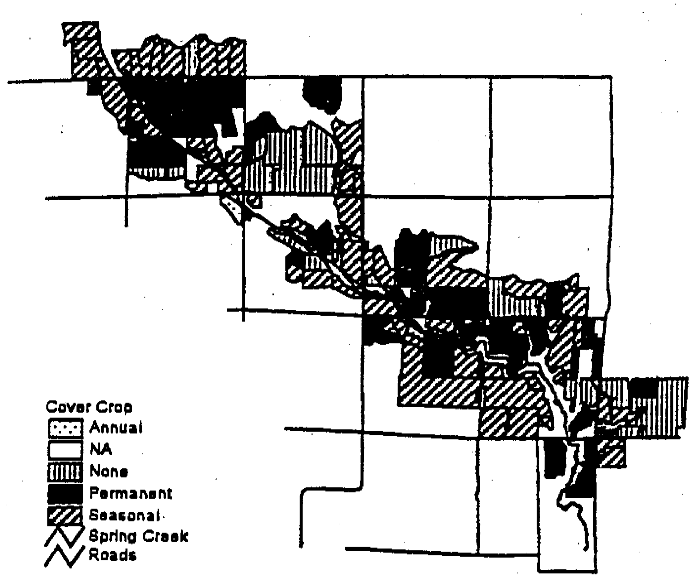


By Crop Type

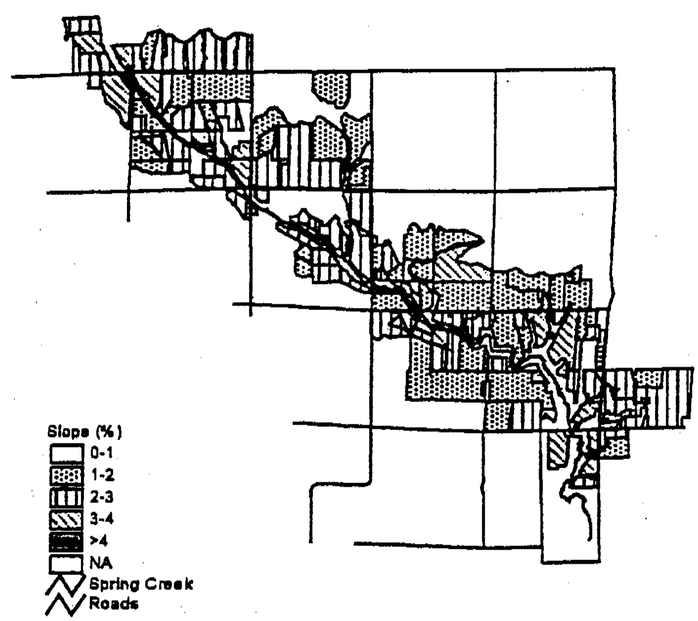


By Irrigation Method

By Cover Crop



By Slope



0.5 0 0.5 1 1.5 2 2.5 Miles

Chart 1:

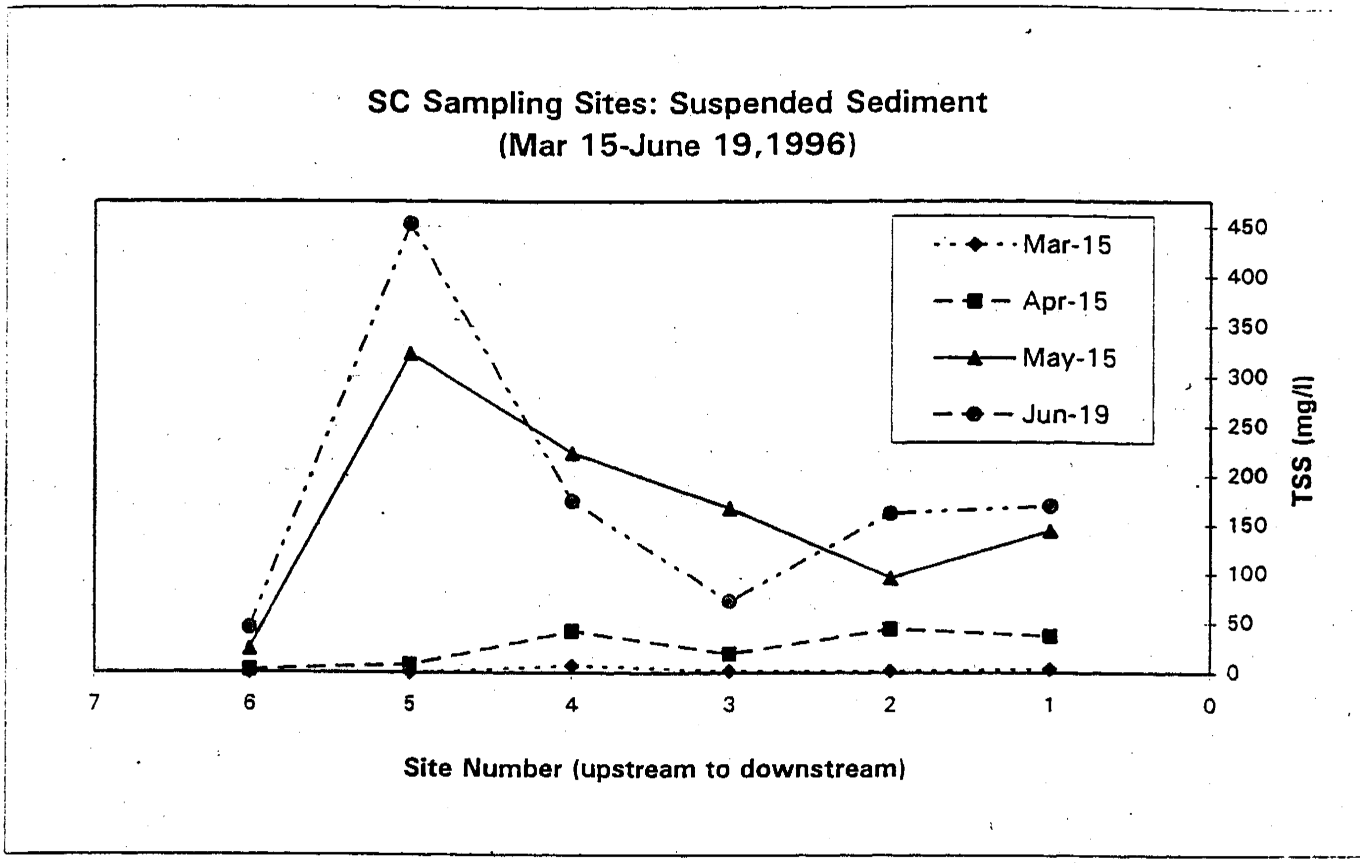
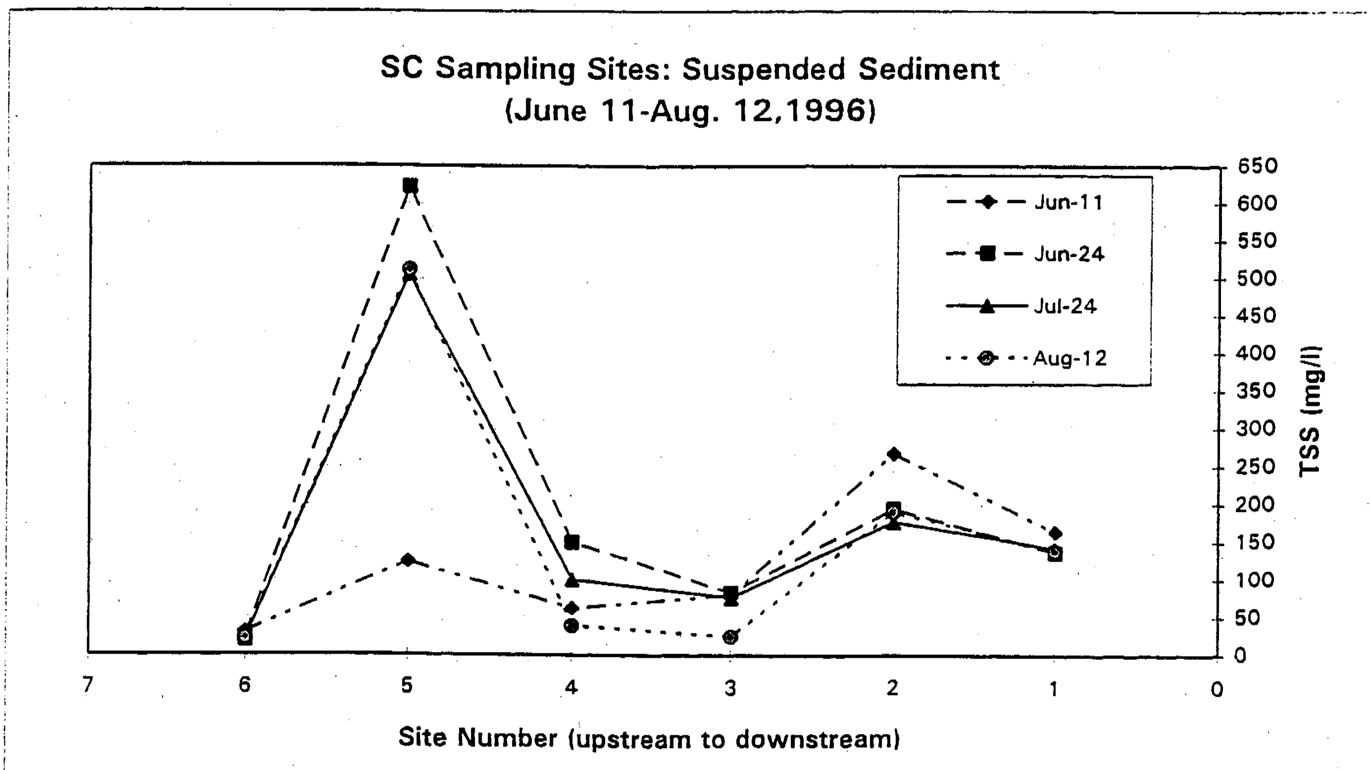


Chart 2:



EPA Changing the PM (Particulate Matter) Standard

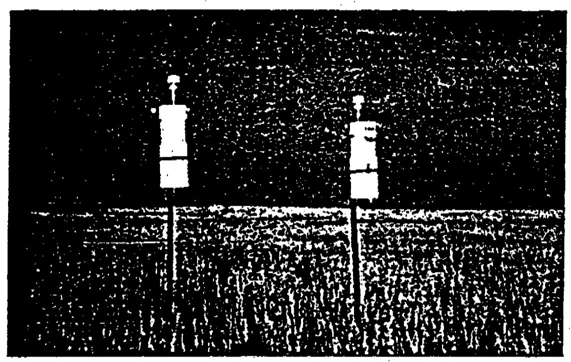
by David Roseberry, Chairman

The federal EPA is proposing a revision to the national ambient air quality standards for particulate matter and is accepting public comment on the proposal until Feb. 14, 1997. I urge everyone who has an opinion to send in written comments (in duplicate) to: Office of Air and Radiation, Dockets & Information Center (6102), attn. Doc. #A-95-54, USEPA, 401 M. St. SW, Washington DC 20460, or call 1-888-tell-EPA to give verbal comments. In addition to general comments, EPA has three specific options under consideration for which they are soliciting comment. Your opinion on these options, which are explained below, will have the most impact. The agency is under a court order to complete revision of the standard by July 1997. The complete text of the proposal along with a fact sheet and other information is available on the web at http://www.epa.gov/airlinks/

Current standards require that concentrations of particulate matter with diameters < 10 micrometers (PM10) be less than 50 micrograms per cubic meter averaged annually (the annual standard) and less than 150 micrograms when averaged over 24 hours (the daily standard). Measurements of PM10 taken in Kennewick, Spokane, and Walla Walla have all exceeded the daily standard at least once. The Kennewick sampler recorded extreme exceedences on several occasions during dust storms in the late 80's and early 90's.

The proposal includes keeping the current PM10 annual and daily standards unchanged and adding a PM2.5 annual and daily standard. The proposed PM2.5 standard is 15 (annual) and 50 (daily) maximum. The three specific options under consideration are: 1) a "limited" policy response option consisting of a PM2.5 standard set at 20 annual and 65 daily, 2) a "highly precautionary" policy response option consisting of a PM2.5 standard set at 12 annual and 20 - 50 daily, and 3) revoking the PM10 daily standard .

My written comments focus on encouraging EPA to revoke the PM10 daily standard. There is, in fact, plenty of reason to eliminate the PM10 standard entirely. The Harvard Six Cities Study, a large, prospective epidemiological study initiated in 1974, has studied the effects of PM2.5, PM10, and the fraction larger than PM2.5 but smaller than PM10, called CM (course mass). The study authors conclude, through several different and convincing lines of evidence, that the association between CM and mortality is "essentially zero." In other words the health effects from particulate matter are entirely due to the size fraction smaller than 2.5 microns.



PM_{10} samplers in CRP grass fields.

It is believed that agricultural dust in PM10 consists largely of CM rather than PM2.5. PM2.5 particles are believed to result mostly from combustion processes. It is likely therefore, that if the standards were designed to be equally restrictive, agricultural dust would be less likely to run afoul of a PM2.5 standard than a PM10 standard. However, soils differ greatly and the lack of PM2.5 data make it unclear at this time whether or not there is significant PM2.5 in local windblown dust; and the proposed PM2.5 standard is much more restrictive than the old PM10 standard, at least in the urban smog setting for which the standards are primarily designed. There are several proposed mechanisms for the toxicity of PM2.5 which would rule out dust entirely. Unfortunately, none of these ideas has been confirmed and small size alone cannot be excluded as the culprit at this time. It is also possible that only an even smaller fraction is toxic, PM1 for example (which would be less likely than PM2.5 to contain much dust). At any rate the EPA does not have a reliable and inexpensive way to separate dust from smoke, and evidence is still sketchy for sizes below 2.5 so PM2.5 will be the regulated entity for the foreseeable future.

...continued on next page

Several studies, including the afore-mentioned Harvard Six Cities Study, conclude that significant increases in mortality from heart and lung disease are caused specifically by particles 2.5 microns in diameter or smaller. Increased mortality is approximately 1.5% per each 10 micrograms per cubic meter increase in PM2.5 level. No threshold exists at least down to 25 micrograms per cubic meter. The mortality increase is only slightly higher for ages 65+ than for the population as a whole. The data for PM toxicity is unusually consistent for epidemiological studies, so the public health community has great confidence in these results.

The proposal includes a change in the way non-attainment of a PM daily standard is calculated, replacing the current 1-expected-exceedance form with a 98th percentile form averaged over 3 years. The new method is an improvement but would probably not prevent non-attainment of the daily PM10 standard caused by windblown dust in circumstances similar to the those in the early '90s.

This is a proposed federal rule under the Clean Air Act and has nothing to do with the proposed phase out of grass seed field burning. However, the proposed PM2.5 daily standard could possibly effect field burning, grass seed or any other, if it is determined to result in the Kennewick sampler exceeding the standard.

District Tree Sales

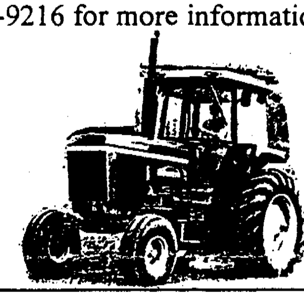
You still have time to order trees for wind breaks, shade and to add greenery to your homesite. The District is offering seedlings of three evergreens and four deciduous trees and shrubs at very reasonable rates, as we do every year. This year's species are: Austrian Pine, Blue Spruce, Ponderosa Pine, Golden Willow, Lombardy Poplar, Hybrid Cottonwood and Tatarian Honeysuckle. Seedlings range from 6 to 24 inches and most are priced $1.00 or less each.

The seedlings are purchased in bulk from major nurseries and arrive at the District in late March, just in time for spring planting. If you would like more information or an order form, contact Pat at 786-9230 or Scott at 786-9216.

Farm Equipment For Sale or Rent

For Sale: Deutz four-cylinder, turbocharged, air-cooled diesel engine. Rated at 106HP at 2500 RPM. Includes instrument panel with safety shutdowns and 20 gallon fuel tank. Contact Scott at 786-9216 for more information.

For Rent: Hesston Round Bale Processor, for straw mulching areas prone to soil erosion. Bale Processor has undergone major modifications and is now equipped with speed kit and PTO drive to accommodate all tractors and Challengers. Rental fee is $50.00 per day. The District also has a source of straw for mulching. Contact Pat at 786-9230 or Scott at 786-9216 for more information.

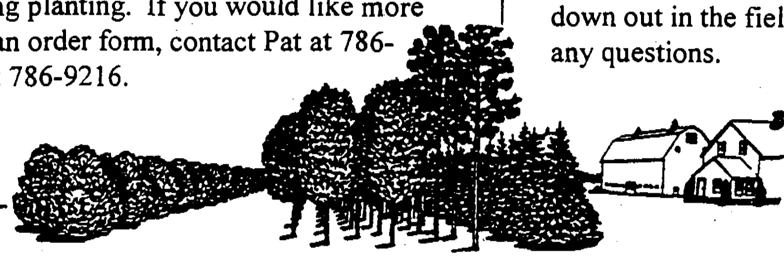


District Continuing GPS Work in North Prosser Area

Scott Manley, District Resource Technician will be traveling about the fields north of Prosser again this winter (you may have already seen him), using the GPS equipment to continue mapping agriculture in our area. (See Spring Creek article on pages 1 and 2.)

The District hopes eventually to map all of the irrigated acres in the county, at least west of Benton City, although that may take some time. For now, we are concentrating on areas near the major Yakima tributaries, particularly Spring and Snipes Creeks.

The information is and will continue to be used to help understand what effects local conditions have on these water bodies, and where limited resources can best be applied to reduce water quality impacts from agriculture activities. For more information, contact Pat or Scott at the District. Or wave Scott down out in the field -- he is always eager to answer any questions.



FARM BILL PROGRAM

by Barbara Bolick, NRCS

Conservation Reserve Program - TAKE OUT OR SIGN UP? That is the question that I have been hearing most recently. For those who are wondering HOW they will convert CRP acres back to cropland, there will be a Conservation Farming Conference held January 7-8 at Cavanaugh's in Kennewick. If you did not get a brochure on this conference from me recently, please stop in and pick one up. The PNW STEEP III Extension publication "Returning CRP Land to Crop Production--A Summary of the 1994-96 Research Trials in Washington State," was printed in November 1996 as PNW Conservation Tillage Handbook Series No. 16 for Chapter 2. It reports on 10 field research trials in low rainfall areas. Fifteen different growers cooperated with these large scale, replicated on-farm tests with farm-scale equipment owned by the growers. Please contact the Extension Office in Prosser or Kennewick, for a copy.

If you are interesting in re-enrolling the CRP, you should know by now, that you will be competing with farmers nationwide for CRP contracts. The rules have changed since most of the Benton County acreage entered the program. First, bids will be by TRACTS not farms. Second, you may have heard of EI or Erodibility Index, that must exceed "8" in order to be eligible for consideration. Unfortunately, most of the CRP acres in Benton County do not exceed 8. The good news is that Washington State NRCS has been working (along with other groups) at the national level to get the rule changed. If you are in a county designated a non-attainment area or potential non-attainment for air quality, you will not need to meet the EI of 8. We are still waiting for this change to be made official. Please stop in after the holidays, and I'll explain EI to you. I am starting a list of those wanting to re-up their CRP, so we can begin to determine "EI's." We hear the next CRP sign-up is "sometime in January."

Environmental Quality Incentive Program (EQIP) - The National Office of NRCS has not selected the Geographic Priority Areas (GPA) from those sent to them by the different states. The Yakima River Basin GPA Local Working Group is still moving forward, a meeting has been set for December 17th. The intention of that meeting is to develop a ranking system, a process too determine which EQIP applicants will qualify for funds. Please contact Rick, Barbara, or Glenn if you are interested in developing a 5 year Long Term Contract (LTC) to address the conservation needs on your farm. Even though we don't have all the rules and we don't know if we have been funded, we do know that developing an LTC takes more time than doing the old ACP "one field, one project" plan. We don't want your applications to be delayed once we are funded, so we'd like to start the planning process right now. The policy will be first come, first served.

$$$$$$$$$$$$$$$$$$$$$$$

EQIP Update, *by Pat Daly*

At the meeting on Dec. 17, several points were cleared up: We expect to hear if the Yakima Watershed GPA will be funded by late January or early February. If it is, there may be as much as two million dollars available for farm improvements in the four-county area. We feel there is a good chance of these dollars being available.

The funds will be distributed for a minimum of 5-year contracts (can go as long as 10 years), with a maximum amount of $50,000 per farm entity. A resource management plan will be done for each entity as part of the program, and awards will be based on the expected resource results as well as the cost of improvements. Priority issues are going to be improving water quality, reducing soil erosion and water conservation.

Applications for the program will be taken this spring for the 1997 fiscal year, and (assuming the valley is awarded the funds) farm contracts will be awarded by early summer. Payments to farms cannot be made until the next fiscal year (October, 1997 for this cycle), but contracts must be signed before the end of September. Construction can begin any time after the contract is signed, either this year or next.

This is not going to be a simple program, but it may provide some valuable funding for growers who have a smaller amount of acreage on which improvements, particularly switching from rill to either sprinkler or drip, need to be made.

For more information, contact Pat at the District (786-9230), or Barbara, Rick or Glenn at the NRCS office (786-1923).

$$$$$$$$$$$$$$$$$$$$$$$

MEMBERSHIP FORM - BENTON CONSERVATION ASSOCIATION

Yes, I would like to become a member of the Association and receive regular updates on local conservation issues and on-farm resources. (Individuals or businesses must reside in Benton County to be eligible for membership.)

Name____ **Phone No.**________________

Address____

Dues:
- ☐ Regular Membership: $25/year (voting membership)
- ☐ Affiliate Membership: $26.00-$50.00/year (non-voting)
- ☐ Supporting Membership: $51.00-$500.00/year (non-voting)
- ☐ Sustaining Membership: $501.00 or more/year (non-voting)

Please enclose check and mail to: ***Benton Conservation Association, 24106 N. Bunn Rd., Prosser, WA 99350***

Thank you to everyone who have become members -- we appreciate your support!

Benton Conservation District

Supervisors: Dave Roseberry, Chairman: Frank Anderson, Secretary-Treasurer; Mike O'Brien and Mike Duncan, Members; Frank Berg, Affiliate Member.
Employees: Pat Daly, District Manager; Scott Manley, Resource Technician.

Benton Conservation Association

Board of Directors: Mike O'Brien, Chairman: Virginia Prest, Vice-Chairman: Dave Roseberry, Secretary-Treasurer: Frank Anderson and Keith Oliver (representing Olsen Brothers Inc.), Members.

Benton Conservation District
24106 N. Bunn Rd.
Prosser, WA 99350

NON-PROFIT
U.S. POSTAGE PAID
PROSSER, WA
PERMIT NO. 44

Conservation Review

October, 1996

A quarterly publication of the Benton Conservation District and Conservation Association

Ecology to Set Limits on Sediment Pollution in Yakima River

The Washington Department of Ecology will soon be setting enforceable limits on the amount of suspended sediment that can be discharged from irrigation return drains.

When waters of the state fail to meet state standards, the federal Clean Water Act requires states take action to bring those waters back into compliance. The lower Yakima River fails to meet state water quality standards for turbidity, DDT and other pesticides, fecal coliforms and temperature.

Ecology, in cooperation with the US Environmental Protection Agency and Yakama Indian Nation, is designing a strategy so the Yakima River will meet state water quality standards.

Decades of monitoring by numerous state and federal agencies has shown that the greatest source of the pollution in the lower Yakima is from irrigated agriculture return drains. Recent monitoring has shown conclusively that many of the pollutants are directly linked to suspended sediment loads. Thus, Ecology will focus its pollution control strategies on limiting suspended sediment loads in the irrigation return drains.

The suspended sediment limits to be set by Ecology are designed to bring the lower Yakima River back to within state water quality standards. The limits on suspended sediments will reduce not only sediment pollution, but also pollution by DDT and other pesticides, turbidity and nutrients and may help reduce summer water temperatures.

According to Ray Hennekey, Ecology's Yakima River project coordinator, greater than ninety percent reductions in sediment loads will be required in certain irrigation return drains to meet water quality targets. Some growers will have to make drastic changes in their irrigation practices, water management and crop management practices in order for the drains to meet those targets. Hennekey is quick to add however, that local input will be a vital part in designing the cleanup strategies that will ultimately be used to meet the water quality targets.

"My sincere hope is that citizens in the Yakima watershed will help us design and implement cleanup strategies and schedules that are practical, efficient and achievable for them. There is no one answer to the Yakima's complex pollution problems," Hennekey said. "We will consider all ideas."

State, local and federal agencies are ready to help growers make decisions about cleanup strategies and take action to reduce pollutant discharges to meet Ecology's limits. WSU Cooperative Extension, local Conservation Districts, NRCS, and others are targeting funding, technical expertise, and on-the-ground assistance on the Yakima River's pollution problems.

For more information on the lower Yakima River Project, contact Ray Hennekey at the Department of Ecology in Yakima, (509) 454-7832. For assistance with improving irrigation management and reducing sediment erosion, contact Pat at the Benton Conservation District office (786-9230).

1996 Ag Tour

About 20 people participated in the first Annual Irrigated Agriculture Tour put on by the District in early September. Stops were made at C&M Orchards, a drip installation in one of Olsen Brother's hop fields, the Roza Irrigation District's Re-regulating reservoir and for a PAM demonstration at WSU-Prosser.

The purpose of the tour was to give non-farmers an idea of the complexities that go into growing crops using irrigation in the Lower Yakima Valley.

Comments about the tour from the group noted that they learned a great deal and were eager to learn more, particularly about hop processing!

District Programs and Activities

Association Files for Non-Profit Status

The Benton Conservation Association was formed this summer to support the activities of the Conservation District. It has received non-profit status from the state of Washington, and recently filed for non-profit status from the IRS. As a non-profit, the Association will seek grants to continue programs established by the District. The major significant difference between the District and the Association is an expanded number of funding sources available to the non-profit Association.

The Boards of the District and the Association overlap – there are three members on the District Board who are also on the Association Board. They are David Roseberry, Frank Anderson and Mike O'Brien. Keith Oliver, representing Olsen Brothers, and Virginia Prest, a researcher at WSU-Prosser, are also on the Association Board.

The first project the Association is developing is financial support to be used for on-farm conservation measures. The Association hopes to be able to work directly with growers to implement changes to irrigation systems that work to reduce soil loss and improve water conservation and water quality. Other programs being developed are additional water quality monitoring; and workshop, training and education activities.

Individual, business and organization memberships are available for the Association. Membership benefits include the newsletter, notices of Association activities, and your partnership with a local organization working to improve resources for on farm conservation.

A membership form is included – please join to support local conservation activities.

New Groundwater Project Underway in North Prosser

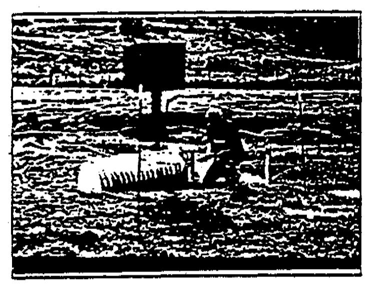
The District has begun a project with the US Geological Survey to sample up to 30 wells in the North Prosser area. The purposes of the project are to get an idea of current ground water quality, to help the District determine agriculture's role in local ground water issues, and to develop further programs to improve water quality.

Tests will be made of depth, temperature, pH, and conductivity, and a sample will be taken to test nitrates. The information will be reviewed on an area-wide basis, not well-by-well. Again, the data will be reviewed to provide an indication of current conditions and trends in local groundwater.

New Stream Gage Installed as Part of USGS Work

If you drive along McCreadie between Rothrock and Pioneer Roads, looking south when you cross Spring Creek, you will notice a strange new pipe standing next to the creek. The site is a stream gage installed by the USGS and the District to monitor stream levels.

Locals are aware of how stream levels can change rapidly depending on irrigation schedules. The gage will help the District determine those changes more closely, and corresponding water samples will allow calculation of sediment discharge. This information is important for helping the District and Association secure additional funding for on-farm improvements, and to demonstrate impacts improvements can make.



District Compiling Ag Data With GPS/GIS

The District is mapping fields in the North Prosser area as part of its program to understand local watersheds and develop information sources for use in seeking funding. Mapping begins by driving around a field with WSU's GPS (Global Positioning System) survey equipment, recording the field perimeter. Data is noted on crop type, irrigation method, cover crops, and field slope. The information is transferred to the District's computer, into ARC/Info (a Geographic Information System mapping software) and compiled. Maps can be produced of a given area, the concentration of various crops and other spatial information, useful for describing this unique area.

Agencies / Organizations - Farm Assistance

BCD, FSA, NRCS... What's the Difference??

With old and new names, two of the three agencies in the same office, similar programs... its not surprising the differences between these agencies is not always clear. Here's a summary that may help:

BCD (Benton Conservation District) is a sub-division of the state. It is run by a local board of directors, made up of people either farming or involved in agriculture who volunteer their time. The purpose of the District is to work directly with farmers to improve their on-farm conservation practices. Funding for the District comes from state, federal and local grants. Pat Daly is District Manager, Scott Manley is a Resource Technician; their offices are located at WSU-Prosser.

FSA (Farm Service Agency) (formerly the ASCS), is an agency of the US Department of Agriculture which administers farm commodity and conservation cost-share programs for farms, and makes farm ownership and operating loans. The local office is administered by John Harris and Bonnie Anderson at 620 8th St., Prosser.

NRCS (Natural Resources Conservation Service), is the former Soil Conservation Service. The local office is at 618 8th St. in Prosser, where Barbara Bolick is the District Conservationist. Their function is to provide free technical assistance with conservation planning, design and construction for implementing best management practices. The NRCS is also an agency of the US Department of Agriculture.

1996 Farm Bill Update

Under the Food, Agriculture, Improvement and Reform Act of 1996, funding for conservation programs will be based on Geographic Priority Areas and Natural Resource Priority Concerns. The Yakima River Basin is one of five Priority Areas selected in Washington State by the NRCS state office. Final selections are yet to be made at a national level. If the Yakima Basin is included in the final selection, funding will be allocated to resource needs identified during the state selection process, which included improving water quality and quantity.

Local NRCS personnel will be attending a workshop on the new Farm Bill October 15-18. For those with questions on EQIP, CRP and WRP, the NRCS hopes to be able to answer your concerns in greater detail.

NRCS Note: Public comment is being requested on proposed conservation rules and regulations dealing with wetland protection, soil erosion and conservation on private lands. A public forum will be held in Spokane on Monday, Oct. 21 at 1:00 pm. For more details, contact Barbara at 786-1923.

Yakima River Basin Water Enhancement Project

Irrigation districts, conservation districts, water purveyors and other area wide entities are eligible for receiving Federal Funds under the Yakima River Basin Water Enhancement Project. Applicants must meet the definition of 'public body' as defined in RCW 43.99E.030 to receive State funds. Reducing irrigation water diversions and installing water measuring devices are requirements for funding in the YRBWEP.

Cost share funds are available for preparing a conservation plan, determining feasibility of proposed conservation measures, implementing approved conservation measures and monitoring the conservation measures installed.

Application packages are available at the Bureau of Reclamation, PO Box 1749, Yakima, WA 98907. Questions about this program can be answered by calling Roberta Ries at 509-575-5848, ext. 265.

Assistance Available for Fencing & Stream Enhancement

The US Fish and Wildlife Service has a program to assist landowners improve riparian areas along streams with fencing and other controls. Landowners can receive up to 50% of the cost of the project by working with the USFW office to design a project that both protects streams and allows grazing.

Projects may include fence design and construction, tree and/or shrub planting and possible other stream bank stabilization.

For more information about this program, contact Pat at the District Office at 786-9230.

MEMBERSHIP FORM - BENTON CONSERVATION ASSOCIATION

Yes, I would like to become a member of the Association and receive regular updates on local conservation issues and on-farm resources. (Individuals or businesses must reside in Benton County to be eligible for membership.)

Name____ **Phone No.**__________________

Address____

Dues:
- ☐ Regular Membership: $25/year (voting membership)
- ☐ Affiliate Membership: $26.00-$50.00/year (non-voting)
- ☐ Supporting Membership: $51.00-$500.00/year (non-voting)
- ☐ Sustaining Membership: $501.00 or more/year (non-voting)

Note: Membership in Association is not tax-deductible until the Association receives federal non-profit status – see related article.

Please enclose check and mail to: ***Benton Conservation Association, 24106 N. Bunn Rd., Prosser, WA 99350***

Benton Conservation District

Supervisors: Dave Roseberry, Chairman; Frank Anderson, Secretary-Treasurer; Mike O'Brien and Mike Duncan, Members; Frank Berg, Affiliate Member.

Employees: Pat Daly, District Manager; Scott Manley, Resource Technician.

Benton Conservation Association

Board of Directors: Mike O'Brien, Chairman; Virginia Prest, Vice-Chairman; Dave Roseberry, Secretary-Treasurer; Frank Anderson and Keith Oliver (representing Olsen Brothers Inc.), Members.

Benton Conservation District
24106 N. Bunn Rd.
Prosser, WA 99350

NON-PROFIT
U.S. POSTAGE PAID
PROSSER, WA
PERMIT NO. 44

INSIDE:
- Limits on Sediment to Yakima River
- Irrigated Ag Tour
- Update on District & Association Activities
- New Farm Bill Review

Benton Conservation District

Located at WSU-Prosser

Technical Assistance

The Benton Conservation District has equipment and personnel available for irrigation system evaluation, soil moisture monitoring and irrigation scheduling. The Benton Conservation District personnel have several years of experience in on-farm grower assistance.

Cost-Share Money

The Benton Conservation District has recently completed another round of cost sharing for irrigation projects that demonstrate soil erosion reduction and/or water savings and conservation. In the past year the Benton Conservation District has cost-shared on 14 projects and has applied for a Federal grant that would be provide money exclusively for on–farm irrigation project cost-sharing. The District's money can, and has been, used in conjunction with other Federal programs, such as EQIP.

EQIP Sign-up

As a working partner with NRCS and FSA, the Benton Conservation District can receive applications and assist growers with the EQIP sign-up process. Although the 1998 EQIP sign-up ends January 30, applications for 1999 EQIP can be accepted any time throughout the year.

Benton Conservation District

Pat Daly, District Manager **786-9230**

Scott Manley, Resource Technician **786-9216** *cellular* **786-8707**

24106 N. Bunn Rd. Prosser, WA. 99350

APPENDIX 7

ROZA - SUNNYSIDE BOARD OF JONT CONTROL

Mission Statement

"Implement a program to enhance water supplies by supporting storage development, improving water quality, and increasing management efficiency in order to achieve within ten years: a) system improvements such as canal automation, regulating reservoirs, and closed conduit delivery systems and additional storage which will protect existing rights while providing higher quality and more reliable irrigation service to Sunnyside Division landowners; b) water savings sufficient to support the goal of furnishing at a minimum, 75% of entitlement to Roza Irrigation District landowners in all years; and c) compliance with the TMDL process for return flows discharging from lands under Roza-Sunnyside Board of Joint Control jurisdiction."

6. Water Quality Monitoring

The RSBOJC will continue its water quality monitoring program with the following objectives:

- Record the annual and seasonal TSS loads and other water quality characteristics of water diverted from the Yakima River into the RSBOJC.
- Record the variation in water quality characteristics of water throughout the conveyance and delivery system.
- Record TSS loads and other water quality characteristics of water discharged into RSBOJC project waterways.
- Determine the benefits of implementation of on-farm Best Management Practices.
- Provide quality control for individual water user water quality sampling programs as requested.
- Coordinate with other agencies in the collection and analysis of water quality data.

7. Sedimentation Ponds and Wetland Areas

The RSBOJC will pursue the planning, construction, and operation of sedimentation ponds and wetland areas in RSBOJC project facilities to improve the quality of water within and exiting the RSBOJC.

Mission Statement

The RSBOJC's mission is to implement a program to enhance water supplies by supporting storage development, improving water quality, and increasing management efficiency. The RSBOJC's goal is to achieve the following within ten years:

√ system improvements such as canal automation, regulating reservoirs, and closed conduit delivery systems and additional storage which will protect existing rights while providing higher quality and more reliable irrigation service to Sunnyside Division landowners

√ water savings sufficient to support the goal of furnishing at a minimum, 75% of entitlement to Roza Irrigation District landowners in all years

√ compliance with the total maximum daily load process for return flows discharging from lands under Roza-Sunnyside Board of Joint Control jurisdiction

A muddy plume of irrigation return water enters the Yakima River at Granger Drain.

Roza-Sunnyside Board of Joint Control

WATER QUALITY POLICY

Adopted January 28, 1998

"We are not inheriting from our ancestors; we are borrowing from our children."

Background

Since the formation of the Roza-Sunnyside Board of Joint Control in August 1996, the directors have been discussing ways to improve water quality and increase water conservation. The recently adopted *Water Quality Policy* is the culmination of many months of hard work and discussion.

The RSBOJC is taking a proactive approach to improving water quality in the lower Yakima River. As custodians of the family farm, we must help preserve and protect our most important natural resource—WATER. If we fail, future generations will suffer because of our lack of commitment to the environment.

We must work together to improve water quality.

Water Quality Policy

The Roza-Sunnyside Board of Joint Control Water Quality Policy began in 1998. Below is a summary of the policy:

1. Permit Required for Discharges to Project Waterways

All discharges into project waterways (canals, laterals, drains, and wasteways operated and maintained by a RSBOJC member and for which an easement or right of way exists) shall require a discharge permit from the appropriate RSBOJC member. The discharge permit will be issued to a discharger and provide among other things, for:

- Operational piped inlets so no erosion occurs to the project waterway.
- Water quality parameters for the discharged water.
- Termination of permit upon noncompliance of its terms and conditions.

2. Irrigation Runoff

All irrigation runoff discharged to project waterways from lands within RSBOJC boundaries must comply with water quality parameters established by the RSBOJC and referenced in the discharge permits.

- The RSBOJC will monitor discharge into project waterways and record turbidity levels above 25 NTU (current TMDL goal of waters discharging to the Yakima River). Such observation will be considered a water quality violation.
- In the event RSBOJC personnel observe a water quality violation, the discharger will be notified of the noncompliance by mail and requested to submit a Compliance Plan prior to the 1999 irrigation season. The plans will include proposed practices or projects to bring the runoff water into compliance and a time schedule for implementation.
- In 1999, landowners must implement their respective Compliance Plans.
- If the landowner fails to perform according to the Compliance Plan, the RSBOJC, may, upon observation of a subsequent water quality violation, turn off the irrigation water to the land until the Compliance Plan is implemented.

3. Buffer Zones

Buffer zones are required on both sides of RSBOJC project waterways.

- Fencing: Livestock grazing is prohibited on project waterways. The RSBOJC will put the initial emphasis on the Joint Drain system. Priority for fencing will be on the basis of water quality protection and operation and maintenance of project waterways.
- No-till zones: Installation of farm drainage ditches and drain inlets as needed to provide a no-till zone typically 20 feet wide from the top of the bank to the edge of the farm operation. Actual width requirements may vary depending on the size of the waterway.

4. Runoff Into Borrow Ditches

The RSBOJC will, with Yakima and Benton counties, develop strategies to regulate runoff into borrow ditches.

5. Water User Awareness Program

In cooperation with appropriate Federal, State, County, and River Basin entities, the RSBOJC will formulate and implement a water user awareness program related to effective on-farm water management.

ROZA-SUNNYSIDE BOARD OF JOINT CONTROL
POLICIES AND PROGRAMS TO IMPROVE WATER QUALITY AND THE USE OF WATER

Adopted January 28, 1998

1. Permit Required for Discharges to Project Waterways

All discharges into project waterways (canals, laterals, drains, and wasteways operated and maintained by a BOJC member and for which an easement or right of way exists) shall require a discharge permit from the appropriate BOJC member. The discharge permit will be issued to a discharger and provide among other things, for:

A. Discharge into the project waterway through a piped inlet of specified size and type to be installed by the discharger or the appropriate BOJC member.
B. Maintenance of the piped inlet by the discharger so that it remains operational in a manner that no erosion occurs to the project waterway.
C. Timely (Immediate) corrective action to be taken by the discharger upon verbal or written notification from the appropriate BOJC member that the piped inlet is not operational and/or erosion is occurring to the project waterway.
D. Reimbursement by the discharger of any costs that may be incurred by the appropriate BOJC member in the installation of or corrective action to the piped inlet.
E. Periodic inspection of the piped inlet by the permit holder.
F. Water quality parameters for the discharged water.
G. The termination of the discharge permit and the right to discharge into the waterways upon noncompliance of its terms and conditions.

2. Irrigation Runoff

A. All irrigation runoff discharged to project waterways from lands within BOJC boundaries must comply with water quality parameters established by the BOJC and referenced in the discharge permits. If the irrigation runoff is not in compliance with the water quality parameters, the discharger, upon written notification from the appropriate BOJC member, will implement appropriate corrective measures so that timely compliance is achieved. Beginning with the 1998 irrigation season, the BOJC will monitor discharge into project waterways and record turbidity levels above 25 NTU (current TMDL goal of waters discharging to the Yakima River). Such observation will be considered a water quality violation.
B. In the event BOJC personnel observe a water quality violation, the discharger will be notified of the noncompliance by mail and requested to agree to Short and Long Term Compliance Plan. The landowner, after notification, must sign and submit a Compliance Plan prior to the 1999 irrigation season. The plan will include proposed practices or projects to bring the runoff water into compliance and a time schedule for implementation. The plan will be tied to a drain inlet or series of inlets and will address proposed practices on a field by field basis. The Compliance Plan will be signed by the landowner and approved by the BOJC.
C. If the landowner refuses to enter into a Compliance Plan, the BOJC may, upon observation of subsequent water quality violation, turn off the irrigation water to the land until the Compliance Plan is executed.
D. If the landowner fails to perform according to the Compliance Plans the BOJC may, upon observation of a subsequent water quality violation, turn off the irrigation water to the land until the Compliance Plan is implemented.

3. Buffer Zones for BOJC Project Waterways

Buffer zones consisting of project operation and maintenance roads or no till-no grazing areas are required on both sides of BOJC project waterways. Where project operation and maintenance roads do not exist, the establishment and maintenance of appropriate buffer zones will be determined by the appropriate BOJC member.

A. FENCING: A policy is adopted prohibiting livestock grazing on project waterways. The Board of Joint Control will put the initial emphasis on the Joint Drain system. Where livestock grazing currently exists on the drains, the BOJC will construct and/or move existing fences to provide a buffer zone on each side of the waterway. Typical buffer strips will be 20 feet from the fence to the edge of the top of the bank. Actual width requirements may vary depending on the size of the waterway. The completed fence will be the property of the landowner. Priority for fencing will be on the basis of water quality protection and operation and maintenance of project waterways.

B. NO-TILL ZONES: The Board of Joint Control adopts a policy creating a no-till zone on both sides of an open project waterway. Implementation of this requirement will be prioritized based on protection of a project waterway. The landowner will be required to install a farm drainage ditch and drain inlets as needed to provide a no-till zone typically 20 feet wide from the top of the bank to the edge of the farm operation. Actual width requirements may vary depending on the size of the waterway.

C. Enforcement of buffer zones will be promoted by the enforcement of water quality standards, exercising the right to existing rights of way and easements, education, and financial assistance.

4. Runoff into County Borrow Ditches

The BOJC will, with Yakima and Benton Counties, develop strategies to regulate runoff into borrow ditches.

5. Water User Awareness Program

The BOJC, in cooperation with appropriate Federal, State, County, and River Basin entities, will formulate and implement a water user awareness program related to effective on-farm water management.

6. Water Quality Monitoring

The BOJC will continue its water quality monitoring program with the following objectives:

A. Identify the annual and seasonal NTU values and TSS loads and other water quality characteristics of water diverted from the Yakima River into the BOJC.

B. Identify the variation in water quality characteristics of water throughout the conveyance and delivery system.

C. Identify TSS loads and other water quality characteristics of water discharged into BOJC project waterways.

D. Determine the effectiveness of implementation of on-farm Best Management Practices.

E. Provide quality control for individual water user water quality sampling programs as requested.

F. Coordinate with other agencies in the collection and analysis of water quality data.

7. Sedimentation Ponds and Wetland Areas

The BOJC will pursue the planning, construction, and operation of sedimentation ponds and wetland areas into BOJC project facilities to improve the quality of water within and exiting the BOJC.

Roza-Sunnyside Board of Joint Control
P.O. Box 810 ■ Sunnyside, WA 98944

MEETING ANNOUNCEMENT

The Roza-Sunnyside Board of Joint Control (BOJC) invites you to come learn more about the challenges facing today's irrigators and learn ways to help improve water quality. The BOJC is taking a proactive approach to improving water quality in the lower Yakima River, and we must work together to make an impact.

WHO: A representative from the BOJC will provide an overview of the Board's recently adopted Water Quality Policies.

Also, Bob Stevens with Washington State University's Irrigated Agriculture Research and Extension Center will present on-farm best management practices.

WHAT: Topics include Water Quality Issues, BOJC's Water Quality Policies, District Programs and Projects, and Landowner Solutions (including funding sources).

WHEN: **January 29 at 9:30 a.m. or 1:30 p.m.**
February 4 at 9:30 a.m. or 1:30 p.m.
February 11 at 9:30 a.m. or 1:30 p.m.

WHERE: Sunnyside Valley Irrigation District office, 120 South 11th St., Sunnyside

LANDOWNER MEETING AGENDA

I. Overview (Board Member / Staff)

   A. The Problem

      1. The Endangered Species Act

      2. The Clean Water Act

   B. The Solution (Staff)

      1. Projects

         a. Settling Basins

         b. Improved Waterway Stabilization

      2. Programs

         a. Water Quality Monitoring

         b. Education / Communications

      3. Policies

         a. Discharges to Project Waterways

         b. Buffer Zones

      4. Coordination with Landowners

         a. Education

         b. Incentives

         c. Compliance with Policies

II. Implications to Landowner (Board Member / Landowner)

   A. The Risks to Landowners

   B. The Approach by the BOJC

ROZA - SUNNYSIDE BOARD OF JOINT CONTROL

COMPLIANCE PLAN

Name: ______________________________
First Middle Last

Address: ______________________________
Street / PO Box City State Zip

Phone: ______________________________
Home Business Cellular

Location: ____________ Point(s) of Noncompliance: ____________
Parcel Number Canal/Lateral/Drain

Problem Description

____
____
____
____

Proposed Solution

Management Practice or Project	Estimated Cost	Completion Date

Description of Available Cost Sharing

____
____
____

Submitted

____
Signature of Landowner

____
Date

Approved

____
Chairman
Roza-Sunnyside Board of Joint Control

____
Date

BULK RATE
Permit No. 37
Sunnyside, WA 98944

THE WATERFRONT

December 1997 Volume 3, Number 4

A PUBLICATION OF SUNNYSIDE VALLEY IRRIGATION DISTRICT
120 South 11th Street ♦ P.O. Box 239 ♦ Sunnyside, WA 98944

Board of Joint Control Sets Water Quality Policy

For the past several months, the Roza-Sunnyside Board of Joint Control (BOJC) has been busy discussing how to improve water quality in the lower Yakima River. Working with state and federal agencies, the BOJC looked at water quality problems associated with irrigation and determined corrective measures to help improve water quality. Below is the recently adopted Roza-Sunnyside Board of Joint Control Water Quality Policy which will take effect in 1998.

1. DISCHARGES TO PROJECT WATERWAYS OF THE BOJC

All discharges into project waterways (canals, laterals, drains, and wasteways operated and maintained by a BOJC member and for which an easement or right of way exists) shall require a discharge permit from the appropriate BOJC member. The discharge permit will provide among other things, for:

- Maintenance of the piped inlet by the discharger so that it remains operational in a manner that no erosion occurs to the project waterway.
- Establishment of water quality parameters for the discharged water.
- The termination of the discharge permit and the right to discharge into the waterways upon non-compliance of its terms and conditions.

2. IRRIGATION RUNOFF

All irrigation runoff from lands within BOJC boundaries must comply with acceptable water quality parameters established by the BOJC.

- Beginning with the 1998 irrigation season, the BOJC will monitor discharge into project waterways and record turbidity levels above 25 NTU (current TMDL goal of waters discharging to the Yakima River). Such observation will be considered a water quality violation.
- In the event BOJC personnel observe a water quality violation, the landowner will be notified of the noncompliance by mail and requested to agree to a Short and Long Term Compliance Plan. The landowner, after notification, must sign and submit Compliance Plans prior to the 1999 irrigation season. These plans will include proposed practices or projects to bring the runoff water into compliance and a time schedule for implementation. These plans will be tied to a drain inlet or series of inlets and will address proposed practices on a field by field basis. The Compliance Plans will be signed by the landowner and approved by the BOJC.
- In 1999, landowners will be required to begin implementing their respective Compliance Plans.

3. BUFFER ZONES FOR BOJC WATERWAYS

Buffer zones consisting of project operation and maintenance roads or no till-no grazing areas will be required on both sides of BOJC project waterways.

- Fencing: Livestock grazing will be eliminated on project waterways. The BOJC will put the initial emphasis on the Joint Drain system. Priority for fencing will be on the basis of water quality protection and operation and maintenance of project waterways.
- No-till zones: The landowner will be required to install a farm drainage ditch and drain inlets as needed to provide a no-till zone typically 20 feet wide from the top of the bank to the edge of the farm operation. Actual width requirements may vary depending on the size of the waterway.
- Enforcement of buffer zones will be promoted by the enforcement of water quality standards, exercising the right to existing rights of way and easements, education, and financial assistance.

4. RUNOFF INTO COUNTY BORROW DITCHES

The BOJC will, with Yakima and Benton Counties, develop strategies to regulate runoff into borrow ditches.

5. WATER USER AWARENESS PROGRAM

The BOJC, in cooperation with appropriate Federal, State, County, and River Basin entities, will formulate and implement a water user awareness program related to effective on-farm water management. *Look for announcement of workshops to be held in early 1998.*

(Policy continued on back page...)

Inside this issue:

Director Election Results..............2
Assessments Set for 1998..............2
Answers to Assessment Questions..............3
Office Closures for 1998..............3
Project with Sunnyside Airport..............4
DID #3 Merger Approved..............4

Director Election Results

Two terms of office of the Sunnyside Valley Irrigation District Board of Directors expire in 1997—Director Division #1 (Granger) and Director Division #5 (Mabton).

Pursuant to RCW 87.03.075, if only one candidate in a division qualifies for election, that person is declared elected to the division for which he or she was nominated and qualified.

Bob Golob and Doug Simpson were declared elected to serve Director Divisions #1 and #5, respectively. Both submitted nominating petitions signed by at least ten qualified electors in the division for which they ran. Both ran unopposed. Each of the directors is elected for a three-year term. The new terms begin January 1, 1998.

Bob Golob

The Board of Directors of SVID, as with any elected governing body, sets operational policy for the district. Board members receive no salary, but are compensated for attending meetings or when otherwise engaged in District business, and are reimbursed for necessary expenses such as travel, food and lodging while on District business.

Bob Golob has served on the SVID Board of Directors since 1986. Doug Simpson has been on the board since 1978 and has served as its chairman since 1980.


Doug Simpson

The time commitment for serving as a director varies with the issues confronting SVID. All of the directors are landowners with busy schedules and lots of work to do for their own farm operations. Over the past year, since the formation of the Board of Joint Control, serving on the SVID board has meant putting in a lot of extra hours.

Assessments Set for 1998 Irrigation Season

The Sunnyside Valley Irrigation District Board of Directors has set 1998 assessments for beneficial use lands at $54.50* per acre. This is an increase of $7.25 per acre. Representing the biggest increase in assessments (15%) in several years, these costs are associated primarily with water quality planning and implementation.

A little background on irrigation assessments:

An assessment is the fee paid to an irrigation district to maintain the irrigation system and provide the opportunity to obtain irrigation water. Irrigation districts are not-for-profit entities which collect funds to cover the cost of operation and maintenance and provide necessary reserves for future projects and emergencies.

The annual assessments are set by projecting the cost of operation, maintenance and administration, together with capital projects and necessary reserves for the following year minus revenues from approved grants. The assessment for each parcel of land is then computed based on acreage.

The Board of Directors has felt compelled to respond in a proactive manner to improving water quality of the return flows discharging into the Yakima River. This proactive position is driven by the threat of the Endangered Species Act listings and the resultant recovery programs which could reduce diversions for irrigation purposes. Secondly, under the Clean Water Act, the Washington State Department of Ecology has set total maximum daily loading (TMDL) for the lower Yakima River with goals to remove 90% of the sediment reaching the river within five years. This would include all drains and irrigation facilities that discharge to the river.

Following is a breakdown of the cost increases:

A total of five additional employees are being hired, increasing costs by $3.25 per acre. Three employees will be working on drainage and water quality projects. One employee will be added for building and pump maintenance responsibilities and another employee will be added to work in the shop for metal fabrication – related primarily to health and safety issues, i.e., walk bridges, screens, catch cables, etc. Funding of water quality programs and projects including increased water quality monitoring, construction of settling basins, and habitat negotiations and restorations are expected to increase assessments by approximately $2 per acre.

Materials and supplies are expected to increase in costs by $1.25 an acre – driven primarily by the cost of chemicals, fuels, metals, rock, and gravel. The Bureau of Reclamation has accelerated the storage operation and maintenance program which will add an additional $.75 per acre. The total of these increases is $7.25 per acre.

For more information, please contact the Sunnyside Valley Irrigation District office at (509) 837-6980.

**Lands with local improvement district indebtedness or assessments may experience different percentage increases or decreases on the total assessment.*

Q & A . . . Assessment questions answered here

With all the bills and invoices you get in the mail, it may get a little confusing deciphering all the information and determining what you are actually paying for. Before Christmas each year, Sunnyside Valley Irrigation District (SVID) mails the annual assessment or billing statement. Landowners have a variety of questions about the billing process. Below are some frequently asked questions along with SVID's answers to those questions.

Q. When must I pay?

A. Assessments may be paid any time after they are received, though they become due on February 15 and must be paid before water is delivered. If an assessment is not paid by October 31, it becomes delinquent.

Q. Why bill in December?

A. SVID sends the statements before Christmas for the people who want their statements before December 31 for tax purposes.

Q. Where does the money go?

A. SVID is a not-for-profit entity and the fifth largest irrigation district in the state of Washington in terms of irrigable acreage.

The money raised through assessments goes toward providing services—the delivery of irrigation water to more than 5,500 landowners. This includes maintenance, repair, and rehabilitation of our water distribution system. SVID's water distribution system is complex and more than 100 years old. It includes 60 miles of main canal, 44 miles of major subsystem canals, and 296 miles of laterals and branch laterals. The district also oversees the maintenance of nearly 90 miles of joint drains and maintains 132 miles of drainage improvement district systems.

Assessments are set based on the budget, an estimate of the amount of money it will take to operate all of the above from January 1 through December 31 each year. SVID's 1997 budget was $4.9 million.

Q. But I don't get water! Why do I have to pay?

A. Some people receive an assessment who do not utilize irrigation water and are confused as to why they must still pay the bill. There is an explanation: When an irrigation district such as SVID is organized, the idea is to provide irrigation water delivery to the entire area within the geographical boundary of the district. In order to pay for that designation, a fee is assessed on all lands within that area which carry a water right.

In other words, everyone in the area with a water right makes the irrigation service possible by paying for the right to receive water—whether they use the water or not.

Just like everyone in a given city might see their taxes used to pay for a certain stretch of sidewalk—they still get to pay, whether they will use the sidewalk or not, and the community benefits by having the sidewalk there—so the members who live there are actually paying for the right to use the sidewalk, whether they choose to use it or not.

According to Washington state law, irrigation districts can establish an annual assessment on all lands which carry a water right, whether or not the water is used.

Q. Why is my access to water limited?

A. Problems develop when acreage which was irrigated under the original system is platted into home sites. When a large piece of land is divided into smaller segments this may result in difficult or no access to the water delivery—but still having to pay a piece of the cost of that water right because the water right is still an obligation on that land. In this case, the water right isn't lost, it is just divided into smaller pieces.

SVID is responsible to deliver water to the point originally designated, and the landowner must take whatever steps are necessary to deliver water to his acreage—piping, pumping, or whatever. This puts the responsibility on the developers and landowners to develop their distribution system. Since 1985, state law permits irrigation districts the authority to require the construction of an irrigation distribution system as part of subdivision requirements.

Q. What's on the billing statement?

A. The assessment includes your parcel number, levy rate assessed, number of acres assessed, and amount due. Statements also tell you the beat, lateral, delivery, and number of acres on each delivery.

Q. The number of acres on my SVID bill is different than what the county shows, why is that?

A. Irrigation district acres may differ with the county acres because they are water right acres, not real estate acres.

Q. Questions?

A. Call 837-6980 or stop by the office during regular business hours to inquire about your assessment.

OFFICE CLOSURES FOR 1998

New Year's Day	Thursday, January 1, 1998
Presidents Day	Monday, February 16, 1998
Memorial Day	Monday, May 25, 1998
Independence Day	Friday, July 3, 1998
Labor Day	Monday, September 7, 1998
Veterans Day	Wednesday, November 11, 1998
Thanksgiving Day	Thursday, November 26, 1998 and Friday, November 27, 1998
Christmas Eve Afternoon	Thursday, December 24, 1998
Christmas Day	Friday, December 25, 1998

DID #3 Merger Approved

The second largest drainage improvement district (DID) in Yakima County, DID #3, with almost 8,000 acres, held an election on September 16, 1997, to merge with Sunnyside Valley Irrigation District. The vote was an emphatic "YES." Election results were:

613 – YES 184 – NO

The total drainage acreage now merged totals over 35,000 acres since 1990.

Drainage Improvement Districts were formed in the early 1900s with the building of drains and establishment of boundaries for both ground and surface water based on topography.

About five years ago, SVID offered the DIDs an opportunity provided by Washington State law allowing DIDs to merge with an irrigation district. There were about 18 DIDs and, to date, 11 of these have merged with SVID. These 11 represent about 75% of the total acres in Yakima County within DID boundaries.

Landowners benefit from the merger, receiving better service for less money. Before the merger the landowner would pay through county taxes and after the merger the costs of drainage are spread over the 75,000 acres within SVID. Landowners within merged DIDs have saved between $2-5 per acre on their county taxes.

There are proposals for two more mergers in the early stages. If these are completed, less than 6,000 acres will remain in DIDs.

The Sunnyside Valley Irrigation District publishes the **WATERFRONT** quarterly for landowners. All articles, letters and other items submitted to Sunnyside Valley Irrigation District (SVID) for use in SVID's landowner newsletter become the property of SVID which is authorized to use any item submitted, without payment or compensation to the person submitting the item, in any newsletter or other publication of SVID. SVID reserves the right to edit all items submitted. Douglas Simpson, Chairman. Robert Golob, Dave Michels, John Newhouse, Douglas Vining, Directors. Officers: James W. Trull, Secretary-Manager-Treasurer; Joseph Buchanan, Assistant Manager; Patricia Bailey, Assistant Secretary-Treasurer. Address comments to: Cyndi King, Editor, P.O. Box 239, Sunnyside, WA 98944.

Joint Project with Sunnyside Airport

Sunnyside Valley Irrigation District (SVID) and Roza Irrigation District are working with the Port of Sunnyside to install 1400 feet of drain pipe at the east end of the Sunnyside Airport runway. For the project, SVID and Roza will be contributing approximately $40,000 in labor and equipment. In addition to SVID and Roza's contribution, the Port of Sunnyside received a $82,000 grant from the state Department of Transportation and the City of Sunnyside is contributing all labor related to runway and lighting changes. This project will aid in the improvement of the safety level at the airport as well as help make the airport more attractive for development.

The partners in this project consist of the Port of Sunnyside, SVID, Roza, the Department of Transportation, and the City of Sunnyside. The irrigation districts are playing a major role in this project by donating the total project engineering as well as labor and equipment on sixty percent of the project.

Airplanes landing and taking off from the airport can experience problems due to a down draft caused by cold air created over the water in the drain. Piping of the waterway will eliminate this problem.

As partners in this project, SVID and Roza are assisting the efforts to increase industrial growth and continued economic stability for Sunnyside.

Policy continued from front page...

6. WATER QUALITY MONITORING

The BOJC will continue its water quality monitoring program with the following objectives:

- Identify the annual and seasonal TSS loads and other water quality characteristics of water diverted from the Yakima River into the BOJC.
- Identify the variation in water quality characteristics of water throughout the conveyance and delivery system.
- Identify TSS loads and other water quality characteristics of water discharged into BOJC project waterways.
- Determine the effectiveness of implementation of on-farm Best Management Practices.
- Provide quality control for individual water user water quality sampling programs as requested.
- Coordinate with other agencies in the collection and analysis of water quality data.

7. SEDIMENTATION PONDS AND WETLAND AREAS

The BOJC will pursue the planning, construction, and operation of sedimentation ponds and wetland areas into BOJC project facilities to improve the quality of water within and exiting the BOJC.

The BOJC is taking a proactive approach to improving water quality in the lower Yakima River. We must work together to improve water quality and to maintain the status quo with the threats of Endangered Species Act listings and stricter water quality standards looming.

THE WATERFRONT

Chris Coffin
Dept. of Ecology
15 W. Yakima Ave.
Yakima, WA 98902

September 1997 Volume 3, Number 3

A PUBLICATION OF SUNNYSIDE VALLEY IRRIGATION DISTRICT
120 South 11th Street ♦ P.O. Box 239 ♦ Sunnyside, WA 98944

Report Finds Yakima River Water Unacceptable

A report on pollution in the lower Yakima River has been released by the Washington State Department of Ecology, signaling major changes in water management for many farmers in the Yakima River basin. The basic finding of the report is that the lower Yakima River fails to meet state water quality standards. As a result, Section 303(d) of the Federal Clean Water Act requires the state to list this section of the river as an impaired water body and perform a Total Daily Maximum Load (TMDL) analysis with the goal of bringing the river into compliance with water quality standards.

> *"The most obvious sign of pollution in the lower Yakima is the muddy water entering the river at the mouths of irrigation return drains and tributaries."*
> —Chris Coffin, Department of Ecology

The report identifies sediment and the associated pesticide DDT as the river's biggest pollution problems. It details the amount and sources of sediment and DDT released to the river during the irrigation season, and sets limits and a schedule for reducing those pollutants. The goal is to restore the quality of the lower Yakima River water so that it meets state water quality standards.

"The most obvious sign of pollution in the lower Yakima is the muddy water entering the river at the mouths of irrigation return drains and tributaries," said Chris Coffin, Yakima River water quality project coordinator for the Washington State Department of Ecology.

"Our sampling indicates tens of thousands of tons of top soil are eroded from valley farms during the irrigation season. The soil is carried down the drains and ends up in the Yakima River. That's bad for agriculture and it's bad for the fishery that we're trying to restore in the river," Coffin said.

The new report is called *A Suspended Sediment and DDT Total Maximum Daily Load Evaluation Report for the Yakima River.* "Total Maximum Daily Loads" are estimates of the amount of specific pollutants that a body of water can safely take in without threatening the beneficial uses of the water such as stock water, irrigation, fishing, swimming and aesthetic enjoyment.

The report states that most of the sediment is eroded from farmland by poor irrigation management and is carried back to the river through the irrigation return drains. One of the recommendations from the report is for growers to convert to sprinkler and drip irrigation where appropriate to eliminate tail water runoff and the resulting topsoil erosion. The Department of Ecology believes the control of suspended sediment generation and transport during the irrigation season will result in far-reaching water quality and fish habitat improvements in the Yakima River basin.

Jim Trull, district manager of the Sunnyside Valley Irrigation District (SVID) said water quality is a priority for the recently created Board of Joint Control involving SVID and the neighboring Roza Irrigation District. "Our board believes it is better to move cooperatively to solve the problem than wait until there is rigorous enforcement. It is in our best interests to be good stewards of the water resources," Trull said.

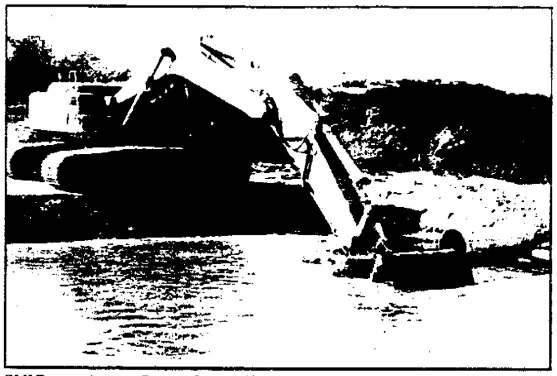
SVID, working through the Roza-Sunnyside Board of Joint Control, is working on the water quality problem. The board has installed two sedimentation basins near drains to allow the sediment to settle out of the water before the water returns to the Yakima River. In addition to the settling basins, the board is monitoring water samples using an on-site water quality specialist to pinpoint the sources of pollution.

For a copy of the executive summary of the report or a fact sheet on the Total Maximum Daily Load process on the Yakima River, contact Department of Ecology's Chris Coffin at (509) 454-7860.

Inside this issue:

Sedimentation Basin Update....2
Employee Joins 25-Year Club....2
SVID Welcomes Assistant Manager....3
Fall Construction Update....3
Irrigation Season Over....4
Flip Flop's Here Again....4
Water Use Information....4

Sedimentation Basins A Success



SVID employee Dave Gosnell removes sediment from Joint Drain 27.2

The sedimentation basins constructed in June as part of a Roza-Sunnyside Board of Joint Control (BOJC) project have been very useful to plan future actions by BOJC. To date, over 4,000 tons of sediment have been removed from the sedimentation basins located at Joint Drains 27.2 and 32.0.

Jim Trull, SVID district manager said, "When the sedimentation basin project was first discussed by the BOJC we knew it would have a positive impact on sediment reduction. At the time though, we had no idea how much material was being transported in the return flow."

But Trull said the sedimentation basins are only a temporary solution to a very large problem. "Irrigation districts and landowners are taking the problem of topsoil erosion and sediment-bearing return flows and trying to find a better solution." Trull said.

The irrigation return flow carries not only valuable topsoil, but also nutrients and agricultural chemicals. Hence, farmers lose valuable topsoil and fertilizer potential, while at the same time the irrigation water returning to the river contains sediment and chemicals.

Sedimentation basins allow particles in the water to "settle out" of the water. This means higher quality water returning to the river or the irrigation canals. According to Bill Rice, BOJC's water quality specialist, "Effectively designed sedimentation basins will capture soil and nutrients carried by irrigation runoff."

Jack Schaneman Joins 25-Year Club

Jack Schaneman is the newest member to join SVID's 25-year club. Jack celebrated 25 years with SVID on September 5. Due to his length of employment at SVID, he is number two on the union seniority list.

Jack Schaneman

Jack has held the same job at SVID over the years and some might wonder why he stayed in the same job, but it is rather simple. When you are good at what you do and have been doing it since you were young, why change? Jack has been running equipment since he was 10-years old.

He doesn't remember what he made when he first started at SVID, but he does remember getting paid only once a month. "When I first started at SVID, one of my jobs was roofing ditchriders' houses and also remodeling the insides of houses." Jack said. His job since as heavy equipment operator has involved laying pipe, cleaning drains and laterals, and driving the dump truck.

Jack has a great work attitude. "I have always done everything the best way and the quickest way. I never tried to goof off." Jack said.

Jim Trull, SVID's district manager had this to say about Jack, "I commend Jack for his 25 years of service to the district. He is a dedicated and valuable employee."

Jack has seen a lot of changes at SVID over the years, probably the most important of which is the equipment improvements. "Equipment has improved considerably over the past 25 years." Jack said. He said he thanks Jim Trull for the equipment improvements. Another improvement Jack has noticed is the wage increase. "Wages have improved a lot since I started here in 1972."

Jack and his wife, Cheryl, have been married for 34 years and have two children, Lisa, who lives in Zillah and Rod, who lives in Sunnyside right next door to his mom and dad. Jack is proud to say he also has a grandson, Chance.

Friendly Assessment Reminder

SVID will be mailing reminders for unpaid 1997 irrigation assessments next week. Remember, assessments become delinquent October 31 — Please check parcel numbers and payment records. Thank you!

SVID Welcomes its New Assistant Manager

Joe Buchanan has recently joined SVID as assistant manager, and we welcome him as the newest member of our team.

Joe received a Bachelor of Science in Mechanical Engineering from the University of Washington in 1983. For ten years, he served as Manager of Engineering for a manufacturing firm active in developing controls for coal, oil, and gas-fired boilers. During his tenure, Joe received four U.S. patents on specialized controls used in combustion processes.

In 1994, Joe and his family relocated to Yakima, where he started working with local farmers on water management in irrigated agriculture. "Moving my family back here to my wife's hometown fulfilled a long time personal goal," he says. "Having taken our vacations here for the last fifteen years, I have grown to love the Valley, its people, and its climate. Over this time, I have developed an abiding respect for the accomplishments of the region's agricultural industry."

SVID Manager Jim Trull is glad to have the position filled. "We are pleased to add Joe to our staff. He brings a lot of drive and enthusiasm to this position. In addition, with his background, he may bring some new perspectives on water management at a time when we are redirecting our focus on water conservation and water quality issues."

Joe is quite excited about his new position with SVID. "I'm proud to be affiliated with an organization that plays such a vital role in sustaining the region's agricultural economy." About his responsibilities, Joe says, "The role of the Assistant Manager is crucial to the daily operation of the District's facilities, and I take these duties quite seriously. However, I also hope to contribute to building a vision for the future that aids the District in meeting the challenges which will be posed over the next twenty years."

Joe Buchanan

Joe and his family currently reside in Yakima, where his wife Cathy is a social worker for Memorial Hospital's Home Health and Hospice. Joe and Cathy have three children and are now searching for a new home closer to the District's office in Sunnyside.

Improvements Planned for Off-Water Season

As the end of the water year approaches, SVID is formulating its plans for construction activity over the upcoming winter. SVID would like to take this opportunity to advise landowners in the district on major projects scheduled for this construction season.

As in previous seasons, a large part of SVID's construction efforts will be the continuation of projects which have seen much activity over recent years, such as the lateral piping program and the Sunnyside Canal Re-Alignment Project.

The lateral piping program, funded in part by Referendum 38 monies provided by the State of Washington, continues with the piping of 4,100 feet of open laterals and the repair or replacement of 17,500 feet now piped with concrete, wood, or clay materials.

The realignment program continues with work on Sunnyside Canal starting at Mile 17.10. This program is an ongoing effort to ensure the Sunnyside Canal holds to the existing right-of-way. Realignment consists of ensuring the canal is in the proper alignment, along with maintenance of canal banks and service roads above and below the canal.

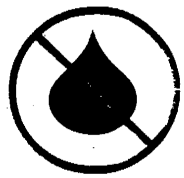
Another project which will get a great deal of attention is the continued maintenance, repair, and replacement of delivery structures throughout the district. As pipelines are replaced or realigned, delivery boxes are evaluated for maintenance.

Mile Post 60 on the Sunnyside Canal will be the site of work on a mechanized trash rack. In addition to fixing operational problems with the existing rack, SVID will be extending the trash conveyer to allow it to dump directly into a bunker. SVID expects this will reduce the labor necessary to handle the large amount of trash which accumulates at this point, and to reduce unpleasant odors encountered by landowners in the area.

Finally, SVID will be working on the Joint Drain 40.2 canal crossing structure near Factory and Edison Roads. This structure, erected in 1908, is nearing the end of its useful life.

Season Over Once Again

Well, the irrigation season is almost over. SVID board members will decide the official date at its October board meeting, which will be held this year on October 7.



Water turn-off is typically done around October 20. The date of the water turn off may not be the same day your water runs out, because it takes SVID about 10 days to completely "dewater" our system. This gradual decrease prevents damage that could occur to the distribution system.

The Sunnyside Valley Irrigation District publishes the **WATERFRONT** quarterly for landowners. All articles, letters and other items submitted to Sunnyside Valley Irrigation District (SVID) for use in SVID's landowner newsletter become the property of SVID which is authorized to use any item submitted, without payment or compensation to the person submitting the item, in any newsletter or other publication of SVID. SVID reserves the right to edit all items submitted. Douglas Simpson, Chairman. Robert Golob, Dave Michels, John Newhouse, Douglas Vining, Directors. Officers: James W. Trull, Secretary-Manager-Treasurer: Joseph Buchanan, Assistant Manager: Patricia Bailey, Assistant Secretary-Treasurer. Address comments to: Cyndi King, Editor, P.O. Box 239, Sunnyside, WA 98944.

Time For Flip Flop Again

Have you ever wondered why there are rapids and rafters on the Tieton in September, but you don't see them earlier in the year? The answer is FLIP FLOP!

Sometime during the beginning of every September, the reservoir system releases are switched (or "flipped") in order to protect salmon and still provide irrigation water storage.

It all started back in 1979 when the Yakama Indian Nation went to federal court complaining that reservoir cutbacks at the end of each irrigation season were killing thousands of salmon eggs each year.

Judge Justin Quackenbush ordered the United States Bureau of Reclamation (USBR) to find a way to protect salmon eggs with the least impact on water storage for irrigation.

So Flip Flop began. How it works: The water in Rimrock and Bumping Reservoirs is held in reserve until September, (with the exception of releases for Yakima-Tieton Irrigation District and other Naches River diverters) to meet the irrigation demands during spawning.

Lake Cle Elum and other Yakima River Reservoirs (Kachess, Keechelus) are used to provide most of the irrigation water through the middle of summer.

After Labor Day each year, the use of the reservoirs is "flip-flopped," that is, Cle Elum, Kachess and Keechelus flows are cut back and Rimrock and Bumping Reservoirs assume the responsibility for downstream needs (primarily Wapato Irrigation Project and the Sunnyside Division). By reducing reservoir releases, there is less water in the Yakima River. The fish are then forced to lay their eggs lower in the channel where they have a better chance for survival.

A benefit of the Flip Flop is the recreational opportunities created by increased flows in the Tieton River. After the Flip Flop, the Tieton becomes a popular location for whitewater enthusiasts throughout the Northwest.

How Much Water Do We Use?

Irrigating a 1/4-acre lawn during irrigation season – 6,500 gallons per week
Taking a bath or shower – 9-12 gallons
Washing the dishes by machine/hand – 8-13 gallons
Washing clothes – 35-50 gallons
Washing the car – 50 gallons
Brushing your teeth – 2-5 gallons
Cooking – 5-10 gallons
Drinking – 1/2 gallon
Flushing the toilet (once) – 4-7 gallons
Leaking toilet (per day) – 60 gallons

SVID Goes To The Fair

The Roza-Sunnyside Board of Joint Control will be part of a display at this year's Central Washington State Fair. The theme of the display is "Partnership in the Yakima River Watershed." The Fair, which will take place in Yakima, starts September 19 and runs through September 28. Please stop by and learn more about the Board of Joint Control's Water Quality Program.

BULK RATE
Permit No. 50
Sunnyside, WA 98944

RSBOJC UPDATE

Chris Coffin
Dept. of Ecology
15 W. Yakima Ave.
Yakima, WA 98902

March 1998

Volume 1, Number 1

A PUBLICATION OF ROZA-SUNNYSIDE BOARD OF JOINT CONTROL
P.O. Box 810 ♦ Sunnyside, WA 98944

Welcome to the RSBOJC Newsletter

The Roza-Sunnyside Board of Joint Control would like to welcome you to the first issue of its newsletter. Through the *RSBOJC Update*, the board can keep landowners up-to-date on water issues, district policy changes, and board activities. The newsletter will be produced twice a year, in March and September. We welcome your comments and suggestions for future newsletter articles.

What is the Roza-Sunnyside Board of Joint Control?

In 1994, a group of landowners approached the state's fifth and sixth largest irrigation districts and suggested forming a joint committee to begin addressing similar concerns of both districts. The Roza-Sunnyside Board of Joint Control is the realization of an idea developed by the landowner group.

How was the Joint Board formed?

After successfully getting enabling legislation passed, the landowner group petitioned the Board of County Commissioners in the county of jurisdiction to form the Roza-Sunnyside Board of Joint Control. The petition was followed by a public hearing process, after which the county commissioners approved the petition. The "Yakima County Board of Joint Control #1" was approved August 13, 1996.

Who is on the Roza-Sunnyside Board of Joint Control?

The first directors were appointed by the county commissioners. The Roza-Sunnyside Board of Joint Control is composed of the five Roza Irrigation District directors, five Sunnyside Valley Irrigation District directors, and two members from other entities in the Sunnyside Division.

What is the Roza-Sunnyside Board of Joint Control's mission?

To implement a program to enhance water supplies by supporting storage development, improving water quality, and increasing management efficiency. The Board's goal is to achieve the following within ten years:

- System improvements such as canal automation, regulating reservoirs, and closed conduit delivery systems and additional storage which will protect existing rights while providing higher quality and more reliable irrigation service to Sunnyside Division landowners:
- Water savings sufficient to support the goal of furnishing at a minimum, 75% of entitlement to Roza Irrigation District landowners in all years:
- Compliance with the total maximum daily load process for return flows discharging from lands under Roza-Sunnyside Board of Joint Control jurisdiction.

Why have a Roza-Sunnyside Board of Joint Control?

A Board of Joint Control provides a structure for the two entities to combine resources where it is appropriate, feasible, and to the advantage of both, while maintaining their separate respective authorities and responsibilities.

A Board of Joint Control allows each district:

- Operational efficiencies
- Financial strength
- Representation
- Shared information

The Board of Joint Control allows Roza Irrigation District and the Sunnyside Division to work together in ways that we have not been able to before—without changing the structure of either entity. Roza Irrigation District serves 72,600 acres and the Sunnyside Division serves 103,570 acres.

Inside this issue:

New Water Quality Policy 2
Roza Irrigation District Corner 3
Sunnyside Valley Irrigation District Corner ... 3
Educational Meetings Held 4
RSBOJC Receives Award 4

RSBOJC Sets Water Quality Policy

For the past several months, the Roza-Sunnyside Board of Joint Control (RSBOJC) has been busy discussing how to improve water quality in the lower Yakima River. Working with state and federal agencies, the RSBOJC looked at water quality problems associated with irrigation and determined corrective measures to help improve water quality. Below is the recently adopted Roza-Sunnyside Board of Joint Control Water Quality Policy which will take effect in 1998.

1. DISCHARGES TO PROJECT WATERWAYS OF THE RSBOJC

All discharges into project waterways (canals, laterals, drains, and wasteways operated and maintained by a RSBOJC member and for which an easement or right of way exists) shall require a discharge permit from the appropriate RSBOJC member. The discharge permit will provide among other things, for:

- Maintenance of the piped inlet by the discharger so that it remains operational in a manner that no erosion occurs to the project waterway.
- Establishment of water quality parameters for the discharged water.
- The termination of the discharge permit and the right to discharge into the waterways upon non-compliance of its terms and conditions.

2. IRRIGATION RUNOFF

All irrigation runoff from lands within RSBOJC boundaries must comply with acceptable water quality parameters established by the RSBOJC.

- Beginning with the 1998 irrigation season, the RSBOJC will monitor discharge into project waterways and record turbidity levels above 25 NTU (current TMDL goal of waters discharging to the Yakima River). Such observation will be considered a water quality violation.
- In the event RSBOJC personnel observe a water quality violation, the landowner will be notified of the noncompliance by mail and requested to agree to a Short and Long Term Compliance Plan. The landowner, after notification, must sign and submit Compliance Plans prior to the 1999 irrigation season. These plans will include proposed practices or projects to bring the runoff water into compliance and a time schedule for implementation. These plans will be tied to a drain inlet or series of inlets and will address proposed practices on a field by field basis. The Compliance Plans will be signed by the landowner and approved by the RSBOJC.
- In 1999, landowners will be required to begin implementing their respective Compliance Plans.

3. BUFFER ZONES FOR RSBOJC WATERWAYS

Buffer zones consisting of project operation and maintenance roads or no till-no grazing areas will be required on both sides of RSBOJC project waterways.

- Fencing: Livestock grazing will be eliminated on project waterways. The RSBOJC will put the initial emphasis on the Joint Drain system. Priority for fencing will be on the basis of water quality protection and operation and maintenance of project waterways.
- No-till zones: The landowner will be required to install a farm drainage ditch and drain inlets as needed to provide a no-till zone typically 20 feet wide from the top of the bank to the edge of the farm operation. Actual width requirements may vary depending on the size of the waterway.
- Enforcement of buffer zones will be promoted by the enforcement of water quality standards, exercising the right to existing rights of way and easements, education, and financial assistance.

4. RUNOFF INTO COUNTY BORROW DITCHES

The RSBOJC will, with Yakima and Benton Counties, develop strategies to regulate runoff into borrow ditches.

5. WATER USER AWARENESS PROGRAM

The RSBOJC, in cooperation with appropriate Federal, State, County, and River Basin entities, will formulate and implement a water user awareness program related to effective on-farm water management.

6. WATER QUALITY MONITORING

The RSBOJC will continue its water quality monitoring program with the following objectives:

- Identify the annual and seasonal TSS loads and other water quality characteristics of water diverted from the Yakima River into the RSBOJC.
- Identify the variation in water quality characteristics of water throughout the conveyance and delivery system.
- Identify TSS loads and other water quality characteristics of water discharged into RSBOJC project waterways.
- Determine the effectiveness of implementation of on-farm Best Management Practices.
- Provide quality control for individual water user water quality sampling programs as requested.
- Coordinate with other agencies in the collection and analysis of water quality data.

7. SEDIMENTATION PONDS AND WETLAND AREAS

The RSBOJC will pursue the planning, construction, and operation of sedimentation ponds and wetland areas into RSBOJC project facilities to improve the quality of water within and exiting the RSBOJC.

The RSBOJC is taking a proactive approach to improving water quality in the lower Yakima River. We must work together to improve water quality and to maintain the status quo with the threats of Endangered Species Act listings and stricter water quality standards looming.

Roza Corner (for RID customers)

Message from the Manager to Roza Irrigation District customers:

I want to take this opportunity before we begin the 1998 irrigation season to remind everyone receiving water through a flow meter of the new regulations that take effect this year. No water will be delivered through any flowmeter unless the farm operator has his own worm gear driven control valve in place beyond district facilities.

I would also like to clear up some confusion on the flow restrictions that are being implemented. A maximum draw of 15 g.p.m. (gallons per minute) will be allowed on any flowmeter delivery. This does not mean that you can get 15 g.p.m. all the time. The systems are designed for 7.5 g.p.m. per acre and that is what your system should be designed for. If everyone on a particular system is drawing their entitlement, 7.5 g.p.m. is all you are likely to get. When fewer people are drawing you may be able to receive more, up to a maximum of 15 g.p.m. Designing your system for too high of flow requirements will definitely become a problem for you at certain times during the season, most likely when you need it the most as that is when everyone else will be running also.

One last reminder, as is always necessary. Reclamation forms must be completed and assessments paid before water will be delivered after April 1. Hope you all have a productive and prosperous season.

RSBOJC Meetings Open to All

This is a reminder that Roza-Sunnyside Board of Joint Control meetings are open to the public. Meetings are held on the third Tuesday of every month at 9:30 a.m. at the Sunnyside Valley Irrigation District office located at 120 South Eleventh Street in Sunnyside.

SVID Corner (for SVID customers)

Sunnyside Valley Irrigation District would like to remind its customers that if a water emergency occurs after regular business hours, please call the district's office number at 837-6980. The Voice Response Unit guides the caller through a series of options. Press "3" for emergency service.

CLIP & SAVE

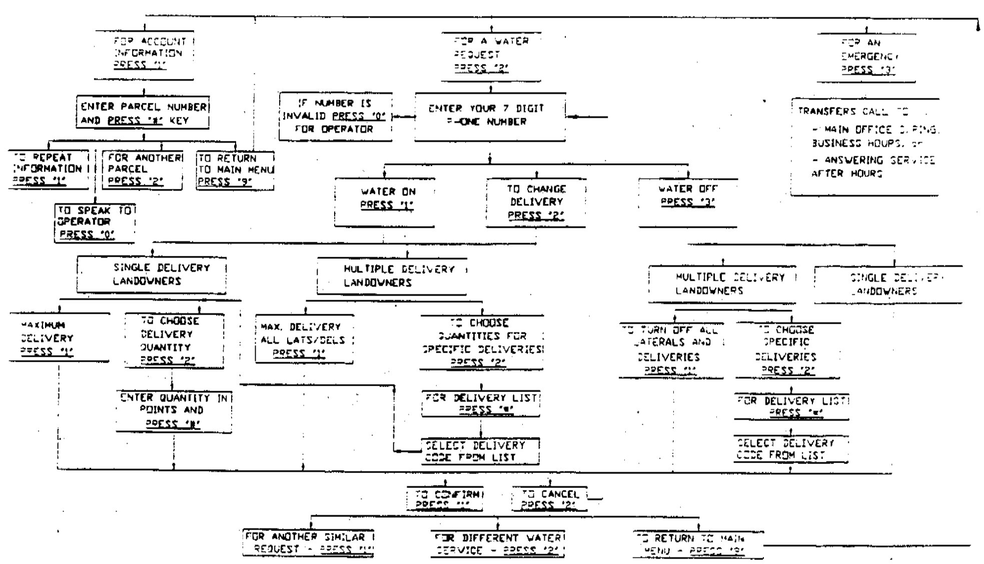
Sunnyside Valley Irrigation District

WATER ORDERING SYSTEM

TO ORDER WATER, PLEASE CALL 854-1540, 837-8611 OR 882-4343

TIP #1: When you are at a menu and you know the number of your selection, you may press it at any time. You do not need to wait until all selections have been given.

TIP #2: Some push-button phones have a Tone-Pulse switch. This must be in the "Tone" position to allow menu selection.



Landowner Meetings Held

In January and February, the RSBOJC held several landowner education meetings. The purpose of the meetings was to present information on the challenges facing today's irrigators and give ways to help improve water quality.

A representative from the RSBOJC provided an overview of the Board's recently adopted Water Quality Policy. Bob Stevens with Washington State University's Irrigated Agriculture Research and Extension Center presented on-farm best management practices.

Meeting topics included Water Quality Issues, RSBOJC's Water Quality Policy, District Programs and Projects, and Landowner Solutions (including funding sources).

For the first set of meetings, landowners in the Granger Drainage Basin were invited. Other areas will be addressed in the coming months. If you would like to learn more about improving water quality, the following agencies may be contacted for technical assistance:

Benton County Conservation District	Pat Daly	786-9230
Natural Resource Conservation Service	Chris Johnson	829-3003
	Cal Aylsworth	829-3003
	Jay Kehne	454-5736
	Rick Beck	786-1923
North Yakima Conservation District	Mike Tobin	454-5736
South Yakima Conservation District	Judith Vesper	837-7911
Washington State Department of Ecology (Ag Water Quality Education)	Jane Tonkin	454-7894
Washington State University at Prosser (Cooperative Extension)	Bob Stevens	786-9231

The Roza-Sunnyside Board of Joint Control (RSBOJC) publishes the **RSBOJC UPDATE** biannually for landowners. All articles, letters and other items submitted to RSBOJC for use in its landowner newsletter become the property of RSBOJC which is authorized to use any item submitted, without payment or compensation to the person submitting the item, in any newsletter or other publication of RSBOJC. RSBOJC reserves the right to edit all items submitted. Ric Valicoff, Chairman; Douglas Simpson, Vice-Chairman. Robert Golob, Ken Lisk, Dave Michels, Mike Miller, David Minick, John Newhouse, Dean Sizer, Douglas Vining, Harry Visser, Jim Willard, Directors. Officers: Ron Van Gundy, Secretary; James W. Trull, Treasurer. Address comments to: Cyndi King, Editor, P.O. Box 239, Sunnyside, WA 98944.

Board Receives Environmental Award

Governor Gary Locke recognized the Roza-Sunnyside Board of Joint Control on February 12 for taking aggressive action to improve water quality in the Yakima River. Gov. Locke presented the Environmental Excellence Award before a large audience at a Rotary meeting in Yakima.

The Board adopted the water quality policy at its January board meeting. The complete text of the new policy is presented on page 2 of this newsletter. The policies are designed to improve the quality of water that leaves farms and flows to the Yakima River via return drains. The goal is to meet the water quality cleanup goals set by Ecology for the lower Yakima River.

"I'm proud of the courage and foresight the Board of Joint Control has shown," said Tom Fitzsimmons, director of the Department of Ecology. "The board's vision and its willingness to take on these problems is exactly the kind of leadership Washington state needs right now to solve the state's serious water quality problems."

Board Director Doug Simpson said the board believes in taking action to deal with problems facing irrigated agriculture.

"The directors have worked hard to develop the water quality policies," Simpson said. "We know it will take some hard work and money to achieve our goals, but we must do this together."

Environmental Excellence Awards recognize special efforts to protect or enhance Washington's environment. Ecology reserves the honor for those who have shown exceptional initiative or innovation.

Pictured from left to right: Jim Willard, Dave Michels, David Minick, Doug Simpson, Mike Miller, Ric Valicoff, John Newhouse, Gov. Gary Locke, Bob Golob, Ken Lisk, and Doug Vining.

SUNNYSIDE VALLEY IRRIGATION DISTRICT
120 S. 11th
P.O. Box 239
509-837-6980 Sunnyside, Washington FAX 509-837-2088
98944
July 30, 1998

RECEIVED
JUL 31 1998
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Dear

As all waterusers have been previously notified, the Roza-Sunnyside Board of Joint Control has adopted policies relative to the implementation of a water quality program. The policy as set by the Board of Directors, is consistent with the Total Maximum Daily Loading goal set by the Department of Ecology for the lower Yakima River. This requires that runoff from agricultural lands discharging into project waterways does not exceed 25 NTU.

With the board's water quality monitoring program, samples have been collected from field runoff sites where visual observation indicated non-compliance with the standard. Samples have been collected for your farm (parcel numbe[redacted] with turbidity levels on three occasions exceeding 25 NTUs. The dates and sample results are as follows:

May 14, 1998	4000
June 12, 1998	3023
June 24, 1998	4000

Consistent with the board's policy, we are asking that you prepare a compliance plan to be submitted to the Board for approval. This plan will identify what measures you propose to take to come into compliance and the time frame for doing so. Your compliance plan must be submitted and approved by the Board of Directors prior to receiving water for the 1999 irrigation season.

If you would like to help in developing your plan we suggest you call Bob Stevens at WSU Extension (509) 786-2226, or Ryan Anderson at Department of Ecology (509) 575-2800, or others. If you are within the Granger Drainage basin some financial assistance may be available to you for implementation. For questions about financial assistance or procedures in filing you compliance plan, please contact Lori Brady in this office.

Sincerely,

James W. Trull
District Manager

Enclosures

c: Don Schramm, Assistant Manager (SVID)
Robert Hood
Bob Stevens (WSU Extension)
Ryan Anderson (DOE)
Lori Brady (SVID)

Irrigation Feeds the Nation

APPENDIX 8

PROPOSED 1998 IRRIGATION SEASON WATER QUALITY MONITORING PLAN

Season

- Early-April through mid-October 1998.

Sampling Frequency

- Two-week intervals, unless indicated otherwise.

Parameters Measured

- Discharge (or stage reading with rating curve).
- Field measurements (temperature, dissolved oxygen, pH, and specific conductance).
- RS-BOJC laboratory measurements (turbidity, total suspended solids, fecal coliform)
- U.S.B.R. laboratory measurement of nutrients (total phosphorus, nitrite plus nitrate, total kjeldahl nitrogen, and ammonia if kjeldahl nitrogen is ≥ 5 mg/L as nitrogen).

Site Locations

- Mouth of tributaries to Yakima River (sites 24-27; 1997 monitoring program).
- Diversion of Roza and Sunnyside Canals from the Yakima River. Samples taken at two-week intervals during early spring through snowmelt runoff, then monthly for the remainder of the season. Discharge will be estimated from waters diverted.
- Main canal sites located near Beam Road, Hanford Highway, and Gap Road. Samples taken at two-week intervals during early spring through snowmelt runoff, then monthly for the remainder of the season. Discharge will be estimated by the appropriate watermasters.
- Sampling sites monitored in the Granger Drain HUA during 1997, and those to be monitored in the 1998 season, include the following: 1, 3, 4, 5, 7, 9, 11, 12, 15, 17, 19, 20, 22, 23, plus one additional site located in DID #2.
- Reserving approximately 15% of monitoring effort in contingency to quantify water quality conditions identified during the irrigation season. Examples of such monitoring efforts may include 1) short-term (synoptic) sampling of all drains and tributaries into the Yakima River from RS-BOJC drainage areas, 2) short-term (synoptic) sampling of spur-drains (DIDs) within the current monitoring area, with emphasis on those which contribute significant loads, or 3) quantify the quality of water in outfalls to the Roza and Sunnyside Canals.

Roza-Sunnyside Board of Joint Control

P.O. Box 810 ■ Sunnyside, WA 98944 ■ (509) 837-5141 ■ FAX: (509) 837-8541

Date: May 7, 1997

To: Members of the Water Quality Advisory Group

From: William Rice

Subject: Roza-Sunnyside Board of Joint Control Water Quality Monitoring Program

The Water Quality Advisory Group will meet in the office of the Sunnyside Valley Irrigation District on Tuesday, May 13, 1997 at 9:00 a.m. Enclosed is a copy of 1) the objectives of the RS-BOJC water quality monitoring plan and 2) proposed sampling sites (i.e., name, location, maps, etc.), sampling schedule and frequency, and protocols (i.e., sample collection and handling, quality control, etc.) developed by Stuart McKenzie and myself for your review and input at our meeting.

See you then.

Objectives

The Roza-Sunnyside Board of Joint Control (RS-BOJC) has a long-term objective of determining how management activities by the irrigation districts and land-use and water-use practices by landowners affect water quality conditions in agriculture drains, which, in turn, impact the overall water quality in the Yakima River. The RS-BOJC has a goal of bringing these drains into compliance with the recent total maximum daily load (TMDL) guidelines provided by the Washington Department of Ecology (Ecology).

The RS-BOJC has tasked Bill Rice with developing a water quality monitoring plan to accomplish this objective. Activities that are likely to be important include identifying best management practices (BMPs) which:

- Reduce soil erosion and sediment loading to the Yakima River.

- Reduce biological loading (fecal coliform) through better waste management practices and waste application methods at confined animal operations (dairies and feedlots).

- Reduce nutrient (phosphorus and nitrogen) losses from the root zone and subsequent loading.

- Increase irrigation-use efficiency and reduce the quantity of water needed through diversions.

- Promote ecological habitats and enhance desirable biological diversity along agricultrure drains by reducing conditions which affect temperature, dissolved oxygen, and pH.

The goals of the RS-BOJC and the TMDL process should, in the long-term (decade of time), afford the following:

- Decreases in turbidity levels and total suspended solids and fecal coliform concentrations (meeting TMDL guidelines and State water quality standards).

- Decrease flows in agriculture drains with less water diverted from the Yakima River.

- Decrease in water temperature and pH levels.

- Increases in dissolved oxygen concentrations.

- Increases in ecological conditions.

In addition to the collection and analysis of samples, the monitoring plan will include the following activities:

- Coordinate with other agencies collecting water quality data including: Ecology, United States Bureau of Reclamation (BOR), South Yakima Conservation District (SYCD), Benton Conservation District (BCD), North Yakima Conservation District (NYCD), Washington State University Cooperative Extension (WSU), Yakama Indian Nation (YIN), Kittitas Reclamation District (KRD), and others.

- Share data with all participants interested in RS-BOJC data.

- Ensure that all data collection, analysis, and data management protocols are consistent with other participating agencies.

- Identify a quality assurance/quality control (QA/QC) plan to quantify the quality of data collected which is consistent with other participating agencies.

I. <u>Roza-Sunnyside Board of Joint Control Water Quality Monitoring Plan Protocols</u>

The protocols used will, in general, be taken from existing protocols established by the U.S. Geological Survey (USGS), American Public Health Association (SM), U.S. Environmental Protection Agency (USEPA), and Washington Department of Ecology (Ecology).

1. <u>Sample collection</u>

   - USGS Western Region Field Manual (Sylvester et al., 1990)

2. <u>Sample preservation, handling, and shipping</u>

   - USGS National Field Manual for the Collection of Water-Quality Data (Wilde et al., 1997)

3. <u>Sample analysis</u>

   A. *Field measurements (pH, temperature, dissolved oxygen, specific conductance)*

      - USGS National Field Manual for the Collection of Water-Quality Data (Wilde and Radtke, 1997)

   B. *Total suspended solids (laboratory)*

      - SM 2540D

   C. *Ratio turbidimetery (laboratory)*

      - Ecology

   D. *Fecal coliform (laboratory)*

      - SM 9222D
      - USGS Western Region Field Manual (Sylvester et al., 1990)

   E. *Nutrients (USBR laboratory)*

      Total Kjeldahl nitrogen (TKN)

      - USEPA 351.2

Total phosphorus (TP)

- USEPA 365.3

Nitrate plus nitrite (NO_{3+2})

- USEPA 353.2

F. *Discharge*

- USGS Techniques for Water Resource Investigations (Smoot and Novak, 1968)

4. Data management

All environmental data will be stored in a suitable spreadsheet at the Sunnyside Valley Irrigation District main office. The spreadsheet will be capable of formatting the data for both statistical and graphical analysis, and allow for the dissemination of data and information to interested agencies. Nutrient data obtained by the USBR regional laboratory (Boise, ID) will also be stored and available through Storet (USEPA). All quality control data will be stored in a separate spreadsheet. All environmental data will include the following meta data: station name and number, date and time of sample collection, and location (latitude and longitude).

5. Quality control (QC) data

A. *Field measurements (pH, temperature, dissolved oxygen, specific conductance)*

- 10% of the measurements will be sequentially replicated

B. *Total suspended solids (laboratory)*

- Ten percent of the samples will be replicated by sub-sampling.
- Ten percent of the samples will be replicated in the field.
- Five percent of the samples will include standard reference materials of known concentration (provided by USGS or Ecology).
- Five percent of the samples will include blanks (field).
- Four samples per year (quarterly) will be split with an independent laboratory.

C. *Ratio turbidimetery (laboratory)*

- Same as for total suspended solids.

D. *Fecal coliform (laboratory)*

- Ten percent of the samples will be replicated by sub-sampling.
- Ten percent of the samples will be replicated in the field.
- Five percent of the samples will include blanks (contamination in dilution water).
- Four samples per year (quarterly) will be split with an independent laboratory.
- Four samples per year (quarterly) will be split from an independent source and analyzed in-house.

E. *Nutrients (USBR laboratory)*

- Ten percent of the samples will be replicated in the field.
- Five percent of the samples will include blanks (field), spikes, and standard reference materials.

F. *Discharge*

- Ten percent of all measurements will be replicated at the same cross section or at an alternate cross section.

II. <u>List of sampling sites, schedule (start date), and frequency</u>

See Table I and maps incluced.

Table I Overview of Sampling Sites, Schedule, and Frequency

Site Name	Site No.	Map ID No.	Location and Description	Lat/Long	Sampling Schedule (Start Date)	Sampling Freq Irr/non-Irr
JD 26.6 at Knowles Road and SS main canal	BOJC26.6-1	1	Joint Drain 26.6 above Sunnyside main canal at concrete intake into conduit and siphon . Access through Knowles Road on the East and dirt road in orchard from the South.	To be determined	Start 5/19/97 (Mon.)	biweekly/monthly
JD 26.6at Snyder Road	BOJC26.6-2	2	Joint Drain 26.6 on the South side of Snyder Road where the drain is culverted under the road.	"	Start 5/19/97 (Mon.)	"
JD 26.6 at I-82 access ramp	BOJC26.6-3	3	Joint Drain 26.6 on the South side of the I-82 access ramp (from Granger) where the drain is culverted under the freeway.	"	Start 5/19/97 (Mon.)	"
JD 27.2 at intake to settling pond	BOJC27.2-1	4	Joint Drain 27.2, South of Knowles Road and directly above the Sunnyside main canal at the intake of the proposed settling pond (to be constructed in 1997).	"	To be determined	"
JD 27.2 at outlet of settling pond	BOJC27.2-2	5	Joint Drain 27.2, South of Knowles Road and directly above the Sunnyside main canal at the outlet of the proposed settling pond (to be constructed in 1997).	"	To be determined	"
JD 27.5 at Hudson Road	BOJC27.5-1	6	Joint Drain 27.5 on the South side of Hudson Road where the drain is culverted under the road.	"	Start 5/19/97 (Mon.)	"
JD 27.5 at VanBelle Road	BOJC27.5-2	7	Joint Drain 27.5 on the South side of Van Belle Road where the drain is culverted under the road.	"	Start 5/19/97 (Mon.)	"

JD 27.5 at Cherry Hill Road and I-82	BOJC27.5-3	8	Joint Drain 27.5, 750 feet East of Bagley Road and North of Cherry Hill Road, near the I-82 span over the railroad tracks.	"	Start 5/19/97 (Mon.)	"
JD 28.0 at Outlook Canal	BOJC28.0-1	9	Joint Drain 28.0 directly above the Outlook Canal (West lateral), East of Price Road with access along the canal.	"	Start 5/20/97 (Tue.)	"
JD 28.0 at Independence Road & SS main canal	BOJC28.0-2	10	Joint Drain 28.0 on the South side of Independence Road, near the concrete sill where the drain is culverted under the road, and directly above the Sunnyside main canal.	"	Start 5/20/97 (Tue.)	"
JD 28.0 at Hudson Road	BOJC28.0-3	11	Joint Drain 28.0 on the North side of Hudson Road before the drain is culverted under the road.	"	Start 5/20/97 (Tue.)	"
JD 28.0 at Yakima Valley Highway	BOJC28.0-4	12	Joint Drain 28.0 on the South side of the Yakima Valley Highway where the drain is culverted under the highway.	"	Start 5/20/97 (Tue.)	"
JD 28.0 at Liberty Road & Yakima Valley Highway	BOJC28.0-5	13	Joint Drain 28.0 South of Liberty Road, Yakima Valley Highway, and railroad tracks, upstream of culvert and below inflow on left bank of drain.	"	Start 5/20/97 (Tue.)	"
JD 31.0W at Phipps Road & Outlook Canal	BOJC31.0W-1	14	Joint Drain 31.0W South of Phipps Road and below the Outlook Canal (West lateral) where the drain is culverted under the road.	"	Start 5/20/97 (Tue.)	"
JD 31.0W at Hudson Road & Snipes Mnt. Lat.	BOJC31.0W-2	15	Joint Drain 31.0W 50 feet East of drainage into Snipes Mountain Lateral along Hudson Road.	"	Start 5/20/97 (Tue.)	"
JD 31.0E at Outlook Canal	BOJC31.0E-1	16	Joint Drain 31.0E 50 feet South of Outlook Canal siphon (East lateral) and below inflow on left bank of drain.	"	Start 5/21/97 (Wed.)	"

JD 31.0E at Reeves Road	BOJC31.0E-2	17	Joint Drain 31.0E South of Reeves Road where the drain is culverted under the road.	"	Start 5/21/97 (Wed.)	"
JD 32.0 at Independence Road	BOJC32.0-1	18	Joint Drain 32.0 North of Independence Road before drain is culverted under the road.	"	Start 5/21/97 (Wed.)	"
JD 32.0 at intake to settling pond	BOJC32.0-2	19	Joint Drain 32.0, 1/4 mile East of Fordyce Road along the North side of the Sunnyside main canal at the intake of the proposed settling pond (to be constructed in 1997).	"	To be determined	"
JD 32.0 at outlet of settling pond	BOJC32.0-3	20	Joint Drain 32.0, 1/4 mile East of Fordyce Road along the North side of the Sunnyside main canal at the outlet of the proposed settling pond (to be constructed in 1997).	"	To be determined	"
JD 32.0 at Fordyce Road	BOJC32.0-4	21	Joint Drain 32.0 East side of Fordyce Road where the drain is culverted under the road.	"	Start 5/21/97 (Wed.)	"
JD 32.0 at VanBelle Road & Snipes Mnt. Lateral	BOJC32.0-5	22	Joint Drain 32.0 North side of Van Belle Road and 50 feet West of Snipes Mountain Lateral where the drain is culverted under the lateral.	"	Start 5/21/97 (Wed.)	"
JD 32.0 at Yakima Valley Highway & JD 28.0	BOJC32.0-6	23	Joint Drain 32.0 South side of the Yakima Valley Highway, 50 feet upstream of the confluence of Joint Drain 32.0 into 28.0.	"	Start 5/21/97 (Wed.)	"
Granger Drain at Sheep Barn	GDO-1	24	Town of Granger where the drain is culverted under the dirt road between the former sheep barns and truck weigh scale.	"	Start 5/27/97 (Tue.)	"
Sulphur Creek Wasteway at Holaday Road	SCW-1	25	South of Sunnyside on Holaday Road and East of Midvale Road where the bridge spans over the wasteway.	"	Start 5/27/97 (Tue.)	"

Spring Creek at Hess Road & Chandler Canal	SpC-1	26	100 feet West of Hess Road and below the Chandler Canal at the concrete apron where the creek is culverted under the canal.	"	Start 5/28/97 (Wed.)	"
Snipes Creek at Railroad Bridge	SnC-1	27	1,400 feet East of Hess Road, directly below the old Burlington Northern Railroad bridge.	"	Start 5/28/97 (Wed.)	"

Roza-Sunnyside Board of Joint Control
Water Quality Monitoring Plan

William Rice (SVID/RID)
Stuart McKenzie (USGS)

April 7, 1997

1. Questions of Interest

Question 1:

a. What is the seasonal and spatial variability of constituent concentrations and levels among the major drainage outlets (Granger Drain, Sulfur Creek, Spring Creek, and Snipes Creek) to the Yakima River mainstem with respect to the **water quality parameters of interest** [total suspended solids (TSS), turbidity, fecal coliform (FC), nutrients, dissolved oxygen (DO), pH, temperature, and specific conductance (SC)]?

b. What is the difference between the irrigation and non-irrigation seasons?

c. What are the long-term trends in the data?

d. Does the data exceed state standards?

e. How does the concentration measured relate to discharge?

f. What is the relationship between turbidity and TSS?

Question 2:

a. What are the loads (lb/day) and yields (lb/acre/day) at the major drainage outlets (Granger Drain, Sulfur Creek, Spring Creek, and Snipes Creek) to theYakima River mainstem with respect to TSS, FC, and nutrients?

b. What are the sources or causes within a given hydrologic unit area (HUA) which are responsible for the variability in constituent loads and yields?

c. What is the difference between the irrigation and non-irrigation seasons with respect to loads and yields?

d. What are the long-term trends with respect to loads and yields?

e. What is an estimation of the errors associated with calculating loads and yields?

Question 3:

a. What is the seasonal and spatial variability of constituent concentrations and levels, loads, and yields within the Granger, Sulfur Creek, Spring Creek, and Snipes Creek HUAs for the water quality parameters of interest?

b. What are the sources or causes within a given HUA which are responsible for the variability in constituent loads and yields?

c. What is the difference between irrigation and non-irrigation seasons?

d. What are the long-term trends in the data?

e. Does the data exceed state standards?

f. How does the concentration measured relate to discharge?

g. What is the relationship between turbidity and TSS?

Question 4:

a. How effective are sedimentation ponds at reducing TSS, turbidity, FC, and total phosphorus (TP) levels in irrigation return flows?

b. What percent of the constituents are retained or not retained by the sedimentation ponds?

c. How was the effectiveness of a particular sedimentation pond related to the independent variables within a given drainage sub-basin (e.g., soil type, stream and land gradients, land-use practices, irrigation methods, water use, drainage acreage, the number of confined animal operations, the total number of animals associated with each operation, etc.).

Question 5 (Emergency Response):

What is the magnitude of constituent concentrations, levels, and loads for spills at point and non-point source discharges observed in the field (Granger and Sulfur Creek HUAs) with respect to the water quality parameters of interest?

Question 6:

a. What is the variability in concentration along the length of the Roza and Sunnyside main canals for the water quality parameters of interest? (What is the quality of water being delivered to farmers in each district?)

b. What are the likely sources or causes of change in water quality along the main canals?

c. What are the long-term trends in the data?

d. Does the data exceed state standards?

e. What is the relationship between turbidity and TSS?

Question 7:

a. What is the range in concentrations, levels, and loads over storm events at key sites in the Granger and Sulfur Creek HUAs (identified in Questions 1 & 2) for TSS, turbidity, FC, and nutrients?

b. What is the difference between the irrigation and non-irrigation seasons?

c. What are the long-term trends in the data?

d. Does the data exceed state standards?

e. How does the concentration measured relate to discharge?

f. What is the relationship between turbidity and TSS?

Question 8:

a. What is the effectiveness of reducing the concentrations and levels of the constituents of interest through on-farm management activities or BMPs (e.g., drip, sprinkler, micromist, and surge-flow irrigation practices, implementation of mulches, PAM, grassed wasteways and drainages, riparian buffers, and other practices)?

b. What percent of the upstream drainage basin must be effected by BMPs for there to be a measurable change in the associated agricultural drains with respect to the water quality parameters of interest?

Question 9:

What is the diel variability during the irrigation and non-irrigation seasons at key sites in the Granger and Sulfur Creek HUAs (identified in Questions 1 & 2) for the water quality parameters of interest?

Question 10:

a. What are the biological (ecological) characteristics and indicators at the sites monitored (e.g., habitat of stream banks and streambeds, size of bed materials, embeddedness of streambeds, stream gradients, shading, populations of periphyton, phytoplankton, benthic invertebrates, and fish, the complexity of aquatic habitats, etc.)? Consider concentration of nutrients, as well as the concentrations of TSS and nutrients, and diel measurements of turbidity, DO, pH, and temperature.

b. How have biological (ecological) characteristics and indicators changed in agricultural drains? Consider low-frequency sampling (once every five years) with a high number of replicates. Distributions will be compared over five year periods.

2. Questions, Hypotheses, and Methods of Analysis for the Proposed Water Quality Monitoring Program

Question 1 - Granger Drain, Spring Creek, and Snipes Creek (Concentrations and Levels):

a. What is the seasonal and spatial variability of constituent concentrations and levels among the major drainage outlets (Granger Drain, Spring Creek, and Snipes Creek) to the Yakima River mainstem with respect to the **water quality parameters of interest** [total suspended solids (TSS), turbidity, fecal coliform (FC), nutrients, dissolved oxygen (DO), pH, temperature, and specific conductance (SC)]?

b. What is the difference between the irrigation and non-irrigation seasons?

c. What are the long-term trends in the data?

d. Does the data exceed state standards?

e. How does the concentration measured relate to discharge?

f. What is the relationship between turbidity and TSS?

Question 1 - Hypotheses:

a. Concentration and measurements are variable in time and space. Observed FC and nutrient concentrations are related to the number of confined animal operations (dairies and feedlots) and the type of waste management practices employed within a given HUA. Turbidity and TSS will be higher at the start of the irrigation season. Water temperature, SC, and pH are expected to increase over the course of the irrigation season.

b. Trends likely to be observed going from the irrigation to the non-irrigation seasons include: 1) decreases in turbidity, TSS, FC (increase during storm events), and flow, 2) increases in nutrients, DO, and SC, and 3) a small increase in pH values.

c. Long-term trends include: 1) decreases in TSS, turbidity, FC, and TP and 2) increases in nitrate plus nitrite (NO_{3+2}) and SC during the irrigation season, with a decrease in these parameters observed during the non-irrigation season.

d. Measured values expected to exceed state standards include: 1) turbidity values of 25 NTU (often), 2) FC (often), 3) temperature (often), and 4) DO and pH (seldom).

e. A direct relationship is expected between flow and concentration during the irrigation season for TSS, turbidity, FC, and TP. An indirect relationship is expected during the same period for NO_{3+2} and SC. During the non-irrigation season, similar results will be found if increased flows are the result of surface water runoff caused by storm events.

f. Good relationships are expected between turbidity and TSS; however, relationships established during the irrigation season may not agree well with the non-irrigation season.

Question 1 - Method of Analysis:

a. Plots of concentration versus time will establish temporal variability for the constituents of interest. Box plots for all samples at a given drainage outlet site versus all others will establish spatial variability for the constituents of interest. Plot the number of animals associated with confined animal operations (dairy and/or feedlot) within a given HUA versus FC and nutrient levels. Look for a relationship between waste management practices and FC and nutrient levels within a given HUA. Plot TSS and turbidity levels versus time, and, in doing so, consider two time periods within the irrigation season such that box plots can be used.

b. Box plots between the irrigation and non-irrigation seasons will establish seasonal differences for the constituents of interest.

c. When 50 samples per site have been established over multiple years, compare distributions of data from year-to-year, with and without flow correction, to establish long-term trends.

d. Compare results obtained to state standards.

e. Plot the logarithm of measured flow against the concentration of each constituent.

f. Plot the logarithm of TSS versus the logarithm of turbidity for both the irrigation and non-irrigation seasons and overlay the two plots. Test the feasibility of using one relationship for all three HUAs.

Question 2 - Granger Drain, Spring Creek, and Snipes Creek (Loads and Yields):

a. What are the loads and yields at the major drainage outlets (Granger Drain, Spring Creek, and Snipes Creek) to theYakima River mainstem with respect to TSS, FC, and nutrients?

b. What are the sources or causes within a given HUA which are responsible for the variability in constituent loads and yields?

c. What is the difference between the irrigation and non-irrigation seasons with respect to loads and yields?

d. What are the long-term trends with respect to loads and yields?

e. What is an estimation of the errors associated with calculating loads and yields?

Question 2 - Hypotheses:

a. Discharge has a dominant influence on the seasonal variability of constituent loads and yields, and is directly related to the seasonal variability in surface water flow.

b. Independent variables within a given HUA (e.g., soil type, stream and land gradients, land-use practices, irrigation methods, water use, drainage acreage, the number of confined animal operations, and the total number of animals associated with each operation) determine some of the observed variability in constituent loads and yields.

c. The major source of dissolved nutrients (NO_{3+2}) and dissolved solids (through SC measurements) is related to ground water seepage.

d. Any long-term trends in constituent loads and yields will be related to trends in flow and land-use activities.

e. Observed FC and nutrient yields are related to the number of animals associated with confined animal operations (dairies and feedlots) and the type of waste management practices employed within a given HUA.

f. Errors associated with annual and seasonal (irrigation and non-irrigation) loads and yields will decrease with the availability of daily, mean discharge information and higher sampling frequency.

Question 2 - Method of Analysis:

a. A method of calculating loads, yields, and variability (annual and seasonal) will be selected which is acceptable to all users of the data.

b. Use regression analysis to determine the relationship between dependent variables (constituent loads and yields) and independent variables.

c. Plot the logarithm of discharge against the logarithm of constituent loads. If there is a noticeable break in how the data correlates, consider splitting the data into two data sets.

d. Use regression analysis to establish a relationship between flow and constituent loads. If constituent loads are defined with sufficient precision, consider decreasing sampling frequency and only measuring discharge.

e. When 50 samples per site have been established over multiple years, compare distributions of data from year-to-year, with and without flow correction, to establish long-term trends. Also, look for trends that might correlate with current land-use activities.

Question 3 - Granger Hydrologic Unit Area:

a. What is the seasonal and spatial variability of constituent concentrations and levels, loads, and yields within the Granger HUA for the water quality parameters of interest?

b. What are the sources or causes within a given HUA which are responsible for the variability in constituent loads and yields?

c. What is the difference between irrigation and non-irrigation seasons?

d. What are the long-term trends in the data?

e. Does the data exceed state standards?

f. How does the concentration measured relate to discharge?

g. What is the relationship between turbidity and TSS?

Question 3 - Hypotheses:

a. Concentration and measurements are variable in time and space. Observed FC and nutrient concentrations are related to the location of confined animal operations (dairies and feedlots) within a sub-basin. Turbidity and TSS will be higher at the start of the irrigation season. Water temperature, SC, and pH are expected to increase from the headwaters to the mouth of drains.

b. Independent variables within a given HUA (e.g., soil type, stream and land gradients, land-use practices, irrigation methods, water use, drainage acreage, the number of confined animal operations, and the total number of animals associated with each operation) determine some of the observed variability in constituent loads and yields.

c. Trends likely to be observed going from the irrigation to the non-irrigation seasons include: 1) decreases in turbidity, TSS, FC (increase during storm events), and flow, 2) increases in nutrients, DO, and SC, and 3) a small increase in pH values.

d. Long-term trends include: 1) decreases in loads and yields for TSS, turbidity, FC, and TP, and in concentrations if flows are comparable to previous years, and 2) increases in NO_{3+2} concentrations and SC levels during the irrigation season, with a decrease in these parameters during non-irrigation season, if flows are comparable to previous years.

e. Measured values expected to exceed state standards include: 1) turbidity values of 25 NTU (often), 2) FC (often), 3) temperature (often), 4) DO and pH (seldom).

f. A direct relationship is expected between flow and concentration during the irrigation season for TSS, FC, turbidity, and TP. An indirect relationship is expected during the same period for NO_{3+2}, and SC. During the non-irrigation season, similar results will be found if increased flows are the result of surface water runoff caused by storm events.

g. Good relationships are expected between turbidity and TSS; however, relationships established during the irrigation season may not agree well with the non-irrigation season.

Question 3 - Method of Analysis:

a. Plots of concentration versus time will establish temporal variability for the constituents of interest. Box plots for all samples at a particular site versus all other sites will establish spatial variability for the constituents of interest. Plot the number of animals associated with confined animal operations (dairy and/or feedlot) above sampling sites versus FC and nutrient levels. Plot the distance between confined animal operations and sampling sites to determine if a relationship exists between FC and nutrient levels and the proximity to sample site locations. Look for a relationship between waste management practices and FC and nutrient levels at sampling sites downstream of operations. Plot TSS and turbidity levels versus time, and, in doing so, consider two time periods within the irrigation season such that box plots can be used. Plot temperature, pH, and SC versus distance from the mouth of the drain to the sampling sites.

b. Use regression analysis to determine the relationship between dependent variables (constituent loads and yields) and independent variables.

c. Box plots between the irrigation and non-irrigation seasons will establish seasonal differences for the constituents of interest.

d. When 50 samples per site have been established over multiple years, compare distributions of data from year-to-year, with and without flow correction, to establish long-term trends.

e. Compare results obtained to state standards.

f. Plot the logarithm of measured flow against the concentration of each constituent.

g. Plot the logarithm of TSS versus the logarithm of turbidity for both the irrigation and non-irrigation seasons and overlay the two plots. Test the feasibility of using one relationship for each sub-basin and one for the entire Granger HUA.

Question 4 - Granger Hydrologic Unit Area Sedimentation Ponds:

a. How effective are sedimentation ponds at reducing TSS, turbidity, FC, and TP levels in irrigation return flows?

b. What percent of the constituents are retained or not retained by the sedimentation ponds?

c. How was the effectiveness of a particular sedimentation pond related to the independent variables within a given drainage sub-basin (e.g., soil type, stream and land gradients, land-use practices, irrigation methods, water use, drainage acreage, the number of confined animal operations, the number of animals associated with each operation, etc.).

Question 4 - Hypotheses:

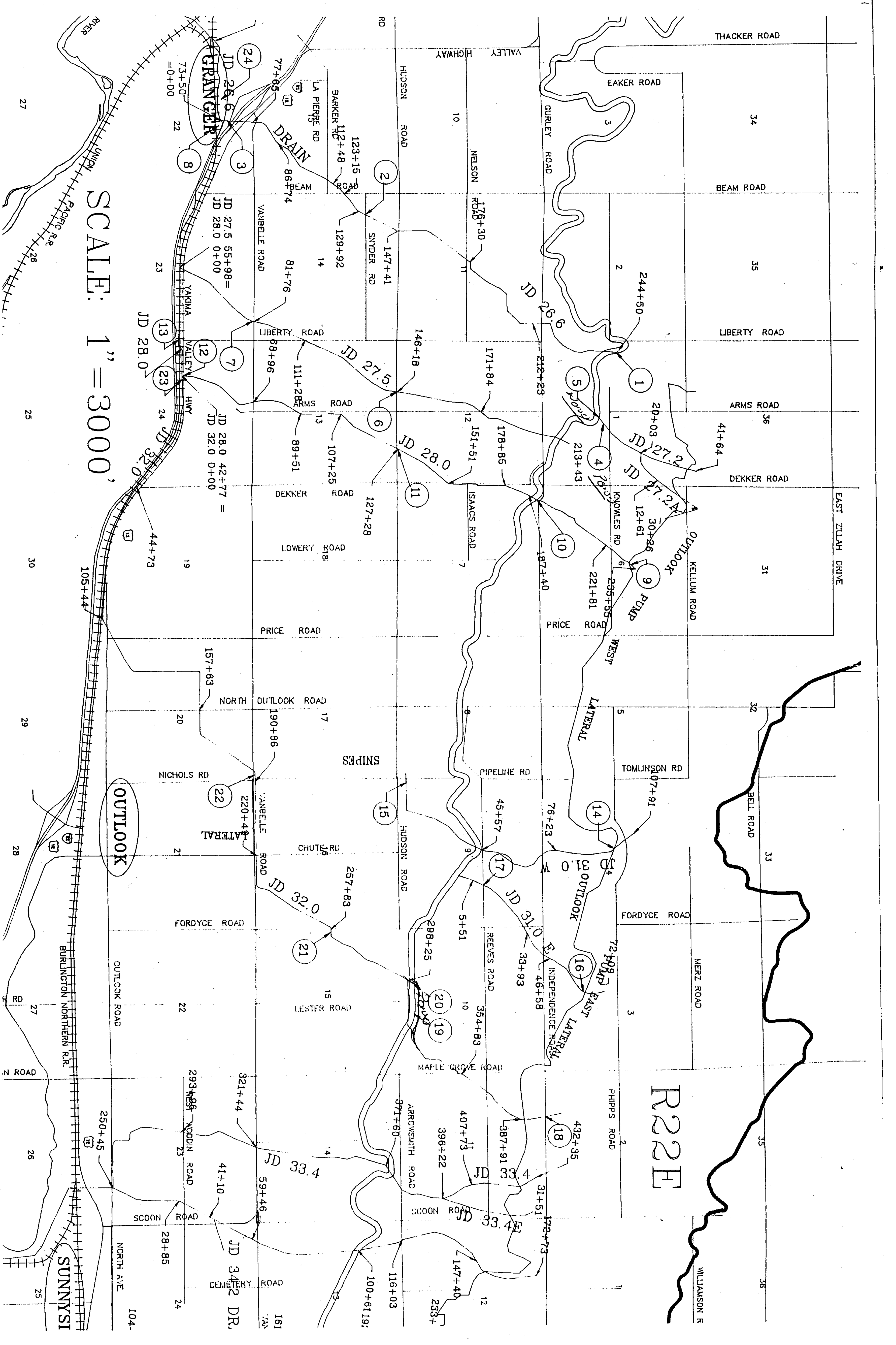
a. TSS and TP levels are anticipated to decrease by 50% and 25% respectively, with a corresponding decrease in turbidity expected as well.

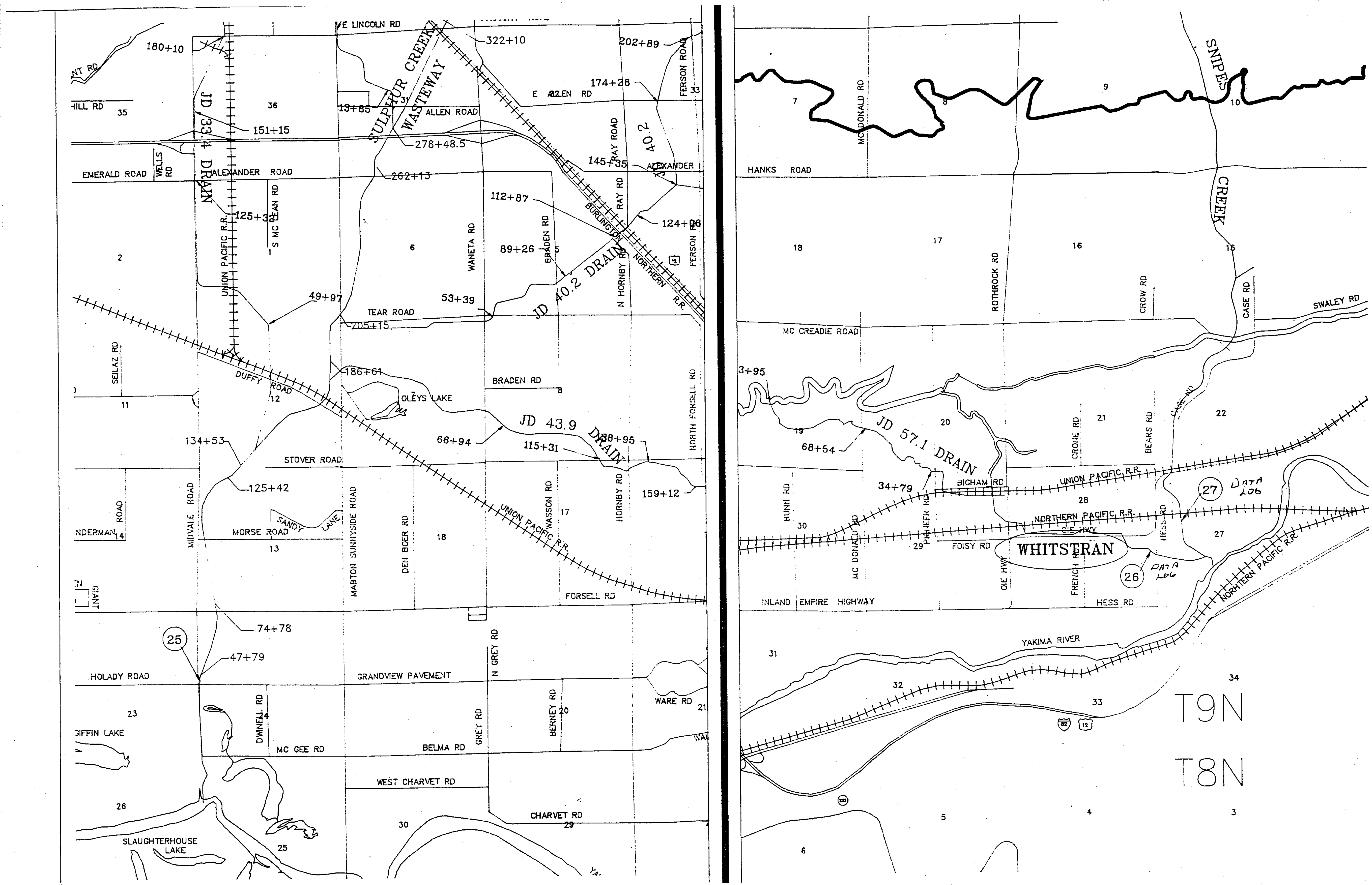
b. The effectiveness of sedimentation ponds will be dependent on the independent variables within a given drainage sub-basin.

Question 4 - Method of Analysis:

a. Evaluate the mass of solid material which enters, exits, and is retained by a particular sedimentation pond. Sum the mass of material which is retained to that which exits and compare this value to the mass of solid material which enters the system.

b. Determine correlations between the dependent variables (TSS, turbidity, FC, and TP) and independent variables to evaluate the causes and sources of materials retained by sedimentation ponds. This correlation can then be used to identify primary locations within drainage sub-basins for the construction of sediment ponds that will serve as BMPs.


SCALE: 1''=3000'
GRANGER
OUTLOOK
SNIPES
R22E
THACKER ROAD
EAKER ROAD
BEAM ROAD
LIBERTY ROAD
ARMS ROAD
DEKKER ROAD
EAST ZILLAH DRIVE
KELLUM ROAD
PRICE ROAD
TOMLINSON RD
BELL ROAD
FORDYCE ROAD
MERZ ROAD
PHIPPS ROAD
WILLIAMSON R
VALLEY HIGHWAY
HUDSON ROAD
GURLEY ROAD
NELSON ROAD
SNYDER RD
BARKER RD
LA PIERRE RD
VANBELLE ROAD
YAKIMA VALLEY HWY
ISAACS ROAD
KNOWLES RD
LOWERY ROAD
NORTH OUTLOOK ROAD
NICHOLS RD
PIPELINE RD
CHUTE RD
REEVES ROAD
INDEPENDENCE ROAD
LESTER ROAD
MAPLE GROVE ROAD
ARROWSMITH ROAD
OUTLOOK ROAD
WOODIN ROAD
SCOON ROAD
CEMETERY ROAD
NORTH AVE.
UNION PACIFIC R.R.
BURLINGTON NORTHERN R.R.
RIVER
DRAIN
OUTLOOK PUMP WEST LATERAL
OUTLOOK PUMP EAST LATERAL
LATERAL
SUNNYSI
JD 26.6
JD 27.2
JD 27.2A
JD 27.5
JD 28.0
JD 31.0 W
JD 31.0 E
JD 32.0
JD 33.4
JD 33.4E
JD 34.2 DR.



JD 33.4 DRAIN
JD 40.2 DRAIN
40.2
JD 43.9 DRAIN
JD 57.1 DRAIN
SULPHUR CREEK WASTEWAY
SNIPES CREEK
WHITSTRAN
YAKIMA RIVER
UNION PACIFIC R.R.
BURLINGTON NORTHERN R.R.
NORTHERN PACIFIC R.R.
T9N
T8N
180+10
151+15
125+32
49+97
322+10
13+85
278+48.5
262+13
205+15
186+61
53+39
112+87
89+26
202+89
174+26
145+35
124+06
66+94
115+31
88+95
159+12
134+53
125+42
74+78
47+79
3+95
68+54
34+79
25
26
27
VE LINCOLN RD
HILL RD
EMERALD ROAD
WELLS RD
ALEXANDER ROAD
S MC LEAN RD
ALLEN ROAD
E ALLEN RD
FERSON ROAD
RAY ROAD
RAY RD
ALEXANDER
WANETA RD
TEAR ROAD
BRADEN RD
N HORNBY RD
FERSON RD
NORTH FORSELL RD
SEILAZ RD
DUFFY ROAD
OLEYS LAKE
STOVER ROAD
MABTON SUNNYSIDE ROAD
DEN BOER RD
WASSON RD
HORNBY RD
FORSELL RD
MIDVALE ROAD
MORSE ROAD
SANDY LANE
ANDERMAN ROAD
GIANT
HOLADY ROAD
GRANDVIEW PAVEMENT
N GREY RD
GREY RD
BERNEY RD
WARE RD
DWINELL RD
MC GEE RD
BELMA RD
WEST CHARVET RD
CHARVET RD
GIFFIN LAKE
SLAUGHTERHOUSE LAKE
HANKS ROAD
MC DONALD RD
ROTHROCK RD
CROW RD
CASE RD
SWALEY RD
MC CREADIE ROAD
BUNN RD
CRONE RD
BEARS RD
BIGHAM RD
PIONEER RD
FOISY RD
OIE HWY
FRENCH RD
HESS RD
INLAND EMPIRE HIGHWAY
DATA LOG

APPENDIX 9

Who We Are and What We're Doing

The Department of Ecology has started a new project to provide water quality education and technical assistance to irrigators and farmers in the basin. Field staff will be visiting agricultural areas throughout the Yakima Basin during the growing season to help identify and solve potential pollution problems.

Important facts we'd like you to know:

- **Soil erosion and the migration of nutrients and chemicals from agricultural areas adds to water pollution in the Yakima River.**
- **The average farmer using furrow/rill irrigation in the Yakima Valley loses about 30 tons of topsoil per acre each year.**
- **Several species of Yakima River fish may soon be listed as "threatened" or "endangered" species, increasing demands for cool, clean water in the Yakima River.**
- **Water in irrigation canals, ditches and drains must meet applicable Washington State water quality standards.**
- **New total maximum daily load (TMDL) targets require that water flowing from drains and tributaries into the Lower Yakima River must have sediment loads reduced by as much as 95% of current loads.**

If you have questions ...... feel free to give us a call at (509) 454-7894 or (509) 575-2642, or stop by Ecology's Yakima office. We look forward to talking with you.

What Are "Best Management Practices"?

Best Management Practices (or "BMPs" as they are commonly known) are specific agricultural management principles or hardware changes. BMPs can help reduce water pollution and soil erosion and increase water conservation. Farmers have found that using BMPs can result in lower operating costs and reduced fertilizer and water expenses. Farmers have also found that crop production and crop quality improve noticeably after using BMPs.

Examples of BMPs:

- **Use soil moisture measurements to help plan irrigation.**
- **Apply PAM (polyacryliamide) or install straw mulch in furrows to prevent erosion.**
- **If using rill/furrow irrigation, consider converting to drip or sprinkler.**
- **Install sedimentation ponds.**
- **Install vegetative buffering strips.**
- **Gather and reuse surface runoff.**
- **Use conservation tillage methods to reduce erosion.**
- **Evaluate the irrigation system using NRCS, CD or WSU Extension Service procedures.**

We have a variety of free materials to give you regarding BMPs and other related issues. Give us a call at (509) 454-7894 or (509) 575-2642 to request this information.

AGRICULTURAL WATER QUALITY EDUCATION PROGRAM

North Yakima County

WASHINGTON STATE DEPARTMENT OF ECOLOGY

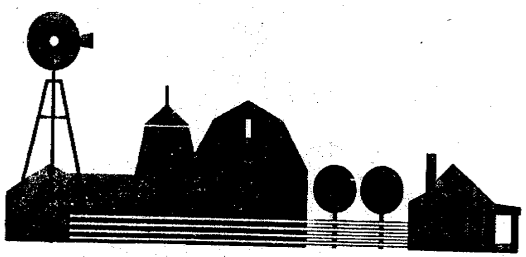
Washington State Department of Ecology

Central Washington Regional Office
Yakima, WA 98902
(509) 575-2490

Publication No. 98-06

Natural Resource Conservation Service (NRCS)

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, is the federal agency in Washington State that works with people to help sustain natural resources on private lands. Their capable staff is ready to provide free technical and educational assistance. NRCS can help you with plans to promote water and soil conservation on your farm.



The Environmental Quality Incentives Program (EQIP) was created in the 1996 Farm Bill to provide a voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. EQIP funding is cost-share. NRCS also provides a variety of other cost share programs that growers can use for conservation and other improvements.

Contact your local NRCS representative for more information about EQIP and other programs:

Jay Kehne
NRCS District Conservationist
1606 Perry Street, Suite F
Yakima, WA 98902
(509) 454-5736

North Yakima Conservation District

A conservation district (CD) is a local unit of government, established to increase voluntary soil and water conservation practices among farmers, ranchers and other land users. A group of local landowners directs all operations of the CD.

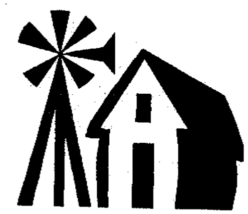
The North Yakima Conservation District works with NRCS to provide cost-share funding for agricultural soil and water conservation programs.

Contact your CD's knowledgeable staff for details on designing a farm conservation plan and applying for financial assistance:

Mike Tobin
District Manager
1606 Perry Street, Suite F
Yakima, WA 98902
(509) 454-5736

WSU Cooperative Extension Service

The Washington State University (WSU) Cooperative Extension Service helps farmers use research-based knowledge to improve farming practices and crop production. All extension agents are faculty of Washington State University and are available for free consultation. The Extension Service also has hundreds of research publications on a variety of topics.



Contact your local Extension Service office at:

WSU Cooperative Extension Service
128 North 2nd Street
Courthouse, Room 209
Yakima, WA 98902
(509) 574-1600

Ecology is an equal opportunity agency. To receive information in alternate format, call (509) 454-7894 (voice) or (509) 454-7673 (TDD).

APPENDIX 10

CHAPTER 90.48 RCW

WATER POLLUTION CONTROL

Sections

90.48.010	Policy enunciated.
90.48.020	Definitions.
90.48.030	Jurisdiction of department.
90.48.035	Rule-making authority.
90.48.037	Authority of department to bring enforcement actions.
90.48.039	Hazardous substance remedial actions--Procedural requirements not applicable.
90.48.045	Environmental excellence program agreements--Effect on chapter.
90.48.080	Discharge of polluting matter in waters prohibited.
90.48.090	Right of entry--Special inspection requirements for metals mining and milling operations.
90.48.095	Authority of department to compel attendance and testimony of witnesses, production of books and papers--Contempt proceedings to enforce--Fees.
90.48.100	Request for assistance.
90.48.110	Plans and proposed methods of operation and maintenance of sewerage or disposal systems to be submitted to department--Exceptions.
90.48.112	Plan evaluation--Consideration of reclaimed water.
90.48.120	Notice of department's determination that violation has or will occur--Report to department of compliance with determination--Order or directive to be issued--Notice.
90.48.140	Penalty.
90.48.142	Violations--Liability in damages for injury or death of fish, animals, vegetation--Action to recover.
90.48.144	Violations--Civil penalty--Procedure.
90.48.150	Construction of chapter.
90.48.153	Cooperation with federal government--Federal funds.
90.48.156	Cooperation with other states and provinces--Interstate and state-provincial projects.
90.48.160	Waste disposal permit--Required--Exemptions.
90.48.162	Waste disposal permits required of counties, municipalities and public corporations.
90.48.165	Waste disposal permits required of counties, municipalities and public corporations--Cities, towns or municipal corporations may be granted authority to issue permits--Revocation--Termination of permits.
90.48.170	Waste disposal permits required of counties, municipalities and public corporations--Application--Notice as to new operation or increase in volume--Investigation--Notice to other state departments.
90.48.180	Waste disposal permits required of counties, municipalities and public corporations--Issuance--Conditions--Duration.

90.48.190 Waste disposal permits required of counties, municipalities and public corporations--Termination--Grounds.
90.48.195 Waste disposal permits required of counties, municipalities and public corporations--Modification or additional conditions may be ordered.
90.48.200 Waste disposal permits required of counties, municipalities and public corporations--Nonaction upon application--Temporary permit--Duration.
90.48.215 Upland finfish facilities--Waste discharge standards--Waste disposal permit.
90.48.220 Marine finfish rearing facilities--Waste discharge standards--Discharge permit applications--Exemption.
90.48.230 Application of administrative procedure law to rule making and adjudicative proceedings.
90.48.240 Water pollution orders for conditions requiring immediate action--Appeal.
90.48.250 Agreements or contracts to monitor waters and effluent discharge.
90.48.260 Federal clean water act--Department designated as state agency, authority--Powers, duties and functions.
90.48.261 Exercise of powers under RCW 90.48.260--Aquatic resource mitigation.
90.48.262 Implementation of RCW 90.48.260--Permits for energy facilities--Rules and procedures.
90.48.264 Federal clean water act--Rules for on-site sewage disposal systems adjacent to marine waters.
90.48.270 Sewage drainage basins--Authority of department to delineate and establish.
90.48.280 Sewage drainage basins--Comprehensive plans for sewage drainage basins.
90.48.285 Contracts with municipal or public corporations and political subdivisions to finance water pollution control projects--Requisites--Priorities.
90.48.290 Grants to municipal or public corporations or political subdivisions to aid water pollution control projects--Limitations.
90.48.300 Pollution control facilities--Tax exemptions and credits.
90.48.364 Discharge of oil into waters of the state--Definitions.
90.48.366 Discharge of oil into waters of the state--Compensation schedule.
90.48.367 Discharge of oil into waters of the state--Assessment of compensation.
90.48.368 Discharge of oil into waters of the state--Preassessment screening.
90.48.369 Discharge of oil into waters of the state--Annual report.
90.48.386 Department of natural resources leases.
90.48.390 Coastal protection fund--Established--Moneys credited to--Use.
90.48.400 Coastal protection fund--Disbursal of moneys from.
90.48.420 Water quality standards affected by forest practices--Department of ecology solely

responsible for water quality standards--Forest practices regulations--Promulgation--Examination--Enforcement procedures.
90.48.425 Forest practices act and regulations relating to water quality protection to be utilized to satisfy federal water pollution act.
90.48.430 Watershed restoration projects--Approval process--Waiver of public review.
90.48.445 Aquatic noxious weed control--Water quality permits--Definition.
90.48.450 Discharges from agricultural activity--Consideration to be given as to whether enforcement action would contribute to conversion of land to nonagricultural use--Minimize the possibility.
90.48.455 Discharge of chlorinated organics--Engineering reports by pulp and paper mills--Permits limiting discharge.
90.48.465 Water discharge fees.
90.48.480 Reduction of sewer overflows--Plans--Compliance schedule--Report to the legislature.
90.48.490 Sewage treatment facilities--Plans to upgrade or construct.
90.48.495 Water conservation measures to be considered in sewer plans.
90.48.500 Pollution Disclosure Act of 1971.
90.48.520 Review of operations before issuance or renewal of wastewater discharge permits--Incorporation of permit conditions.
90.48.900 Severability--1945 c 216.
90.48.901 Severability--1967 c 13.
90.48.902 Severability--1970 ex.s. c 88.
90.48.903 Severability--1971 ex.s. c 180.
90.48.904 Severability--1989 c 262.
90.48.906 Short title--1971 ex.s. c 180.

NOTES:

County water and sewerage systems, approval of the department of social and health services and the department of ecology: RCW 36.94.100.

Domestic waste treatment plants--Certification and regulation of operators: Chapter 70.95B RCW.

Ecology, department of, powers, duties, and functions: RCW 43.21A.060.

Environmental certification programs--Fees--Rules--Liability: RCW 43.21A.175.

Oil and hazardous substance spill prevention and response: Chapter 90.56 RCW.

Oil tankers on Puget Sound, restrictions, etc.: RCW 88.16.170 through 88.16.190.

Shellfish, sanitary control: RCW 69.30.130.

Washington clean air act: Chapter 70.94 RCW.

Water-sewer district powers as to mutual systems, approval of exercise by pollution control commission: RCW 57.08.065.

Water pollution control facilities, tax exemptions and credits: Chapter 82.34 RCW.

RCW 90.48.010 Policy enunciated. It is declared to be the public policy of the state of Washington to maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington. Consistent with this policy, the state of Washington will exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state. The state of Washington in recognition of the federal government's interest in the quality of the navigable waters of the United States, of which certain portions thereof are within the jurisdictional limits of this state, proclaims a public policy of working cooperatively with the federal government in a joint effort to extinguish the sources of water quality degradation, while at the same time preserving and vigorously exercising state powers to insure that present and future standards of water quality within the state shall be determined by the citizenry, through and by the efforts of state government, of the state of Washington. [1973 c 155 § 1; 1945 c 216 § 1; Rem. Supp. 1945 § 10964a.]

RCW 90.48.020 Definitions. Whenever the word "person" is used in this chapter, it shall be construed to include any political subdivision, government agency, municipality, industry, public or private corporation, copartnership, association, firm, individual or any other entity whatsoever.

Wherever the words "waters of the state" shall be used in this chapter, they shall be construed to include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Whenever the word "pollution" is used in this chapter, it shall be construed to mean such contamination, or other alteration of the physical, chemical or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Wherever the word "department" is used in this chapter it shall mean the department of ecology.

Whenever the word "director" is used in this chapter it shall mean the director of ecology.

Whenever the words "aquatic noxious weed" are used in this chapter, they have the meaning prescribed under RCW 17.26.020. [1995 c 255 § 7; 1987 c 109 § 122; 1967 c 13 § 1; 1945 c 216 § 2; Rem. Supp. 1945 § 10964b.]

NOTES:

Severability--Effective date--1995 c 255: See RCW 17.26.900 and 17.26.901.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.030 Jurisdiction of department. The department shall have the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland waters, salt waters, water courses, and other surface and underground waters of the state of Washington. [1987 c 109 § 123; 1945 c 216 § 10; Rem. Supp. 1945 § 10964j. FORMER PART OF SECTION: 1945 c 216 § 11; Rem. Supp. 1945 § 10964k, now codified as RCW 90.48.035.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Powers, duties, and functions transferred to department of ecology: RCW 43.21A.060.

RCW 90.48.035 Rule-making authority. The department shall have the authority to, and shall promulgate, amend, or rescind such rules and regulations as it shall deem necessary to carry out the provisions of this chapter, including but not limited to rules and regulations relating to standards of quality for waters of the state and for substances discharged therein in order to maintain the highest possible standards of all waters of the state in accordance with the public policy as declared in RCW 90.48.010. [1987 c 109 § 124; 1970 ex.s. c 88 § 11; 1967 c 13 § 6; 1945 c 216 § 11; Rem. Supp. 1945 § 10964k. Formerly RCW 90.48.030, part.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.037 Authority of department to bring enforcement actions. The department, with the assistance of the attorney general, is authorized to bring any appropriate action at law or in equity, including action for injunctive relief, in the name of the people of the state of Washington as may be necessary to carry out the provisions of this chapter or chapter 90.56 RCW. [1991 c 200 § 1102; 1987 c 109 § 125; 1967 c 13 § 7.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.039 Hazardous substance remedial actions--Procedural requirements not applicable. The procedural requirements of this chapter shall not apply to any person conducting a remedial action at a facility pursuant to a consent decree, order, or agreed order issued pursuant to chapter 70.105D RCW, or to the department of ecology when it conducts a remedial action under chapter 70.105D RCW. The department of ecology shall ensure compliance with the substantive requirements of this chapter through the consent decree, order, or agreed order issued pursuant to chapter 70.105D RCW, or during the department-conducted remedial action, through the procedures developed by the department pursuant to RCW 70.105D.090. [1994 c 257 § 19.]

NOTES:

Severability--1994 c 257: See note following RCW 36.70A.270.

RCW 90.48.045 Environmental excellence program agreements--Effect on chapter. Notwithstanding any other provision of law, any legal requirement under this chapter, including any standard, limitation, rule, or order is superseded and replaced in accordance with the terms and provisions of an environmental excellence program agreement, entered into under chapter 43.21K RCW. [1997 c 381 § 26.]

NOTES:

Purpose--1997 c 381: See RCW 43.21K.005.

RCW 90.48.080 Discharge of polluting matter in waters prohibited. It shall be unlawful for any person to throw, drain, run, or otherwise discharge into any of the waters of this state, or to cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged into such waters any organic or inorganic matter that shall cause or tend to cause pollution of such waters according to the determination of the department, as provided for in this chapter. [1987 c 109 § 126; 1967 c 13 § 8; 1945 c 216 § 14; Rem. Supp. 1945 § 10964n.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.090 Right of entry--Special inspection requirements for metals mining and milling operations. The department or its duly appointed agent shall have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution of or the possible pollution of any of the waters of this state.

The department shall have special inspection requirements for metals mining and milling operations regulated under chapter 232, Laws of 1994. The department shall inspect these mining and milling operations at least quarterly in order to ensure compliance with the intent and any permit issued pursuant to this chapter. The department shall conduct additional inspections as needed during the construction phase of these mining operations in order to ensure compliance with this chapter. [1994 c 232 § 21; 1987 c 109 § 127; 1945 c 216 § 15; Rem. Supp. 1945 § 10964o.]

NOTES:

Severability--1994 c 232: See RCW 78.56.900.

Effective date--1994 c 232 §§ 6-8 and 18-22: See RCW 78.56.902.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.095 Authority of department to compel attendance and testimony of witnesses, production of books and papers--Contempt proceedings to enforce--Fees. In carrying out the purposes of this chapter or chapter 90.56 RCW the department shall, in conjunction with either the adoption of rules, consideration of an application for a waste discharge permit or the termination or modification of such permit, or proceedings in adjudicative hearings, have the authority to issue process and subpoena witnesses effective throughout the state on its own behalf or that of an interested party, compel their attendance, administer oaths, take the testimony of any person under oath and, in connection therewith require the production for examination of any books or papers relating to the matter under consideration by the department. In case of disobedience on the part of any person to comply with any subpoena issued by the department, or on the refusal of any witness to testify to any matters regarding which he may be lawfully interrogated, it shall be the duty of the superior court of any county, or of the judge thereof, on application of the department, to compel obedience by proceedings for contempt, as in the case of disobedience of the requirements of a subpoena issued from such court or a refusal to testify therein. In connection with the authority granted under this section no witness or other person shall be required to divulge trade secrets or secret processes. Persons responding to a subpoena as provided herein shall be entitled to fees as are witnesses in superior court. [1991 c 200 § 1103; 1987 c 109 § 128; 1967 c 13 § 9.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.100 Request for assistance. The department shall have the right to request and receive the assistance of any educational institution or state agency when it is deemed necessary by the department to carry out the provisions of this chapter or chapter 90.56 RCW. [1991 c 200 § 1104; 1987 c 109 § 129; 1945 c 216 § 16; Rem. Supp. 1945 § 10964p.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.110 Plans and proposed methods of operation and maintenance of sewerage or disposal systems to be submitted to department--Exceptions. (1) Except under subsection (2) of this section, all engineering reports, plans, and specifications for the construction of new sewerage systems, sewage treatment or disposal plants or systems, or for improvements or extensions to existing sewerage systems or sewage treatment or disposal plants, and the proposed method of future operation and maintenance of said facility or facilities, shall be submitted to and be approved by the department, before construction thereof may begin. No approval shall be given until the department is satisfied that said plans and specifications and the methods of operation and maintenance submitted are adequate to protect the quality of the state's waters as provided for in this chapter.

(2) To promote efficiency in service delivery and intergovernmental cooperation in protecting the quality of the state's waters, the department may delegate the authority for review and approval of engineering reports, plans, and specifications for the construction of new sewerage systems, sewage treatment or disposal plants or systems, or for improvements or extensions to existing sewerage system or sewage treatment or disposal plants, and the proposed method of future operations and maintenance of said facility or facilities and industrial pretreatment systems, to local units of government requesting such delegation and meeting criteria established by the department. [1994 c 118 § 1; 1987 c 109 § 130; 1967 c 13 § 10; 1945 c 216 § 17; Rem. Supp. 1945 § 10964q.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.112 Plan evaluation--Consideration of reclaimed water. The evaluation of any plans submitted under RCW 90.48.110 must include consideration of opportunities for the use of reclaimed water as defined in RCW 90.46.010. [1997 c 444 § 9.]

NOTES:

Severability--1997 c 444: See note following RCW 90.46.010.

RCW 90.48.120 Notice of department's determination that violation has or will occur--Report to department of compliance with determination--Order or directive to be issued--Notice. (1) Whenever, in the opinion of the department, any person shall violate or creates a substantial potential to violate the provisions of this chapter or chapter 90.56 RCW, or fails to control the polluting content of waste discharged or to be discharged into any waters of the state, the department shall notify such person of its determination by registered mail. Such determination shall not constitute an order or directive under RCW 43.21B.310. Within thirty days from the receipt of notice of such determination, such person shall file with the department a full report stating what steps have been and are being taken to control such waste or pollution or to otherwise comply with the determination of the department. Whereupon the department shall issue such order or directive as it deems appropriate under the circumstances, and shall notify such person thereof by registered mail.

(2) Whenever the department deems immediate action is necessary to accomplish the purposes of this chapter or chapter 90.56 RCW, it may issue such order or directive, as appropriate under the circumstances, without first issuing a notice or determination pursuant to subsection (1) of this section. An order or directive issued pursuant to this subsection shall be served by registered mail or personally upon any person to whom it is directed. [1992 c 73 § 25; 1987 c 109 § 131; 1985 c 316 § 3; 1973 c 155 § 2; 1967 c 13 § 11; 1945 c 216 § 18; Rem. Supp. 1945 § 10964r.]

NOTES:

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Appeal of orders under RCW 90.48.120(2): RCW 43.21B.310.

RCW 90.48.140 Penalty. Any person found guilty of willfully violating any of the provisions of this chapter or chapter 90.56 RCW, or any final written orders or directive of the department or a court in pursuance thereof shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment in the discretion of the court. Each day upon which a willful violation of the provisions of this chapter or chapter 90.56 RCW occurs may be deemed a separate and additional violation. [1992 c 73 § 26; 1973 c 155 § 8; 1945 c 216 § 20; Rem. Supp. 1945 § 10964t.]

NOTES:

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

RCW 90.48.142 Violations--Liability in damages for injury or death of fish, animals, vegetation--Action to recover. (1) Any person who:

(a)(i) Violates any of the provisions of this chapter or chapter 90.56 RCW;

(ii) Fails to perform any duty imposed by this chapter or chapter 90.56 RCW;

(iii) Violates an order or other determination of the department or the director made pursuant to the provisions of this chapter or chapter 90.56 RCW;

(iv) Violates the conditions of a waste discharge permit issued pursuant to RCW 90.48.160; or

(v) Otherwise causes a reduction in the quality of the state's waters below the standards set by the department or, if no standards have been set, causes significant degradation of water quality, thereby damaging the same; and

(b) Causes the death of, or injury to, fish, animals, vegetation, or other resources of the state;

shall be liable to pay the state and affected counties and cities damages in an amount determined pursuant to RCW 90.48.367.

(2) No action shall be authorized under this section against any person operating in compliance with the conditions of a waste discharge permit issued pursuant to RCW 90.48.160. [1991 c 200 § 810; 1989 c 262 § 2; 1988 c 36 § 69; 1987 c 109 § 132; 1985 c 316 § 6; 1970 ex.s. c 88 § 12; 1967 ex.s. c 139 § 13.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Findings--1989 c 262: "The legislature finds that there is confusion regarding the measure of damages authorized under RCW 90.48.142. The intent of this act is to clarify existing law on the measure of damages authorized under RCW 90.48.142, not to change the law." [1989 c 262 § 1.] "This act" consists of the 1989 c 262 amendments to RCW 90.48.142, 90.48.390, and 90.48.400.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Severability--1967 ex.s. c 139: See RCW 82.34.900.

RCW 90.48.144 Violations--Civil penalty--Procedure. Except as provided in RCW 43.05.060 through 43.05.080 and 43.05.150, every person who:

(1) Violates the terms or conditions of a waste discharge permit issued pursuant to RCW 90.48.180 or 90.48.260 through 90.48.262, or

(2) Conducts a commercial or industrial operation or other point source discharge operation without a waste discharge permit as required by RCW 90.48.160 or 90.48.260 through 90.48.262, or

(3) Violates the provisions of RCW 90.48.080, or other sections of this chapter or chapter 90.56 RCW or rules or orders adopted or issued pursuant to either of those chapters, shall incur, in addition to any other penalty as provided by law, a penalty in an amount of up to ten thousand dollars a day for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be and be deemed to be a separate and distinct violation. Every act of commission or omission which procures, aids or abets in the violation shall be considered a violation under the provisions of this section and subject to the penalty herein provided for. The penalty amount shall be set in consideration of the previous history of the violator and the severity of the violation's impact on public health and/or the environment in addition to other relevant factors. The penalty herein provided for shall be imposed pursuant to the procedures set forth in RCW 43.21B.300. [1995 c 403 § 636; 1992 c 73 § 27; 1987 c 109 § 17; 1985 c 316 § 2; 1973 c 155 § 9; 1970 ex.s. c 88 § 13; 1967 ex.s. c 139 § 14.]

NOTES:

Findings--Short title--Intent--1995 c 403: See note following RCW 34.05.328.

Part headings not law--Severability--1995 c 403: See RCW 43.05.903 and 43.05.904.

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Severability--1967 ex.s. c 139: See RCW 82.34.900.

RCW 90.48.150 Construction of chapter. This chapter shall not be construed as repealing any of the laws governing the pollution of the waters of the state, but shall be held and construed as ancillary to and supplementing the same and an addition to the laws now in force, except as the same may be in direct conflict herewith. [1945 c 216 § 21; Rem. Supp. 1945 § 10964u.]

RCW 90.48.153 Cooperation with federal government--Federal funds. The department is authorized to cooperate with the federal government and to accept grants of federal funds for carrying out the purposes of this chapter. The department is empowered to make any application or report required by an agency of the federal government as an incident to receiving such grants. [1987 c 109 §

133; 1949 c 58 § 1; Rem. Supp. 1949 § 10964pp. , Formerly RCW 90.48.040.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.156 Cooperation with other states and provinces--Interstate and state-provincial projects. The department is authorized to cooperate with appropriate agencies of neighboring states and neighboring provinces, to enter into contracts, and make contributions toward interstate and state-provincial projects to carry out the purposes of this chapter and chapter 90.56 RCW. [1991 c 200 § 1105; 1987 c 109 § 134; 1949 c 58 § 2; Rem. Supp. 1949 § 10964pp-1. Formerly RCW 90.48.050.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.160 Waste disposal permit--Required--Exemptions. Any person who conducts a commercial or industrial operation of any type which results in the disposal of solid or liquid waste material into the waters of the state, including commercial or industrial operators discharging solid or liquid waste material into sewerage systems operated by municipalities or public entities which discharge into public waters of the state, shall procure a permit from either the department or the *thermal power plant site evaluation council as provided in RCW 90.48.262(2) before disposing of such waste material: PROVIDED, That this section shall not apply to any person discharging domestic sewage only into a sewerage system.

The department may, through the adoption of rules, eliminate the permit requirements for disposing of wastes into publicly operated sewerage systems for:

(1) Categories of or individual municipalities or public corporations operating sewerage systems; or

(2) Any category of waste disposer;

if the department determines such permit requirements are no longer necessary for the effective implementation of this chapter. The department may by rule eliminate the permit requirements for disposing of wastes by upland finfish rearing facilities unless a permit is required under the federal clean water act's national pollutant discharge elimination system. [1989 c 293 § 2; 1973 c 155 § 3; 1967 c 13 § 13; 1955 c 71 § 1.]

NOTES:

***Reviser's note:** The "thermal power plant site evaluation council" was redesignated the "energy facility site evaluation council" by 1975-'76 2nd ex.s. c 108.

RCW 90.48.162 Waste disposal permits required of counties, municipalities and public corporations. Any county or any municipal or public corporation operating or proposing to operate a sewerage system, including any system which collects only domestic sewerage, which results in the disposal of waste material into the waters of the state shall procure a permit from the department of ecology before so disposing of such materials. This section is intended to extend the permit system of RCW 90.48.160 to counties and municipal or public corporations and the provisions of RCW 90.48.170 through *90.48.210 and 90.52.040 shall be applicable to the permit requirement imposed under this section. [1972 ex.s. c 140 § 1.]

NOTES:

***Reviser's note:** RCW 90.48.210 was repealed by 1987 c 109 § 159.

RCW 90.48.165 Waste disposal permits required of counties, municipalities and public corporations--Cities, towns or municipal corporations may be granted authority to issue permits--Revocation--Termination of permits. Any city, town or municipal corporation operating a sewerage system including treatment facilities may be granted authority by the department to issue permits for the discharge of wastes to such system provided the department ascertains to its satisfaction that the sewerage system and the inspection and control program operated and conducted by the city, town or municipal corporation will protect the public interest in the quality of the state's waters as provided for in this chapter. Such authority may be granted by the department upon application by the city, town or municipal corporation and may be revoked by the department if it determines that such city, town, or municipal corporation is not, thereafter, operated and conducted in a manner to protect the public interest. Persons holding municipal permits to discharge into sewerage systems operated by a municipal corporation authorized by this section to issue such permits shall not be required to secure a waste discharge permit provided for in RCW 90.48.160 as to the wastes discharged into such sewerage systems. Authority granted by the department to cities, towns, or municipal corporations to issue permits under this section shall be in addition to any authority or power now or hereafter granted by law to cities, towns and municipal corporations for the regulation of discharges into sewerage systems operated by such cities, towns, or municipal corporations. Permits issued under this section shall automatically terminate if the authority to issue the same is revoked by the department. [1987 c 109 § 135; 1967 c 13 § 14.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.170 Waste disposal permits required of counties, municipalities and public corporations--Application--Notice as to new operation or increase in volume--Investigation--Notice to other state departments. Applications for permits shall be made on forms prescribed by the department and shall contain the name and address of the applicant, a description of the applicant's operations, the quantity and type of waste material sought to be disposed of, the proposed method of disposal, and any other relevant information deemed necessary by the department. Application for permits shall be made at least sixty days prior to commencement of any proposed discharge or permit expiration date, whichever is applicable. Upon receipt of a proper application relating to a new operation, or an operation previously under permit for which an increase in volume of wastes or change in character of effluent is requested over that previously authorized, the department shall instruct the applicant to publish notices thereof by such means and within such time as the department shall prescribe. The department shall require that the notice so prescribed shall be published twice in a newspaper of general circulation within the county in which the disposal of waste material is proposed to be made and in such other appropriate information media as the department may direct. Said notice shall include a statement that any person desiring to present his or her views to the department with regard to said application may do so in writing to the department, or any person interested in the department's action on an application for a permit, may submit his or her views or notify the department of his or her interest within thirty days of the last date of publication of notice. Such notification or submission of views to the department shall entitle said persons to a copy of the action taken on the application. Upon receipt by the department of an application, it shall immediately send notice thereof containing pertinent information to the director of fish and wildlife and to the secretary of social and health services. When an application complying with the provisions of this chapter and the rules and regulations of the department has been filed with the department, it shall be its duty to investigate the application, and determine whether the use of public waters for waste disposal as proposed will pollute the same in violation of the public policy of the state. [1994 c 264 § 91; 1988 c 36 § 70; 1987 c 109 § 136; 1967 c 13 § 15; 1955 c 71 § 2.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.180 Waste disposal permits required of counties, municipalities and public corporations--Issuance--Conditions--Duration. The department shall issue a permit unless it finds that the disposal of waste material as proposed in the application will pollute the waters of the state in violation of the public policy declared in RCW 90.48.010. The department shall have authority to specify conditions necessary to avoid such pollution in each permit under which waste material may be disposed of by the permittee.

Permits may be temporary or permanent but shall not be valid for more than five years from date of issuance. [1987 c 109 § 137; 1967 c 13 § 16; 1955 c 71 § 3.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.190 Waste disposal permits required of counties, municipalities and public corporations--Termination--Grounds. A permit shall be subject to termination upon thirty days' notice in writing if the department finds:

(1) That it was procured by misrepresentation of any material fact or by lack of full disclosure in the application;

(2) That there has been a violation of the conditions thereof;

(3) That a material change in quantity or type of waste disposal exists. [1987 c 109 § 138; 1967 c 13 § 17; 1955 c 71 § 4. (1987 3rd ex.s. c 2 § 43 repealed by 1989 c 2 § 24, effective March 1, 1989.)]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.195 Waste disposal permits required of counties, municipalities and public corporations--Modification or additional conditions may be ordered. In the event that a material change in the condition of the state waters occurs the department may, by appropriate order, modify permit conditions or specify additional conditions in permits previously issued. [1987 c 109 § 139; 1967 c 13 § 18.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.200 Waste disposal permits required of counties, municipalities and public corporations--Nonaction upon application--Temporary permit--Duration. In the event of failure of the department to act upon an application within sixty days after it has been filed the applicant shall be deemed to have received a temporary permit. Said permit shall authorize the applicant to discharge wastes into waters of the state as requested in its application only until such time as the department shall have taken action upon said application. [1987 c 109 § 140; 1967 c 13 § 19; 1955 c 71 § 5.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.215 Upland finfish facilities--Waste discharge standards--Waste disposal permit. (1) The following definition shall apply to this section: "Upland finfish hatching and rearing facilities" means those facilities not located within waters of the state where finfish are hatched, fed, nurtured, held, maintained, or reared to reach the size of release or for market sale. This shall include fish hatcheries, rearing ponds, spawning channels, and other similarly constructed or fabricated public or private facilities.

(2) Not later than September 30, 1989, the department shall adopt standards pursuant to chapter 34.05 RCW for waste discharges from upland finfish hatching and rearing facilities. In establishing these standards, the department shall incorporate, to the extent applicable, studies conducted by the United States environmental protection agency on finfish rearing facilities and other relevant information. The department shall also issue a general permit as authorized by the federal clean water act, 33 U.S.C. 1251 et seq., or RCW 90.48.160 by September 30, 1989, for upland finfish hatching and rearing facilities. The department shall approve or deny applications for coverage under the general permit for upland finfish hatching and rearing facilities within one hundred eighty days from the date of application, unless a longer time is required to satisfy public participation requirements in the permit process in accordance with applicable rules, or compliance with the requirements of the state environmental policy act under chapter 43.21C RCW. The department shall notify applicants for coverage by a general permit as soon as it determines that a proposed discharge meets or fails to comply with the standards or general permit conditions set forth pursuant to this section, or that a time period longer than one hundred eighty days is necessary to satisfy public participation requirements or the state environmental policy act. [1989 c 293 § 1.]

RCW 90.48.220 Marine finfish rearing facilities--Waste discharge standards--Discharge permit applications--Exemption. (1) For the purposes of this section "marine finfish rearing facilities" means those private and public facilities located within the salt water of the state where finfish are fed, nurtured, held, maintained, or reared to reach the size of release or for market sale.

(2) Not later than October 31, 1994, the department shall adopt criteria under chapter 34.05 RCW for allowable sediment impacts from organic enrichment due to marine finfish rearing facilities.

(3) Not later than June 30, 1995, the department shall adopt standards under chapter 34.05 RCW for waste discharges from marine finfish rearing facilities. In establishing these standards, the department shall review and incorporate, to the extent possible, studies conducted by state and federal agencies on waste discharges from marine finfish rearing facilities, and any reports and other materials prepared by technical committees on waste discharges from marine finfish rearing facilities. The department shall approve or

deny discharge permit applications for marine finfish rearing facilities within one hundred eighty days from the date of application, unless a longer time is required to satisfy public participation requirements in the permit process in accordance with applicable rules, or compliance with the requirements of the state environmental policy act under chapter 43.21C RCW. The department shall notify applicants as soon as it determines that a proposed discharge meets or fails to comply with the standards adopted pursuant to this section, or if a time period longer than one hundred eighty days is necessary to satisfy public participation requirements of the state environmental policy act.

(4) The department may adopt rules to exempt marine finfish rearing facilities not requiring national pollutant discharge elimination system permits under the federal water pollution control act from the discharge permit requirement. [1993 c 296 § 1.]

RCW 90.48.230 Application of administrative procedure law to rule making and adjudicative proceedings. The provisions of chapter 34.05 RCW, the Administrative Procedure Act, apply to all rule making and adjudicative proceedings authorized by or arising under the provisions of this chapter. [1989 c 175 § 181; 1967 c 13 § 21.]

NOTES:

Effective date--1989 c 175: See note following RCW 34.05.010.

RCW 90.48.240 Water pollution orders for conditions requiring immediate action--Appeal. Notwithstanding any other provisions of this chapter or chapter 90.56 RCW, whenever it appears to the director that water quality conditions exist which require immediate action to protect the public health or welfare, or that a person required by RCW 90.48.160 to obtain a waste discharge permit prior to discharge is discharging without the same, or that a person conducting an operation which is subject to a permit issued pursuant to RCW 90.48.160 conducts the same in violation of the terms of said permit, causing water quality conditions to exist which require immediate action to protect the public health or welfare, the director may issue a written order to the person or persons responsible without prior notice or hearing, directing and affording the person or persons responsible the alternative of either (1) immediately discontinuing or modifying the discharge into the waters of the state, or (2) appearing before the department at the time and place specified in said written order for the purpose of providing to the department information pertaining to the violations and conditions alleged in said written order. The responsible person or persons shall be afforded not less than twenty-four hours notice of such an information meeting. If following such a meeting the department determines that water quality conditions exist which require immediate action as described herein, the department may issue a written order requiring immediate discontinuance or modification of the discharge into the waters of the state. In the event an order is not immediately complied with the attorney general, upon request of the department, shall seek and obtain an order of the superior court of the county in which the violation took place directing compliance with the order of the department. Such an order is appealable pursuant to RCW 43.21B.310. [1991 c 200 § 1106; 1987 c 109 § 15; 1967 c 13 § 22.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.250 Agreements or contracts to monitor waters and effluent discharge. The department is authorized to make agreements and enter into such contracts as are appropriate to carry out a program of monitoring the condition of the waters of the state and the effluent discharged therein, including contracts to monitor effluent discharged into public waters when such monitoring is required by the terms of a waste discharge permit or as part of the approval of a sewerage system, if adequate compensation is provided to the department as a term of the contract. [1987 c 109 § 141; 1967 c 13 § 23.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.260 Federal clean water act--Department designated as state agency, authority--Powers, duties and functions. The department of ecology is hereby designated as the State Water Pollution Control Agency for all purposes of the federal clean water act as it exists on February 4, 1987, and is hereby authorized to participate fully in the programs of the act as well as to take all action necessary to secure to the state the benefits and to meet the requirements of that act. With regard to the national estuary program established by section 320 of that act, the department shall exercise its responsibility jointly with the *Puget Sound water quality authority. The powers granted herein include, among others, and notwithstanding any other provisions of chapter 90.48 RCW or otherwise, the following:

(1) Complete authority to establish and administer a comprehensive state point source waste discharge or pollution discharge elimination permit program which will enable the department to qualify for full participation in any national waste discharge or pollution discharge elimination permit system and will allow the department to be the sole agency issuing permits required by such national system operating in the state of Washington subject to the provisions of RCW 90.48.262(2). Program elements authorized herein may include, but are not limited to: (a) Effluent treatment and limitation requirements together with timing requirements related thereto; (b) applicable receiving water quality standards requirements; (c) requirements of standards of performance for new sources; (d) pretreatment requirements; (e) termination and modification of permits for cause; (f) requirements

for public notices and opportunities for public hearings; (g) appropriate relationships with the secretary of the army in the administration of his responsibilities which relate to anchorage and navigation, with the administrator of the environmental protection agency in the performance of his duties, and with other governmental officials under the federal clean water act; (h) requirements for inspection, monitoring, entry, and reporting; (i) enforcement of the program through penalties, emergency powers, and criminal sanctions; (j) a continuing planning process; and (k) user charges.

(2) The power to establish and administer state programs in a manner which will insure the procurement of moneys, whether in the form of grants, loans, or otherwise; to assist in the construction, operation, and maintenance of various water pollution control facilities and works; and the administering of various state water pollution control management, regulatory, and enforcement programs.

(3) The power to develop and implement appropriate programs pertaining to continuing planning processes, area-wide waste treatment management plans, and basin planning.

The governor shall have authority to perform those actions required of him or her by the federal clean water act. [1988 c 220 § 1; 1983 c 270 § 1; 1979 ex.s. c 267 § 1; 1973 c 155 § 4; 1967 c 13 § 24.]

NOTES:

***Reviser's note:** The Puget Sound water quality authority and its powers and duties, pursuant to the Sunset Act, chapter 43.131 RCW, were terminated June 30, 1995, and repealed June 30, 1996. See 1990 c 115 §§ 11 and 12. Powers, duties, and functions of the Puget Sound water quality authority pertaining to cleanup and protection of Puget Sound transferred to the Puget Sound action team by 1996 c 138 § 11. See RCW 90.71.903.

Severability--1983 c 270: "If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected." [1983 c 270 § 5.]

RCW 90.48.261 Exercise of powers under RCW 90.48.260--Aquatic resource mitigation. When exercising its powers under RCW 90.48.260, the department shall, at the request of the project proponent, follow the guidance contained in RCW 90.74.005 through 90.74.030. [1997 c 424 § 7.]

RCW 90.48.262 Implementation of RCW 90.48.260--Permits for energy facilities--Rules and procedures. (1) The powers established under RCW 90.48.260 shall be implemented by the department through the adoption of rules in every appropriate situation. The permit program authorized under RCW 90.48.260(1) shall constitute a continuation of the established permit program of RCW 90.48.160 and other applicable sections within chapter 90.48 RCW. The appropriate modifications as authorized in *this 1973 amendatory act are designed to avoid duplication and other wasteful practices and to insure that the state permit program contains all required elements of and is compatible with the requirements of any national permit system.

(2) Permits for energy facilities subject to chapter 80.50 RCW shall be issued by the energy facility site evaluation council: PROVIDED, That such permits shall become effective only if the governor approves an application for certification and executes a certification agreement pursuant to said chapter. The council shall have all powers necessary to establish and administer a point source discharge permit program pertaining to such plants, consistent with applicable receiving water quality standards established by the department, and to qualify for full participation in any national waste discharge or pollution discharge elimination permit system. The council and the department shall each adopt, by rules, procedures which will provide maximum coordination and avoid duplication between the two agencies with respect to permits in carrying out the requirements of *this act including, but not limited to, monitoring and enforcement of certification agreements, and in qualifying for full participation in any such national system. [1975-'76 2nd ex.s. c 108 § 41; 1973 c 155 § 5.]

NOTES:

***Reviser's note:** "This 1973 amendatory act" and "this act" apparently refer to 1973 c 155, which consists of this section, amendments to RCW 90.48.010, 90.48.120, 90.48.140, 90.48.144, 90.48.160, and 90.48.260, and the repeal of RCW 90.48.070.

Severability--Effective date--1975-'76 2nd ex.s. c 108: See notes following RCW 43.21F.010.

RCW 90.48.264 Federal clean water act--Rules for on-site sewage disposal systems adjacent to marine waters. In implementing this chapter and in participating in programs under the federal clean water act, the department may consult with the department of social and health services concerning standards for repair of existing, failing on-site sewage disposal systems that are adjacent to marine waters. By January 1, 1989, the department of social and health services shall propose rules for adoption by the state board of health identifying the standards for repair of existing, failing on-site sewage disposal systems at single-family residences that were legally occupied prior to June 9, 1988, and that are adjacent to marine waters. The rules may specify the design, operation and maintenance standards for such repaired systems so as to ensure protection of the public health, attainment of state water quality standards and the protection of shellfish and other public resources. The rules shall also provide that any proposed discharge to marine water shall be considered only if on-site sewage disposal systems are not feasible and that such discharges shall meet the requirements of this chapter and department of ecology regulations. The state board of health shall adopt such proposed rules unless the board finds modification or rejection of them necessary to protect the public health. [1988 c 220 § 2.]

RCW 90.48.270 Sewage drainage basins--Authority of department to delineate and establish. The department shall have authority to delineate and establish sewage drainage basins in the state for the purpose of developing and/or adopting comprehensive plans for the control and abatement of water pollution within such basins. Basins may include, but are not limited to, rivers and their tributaries, streams, coastal waters, sounds, bays, lakes, and portions or combinations thereof, as well as the lands drained thereby. [1987 c 109 § 142; 1967 c 13 § 26.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Aquifer protection areas: Chapter 36.36 RCW.

RCW 90.48.280 Sewage drainage basins--Comprehensive plans for sewage drainage basins. The department is authorized to prepare and/or adopt a comprehensive water pollution control and abatement plan and to make subsequent amendments thereto, for each basin established pursuant to RCW 90.48.270. Comprehensive plans for sewage drainage basins may be prepared by any municipality and submitted to the department for adoption.

Prior to adopting a comprehensive plan for any basin or any subsequent amendment thereof the department shall hold a public hearing thereon. Notice of such hearing shall be given by registered mail, together with copies of the proposed plan, to each municipality, or other political subdivision, within the basin exercising a sewage disposal function, at least twenty days prior to the hearing date. Such hearing may be continued from time to time and, at the termination thereof, the department may reject the plan proposed or adopt it with such modifications as it shall deem proper.

Following adoption of a comprehensive plan for any basin, the department shall require compliance with such plan by any municipality or person operating or constructing a sewage collection, treatment or disposal system or plant, or any improvement to or extension of an existing sewage collection, treatment or disposal system or plant, within the basin. [1987 c 109 § 143; 1967 c 13 § 27.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.48.285 Contracts with municipal or public corporations and political subdivisions to finance water pollution control projects--Requisites--Priorities. The department is authorized to enter into contracts with any municipal or public corporation or political subdivision within the state for the purpose of assisting such agencies to finance the construction of water pollution control projects necessary to prevent the discharge of untreated or inadequately treated sewage or other waste into the waters of the state, including but not limited to, systems for the control of storm or surface waters which will provide for the removal of waste or polluting materials in a manner conforming to the comprehensive plan of water pollution control and abatement proposed by the agencies and approved by the department. Any such contract may provide for:

The payment by the department to a municipal or public corporation or political subdivision on a monthly, quarterly, or annual basis of varying amounts of moneys as advances which shall be repayable by said municipal or public corporation, or political subdivision under conditions determined by the department.

Contracts made by the department shall be subject to the following limitations:

(1) No contract shall be made unless the department shall find that the project cannot be financed at reasonable cost or within statutory limitations by the borrower without the making of such contract.

(2) No contract shall be made with any public or municipal corporation or political subdivision to assist in the financing of any project located within a sewage drainage basin for which the department shall have previously adopted a comprehensive water pollution control and abatement plan unless the project is found by the department to conform with the basin comprehensive plan.

(3) The department shall determine the interest rate, not to exceed ten percent per annum, which such advances shall bear.

(4) The department shall provide such reasonable terms and conditions of repayment of advances as it may determine.

(5) The total outstanding amount which the department may at any time be obligated to pay under all outstanding contracts made pursuant to this section shall not exceed the moneys available for such payment.

(6) Municipal or public corporations or political subdivisions shall meet such qualifications and follow such procedures in applying for contract assistance as shall be established by the department.

In making such contracts the department shall give priority to projects which will provide relief from actual or potential public health hazards or water pollution conditions and which provide substantial capacity beyond present requirements to meet anticipated future demand. [1987 c 109 § 144; 1980 c 32 § 13; 1969 ex.s. c 141 § 1.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Severability--1969 ex.s. c 141: "If any provision of this act, or its application to any person or circumstance is held invalid, the remainder of the act, or the application of the provisions to other persons or circumstances is not affected." [1969 ex.s. c 141 § 2.]

RCW 90.48.290 Grants to municipal or public corporations or political subdivisions to aid water pollution control projects--Limitations. The department is authorized to make and administer grants within appropriations authorized by the legislature to any municipal or public corporation, or political subdivision within the state for the purpose of aiding in the construction of water pollution control projects necessary to prevent the discharge of untreated or inadequately treated sewage or other waste into the waters of the state including, but not limited to, projects for the control of storm or surface waters which will provide for the removal of waste or polluting materials therefrom.

Grants so made by the department shall be subject to the following limitations:

(1) No grant shall be made in an amount which exceeds the recipient's contribution to the estimated cost of the project: PROVIDED, That the following shall be considered a part of the recipient's contribution:

(a) Any grant received by the recipient from the federal government pursuant to section 8(f) of the Federal Water Pollution Control Act (33 U.S.C. 466) for the project;

(b) Any expenditure which is made by any municipal or public corporation, or political subdivision within the state as a part of a joint effort with the recipient to carry out the project and which has not been used as a matching contribution for another grant made pursuant to this chapter, and

(c) Any expenditure for the project made by the recipient out of moneys advanced by the department from a revolving fund and repayable to said fund.

(2) No grant shall be made for any project which does not qualify for and receive a grant of federal funds under the provisions of the Federal Water Pollution Control Act as now or hereafter amended: PROVIDED, That this restriction shall not apply to state grants made in any biennium over and above the amount of such grants required to match all federal funds allocated to the state for such biennium.

(3) No grant shall be made to any municipal or public corporation, or political subdivision for any project located within a drainage basin unless the department shall have previously adopted a comprehensive water pollution control and abatement plan and unless the project is found by the department to conform with such basin comprehensive plan: PROVIDED, That the requirement for a project to conform to a comprehensive water pollution control and abatement plan may be waived by the department for any grant application filed with the department prior to July 1, 1974, in those situations where the department finds the public interest would be served better by approval of any grant application made prior to adoption of such plan than by its denial.

(4) Recipients of grants shall meet such qualifications and follow such procedures in applying for grants as shall be established by the department.

(5) Grants may be made to reimburse recipients for expenditures made after July 1, 1967 for projects which meet the requirements of this section and were commenced after the recipient had filed a grant application with the department. [1987 c 109 § 145; 1969 ex.s. c 284 § 1; 1967 c 13 § 28.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Severability--1969 ex.s. c 284: "If any provision of this act, or its application to any person or circumstance is held invalid, the remainder of the act, or the application of the provision to other persons or circumstances is not affected."

[1969 ex.s. c 284 § 24.] This applies to RCW 90.48.290, 90.48.295, 90.22.010 through 90.22.040, 90.14.031 through 90.14.121, 43.27A.190 through 43.27A.220, 43.27A.075, and to the repeal of RCW 43.21.145 and 90.14.030 through 90.14.120.

RCW 90.48.300 Pollution control facilities--Tax exemptions and credits. See chapter 82.34 RCW.

RCW 90.48.364 Discharge of oil into waters of the state--Definitions. For the purposes of this chapter, "technical feasibility" or "technically feasible" means that given available technology, a restoration or enhancement project can be successfully completed at a cost that is not disproportionate to the value of the resource before the injury. [1991 c 200 § 811.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

RCW 90.48.366 Discharge of oil into waters of the state--Compensation schedule. By July 1, 1991, the department, in consultation with the departments of *fisheries, wildlife, and natural resources, and the parks and recreation commission, shall adopt rules establishing a compensation schedule for the discharge of oil in violation of this chapter and chapter 90.56 RCW. The amount of compensation assessed under this schedule shall be no less than one dollar per gallon of oil spilled and no greater than fifty dollars per gallon of oil spilled. The compensation schedule shall reflect adequate compensation for unquantifiable damages or for damages not quantifiable at reasonable cost for any adverse environmental, recreational, aesthetic, or other effects caused by the spill and shall take into account:

(1) Characteristics of any oil spilled, such as toxicity, dispersibility, solubility, and persistence, that may affect the severity of the effects on the receiving environment, living organisms, and recreational and aesthetic resources;

(2) The sensitivity of the affected area as determined by such factors as: (a) The location of the spill; (b) habitat and living resource sensitivity; (c) seasonal distribution or sensitivity of living resources; (d) areas of recreational use or aesthetic importance; (e) the proximity of the spill to important habitats for birds, aquatic mammals, fish, or to species listed as threatened or endangered under state or federal law; (f) significant archaeological resources as determined by the office of archaeology and historic preservation; and (g) other areas of special ecological or recreational importance, as determined by the department. If the department has adopted rules for a compensation table prior to July 1, 1992, the sensitivity of significant archaeological resources shall only be included among factors to be used in the compensation table when the department revises the rules for the compensation table after July 1, 1992; and

(3) Actions taken by the party who spilled oil or any party liable for the spill that: (a) Demonstrate a recognition and affirmative acceptance of responsibility for the spill, such as the

immediate removal of oil and the amount of oil removed from the environment; or (b) enhance or impede the detection of the spill, the determination of the quantity of oil spilled, or the extent of damage, including the unauthorized removal of evidence such as injured fish or wildlife. [1994 sp.s. c 9 § 855; 1992 c 73 § 28; 1991 c 200 § 812; 1989 c 388 § 2.]

NOTES:

***Reviser's note:** Powers, duties, and functions of the department of fisheries and the department of wildlife were transferred to the department of fish and wildlife by 1993 sp.s. c 2, effective July 1, 1994.

Severability--Headings and captions not law--Effective date--1994 sp.s. c 9: See RCW 18.79.900 through 18.79.902.

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

RCW 90.48.367 Discharge of oil into waters of the state--Assessment of compensation. (1) After a spill or other incident causing damages to the natural resources of the state, the department shall conduct a formal preassessment screening as provided in RCW 90.48.368.

(2) The department shall use the compensation schedule established under RCW 90.48.366 to determine the amount of damages if the preassessment screening committee determines that: (a) Restoration or enhancement of the injured resources is not technically feasible; (b) damages are not quantifiable at a reasonable cost; and (c) the restoration and enhancement projects or studies proposed by the liable parties are insufficient to adequately compensate the people of the state for damages.

(3) If the preassessment screening committee determines that the compensation schedule should not be used, compensation shall be assessed for the amount of money necessary to restore any damaged resource to its condition before the injury, to the extent technically feasible, and compensate for the lost value incurred during the period between injury and restoration.

(4) Restoration shall include the cost to restock such waters, replenish or replace such resources, and otherwise restore the stream, lake, or other waters of the state, including any estuary, ocean area, submerged lands, shoreline, bank, or other lands adjoining such waters to its condition before the injury, as such condition is determined by the department. The lost value of a damaged resource shall be equal to the sum of consumptive, nonconsumptive, and indirect use values, as well as lost taxation, leasing, and licensing revenues. Indirect use values may include existence, bequest, option, and aesthetic values. Damages shall be determined by generally accepted and cost-effective procedures, including, but not limited to, contingent valuation method studies.

(5) Compensation assessed under this section shall be recoverable in an action brought by the attorney general on behalf of the people of the state of Washington and affected counties and cities in the superior court of Thurston county or any county in which damages occurred. Moneys recovered by the attorney general under this section shall be deposited in the coastal protection fund established under RCW 90.48.390, and shall only be used for the purposes stated in RCW 90.48.400.

(6) Compensation assessed under this section shall preclude claims under this chapter by local governments for compensation for damages to publicly owned resources resulting from the same incident. [1991 c 200 § 813; 1989 c 388 § 3.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

RCW 90.48.368 Discharge of oil into waters of the state--Preassessment screening. (1) The department shall adopt rules establishing a formal process for preassessment screening of damages resulting from spills to the waters of the state causing the death of, or injury to, fish, animals, vegetation, or other resources of the state. The rules shall specify the conditions under which the department shall convene a preassessment screening committee. The preassessment screening process shall occur concurrently with reconnaissance activities. The committee shall use information obtained from reconnaissance activities as well as any other relevant resource and resource use information. For each incident, the committee shall determine whether a damage assessment investigation should be conducted, or, whether the compensation schedule authorized under RCW 90.48.366 and 90.48.367 should be used to assess damages. The committee may accept restoration or enhancement projects or studies proposed by the liable parties in lieu of some or all of: (a) The compensation schedule authorized under RCW 90.48.366 and 90.48.367; or (b) the claims from damage assessment studies authorized under RCW 90.48.142.

(2) A preassessment screening committee may consist of representatives of the departments of ecology, fish and wildlife, natural resources, social and health services, and emergency management, the parks and recreation commission, the office of archaeology and historic preservation, as well as other federal, state, and local agencies, and tribal and local governments whose presence would enhance the reconnaissance or damage assessment aspects of spill response. The department shall chair the committee and determine which representatives will be needed on a spill-by-spill basis.

(3) The committee shall consider the following factors when determining whether a damage assessment study authorized under RCW 90.48.367 should be conducted: (a) Whether evidence from reconnaissance investigations suggests that injury has occurred or is likely to occur to publicly owned resources; (b) the potential loss in services provided by resources injured or likely to be injured and the expected value of the potential loss; (c) whether

a restoration project to return lost services is technically feasible; (d) the accuracy of damage quantification methods that could be used and the anticipated cost-effectiveness of applying each method; (e) the extent to which likely injury to resources can be verified with available quantification methods; and (f) whether the injury, once quantified, can be translated into monetary values with sufficient precision or accuracy.

(4) When a resource damage assessment is required for an oil spill in the navigable waters of the state, as defined in RCW 90.56.010, the state trustee agency responsible for the resource and habitat damaged shall conduct the damage assessment and pursue all appropriate remedies with the responsible party.

(5) Oil spill damage assessment studies authorized under RCW 90.48.367 may only be conducted if the committee, after considering the factors enumerated in subsection (3) of this section, determines that the damages to be investigated are quantifiable at a reasonable cost and that proposed assessment studies are clearly linked to quantification of the damages incurred.

(6) As new information becomes available, the committee may reevaluate the scope of damage assessment using the factors listed in subsection (3) of this section and may reduce or expand the scope of damage assessment as appropriate.

(7) The preassessment screening process shall provide for the ongoing involvement of persons who may be liable for damages resulting from an oil spill. The department may negotiate with a potentially liable party to perform restoration and enhancement projects or studies which may substitute for all or part of the compensation authorized under RCW 90.48.366 and 90.48.367 or the damage assessment studies authorized under RCW 90.48.367.

(8) For the purposes of this section and RCW 90.48.367, the cost of a damage assessment shall be considered "reasonable" when the anticipated cost of the damage assessment is expected to be less than the anticipated damage that may have occurred or may occur. [1994 c 264 § 92; 1992 c 73 § 29; 1991 c 200 § 814; 1989 c 388 § 4.]

NOTES:

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

RCW 90.48.369 Discharge of oil into waters of the state--Annual report. The department shall submit an annual report to the appropriate standing committees of the legislature for the next five years beginning January 1, 1990. The annual report shall cover the implementation of RCW 90.48.366, 90.48.367, 90.48.368, and 90.48.369 and shall include information on each spill for which a preassessment screening committee was convened, the outcome of each process, any compensation claims imposed or damage assessment studies conducted, and the revenues to and expenditures from the coastal protection fund. [1991 c 200 § 817; 1989 c 388 § 5.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

RCW 90.48.386 Department of natural resources leases. After May 15, 1991, the department of natural resources shall include in its leases for onshore and offshore facilities the following provisions:

(1) Require those wishing to lease, sublease, or re-lease state-owned aquatic lands to comply with the provisions of this chapter;

(2) Require lessees and sublessees to operate according to the plan of operations and to keep the plan current in compliance with this chapter; and

(3) Include in its leases provisions that a violation by the lessee or sublessee of the provisions of this chapter may be grounds for termination of the lease. [1991 c 200 § 1101.]

NOTES:

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

RCW 90.48.390 Coastal protection fund--Established--Moneys credited to--Use. The coastal protection fund is established to be used by the department as a revolving fund for carrying out the purposes of restoration of natural resources under this chapter and chapter 90.56 RCW. To this fund there shall be credited penalties, fees, damages, charges received pursuant to the provisions of this chapter and chapter 90.56 RCW, compensation for damages received under this chapter and chapter 90.56 RCW, and an amount equivalent to one cent per gallon from each marine use refund claim under RCW 82.36.330.

Moneys in the fund not needed currently to meet the obligations of the department in the exercise of its powers, duties, and functions under RCW 90.48.142, 90.48.366, 90.48.367, and 90.48.368 shall be deposited with the state treasurer to the credit of the fund. [1991 sp.s. c 13 § 84; 1991 c 200 § 815; 1989 c 388 § 7; 1989 c 262 § 3; 1971 ex.s. c 180 § 4.]

NOTES:

Effective dates--Severability--1991 sp.s. c 13: See notes following RCW 18.08.240.

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

Findings--1989 c 262: See note following RCW 90.48.142.

RCW 90.48.400 Coastal protection fund--Disbursal of moneys from. (1) Moneys in the coastal protection fund shall be disbursed for the following purposes and no others:

(a) Environmental restoration and enhancement projects intended to restore or enhance environmental, recreational, archaeological, or aesthetic resources for the benefit of Washington's citizens;

(b) Investigations of the long-term effects of oil spills; and

(c) Development and implementation of an aquatic land geographic information system.

(2) The director may allocate a portion of the fund to be devoted to research and development in the causes, effects, and removal of pollution caused by the discharge of oil or other hazardous substances.

(3) A steering committee consisting of representatives of the departments of ecology, fish and wildlife, and natural resources, and the parks and recreation commission shall authorize the expenditure of the moneys collected under RCW 90.48.366 through 90.48.368, after consulting impacted local agencies and local and tribal governments.

(4) Agencies may not be reimbursed from the coastal protection fund for the salaries and benefits of permanent employees for routine operational support. Agencies may only be reimbursed under this section if money for reconnaissance and damage assessment activities is unavailable from other sources. [1994 c 264 § 93; 1992 c 73 § 30; 1991 c 200 § 816; 1990 c 116 § 14. Prior: 1989 c 388 § 8; 1989 c 262 § 4; 1971 ex.s. c 180 § 5.]

NOTES:

Effective dates--Severability--1992 c 73: See RCW 82.23B.902 and 90.56.905.

Effective dates--Severability--1991 c 200: See RCW 90.56.901 and 90.56.904.

Findings--Severability--1990 c 116: See notes following RCW 90.56.210.

Intent--Application--Captions--Severability--1989 c 388: See notes following RCW 90.56.010.

Findings--1989 c 262: See note following RCW 90.48.142.

RCW 90.48.420 Water quality standards affected by forest practices--Department of ecology solely responsible for water quality standards--Forest practices regulations--Promulgation--Examination--Enforcement procedures. (1) The department of ecology, pursuant to powers vested in it previously by chapter 90.48 RCW and consistent with the policies of said chapter and RCW 90.54.020(3), shall be solely responsible for establishing water quality standards for waters of the state. On or before January 1, 1975, the department of ecology shall examine existing regulations containing water quality standards and other applicable rules and regulations of said department pertaining to waters of the state affected by nonpoint sources of pollution arising from forest practices and, when it appears appropriate to the department of ecology, modify said regulations. In any such examination or modification the department of ecology shall consider such factors, among others, as uses of the receiving waters, diffusion, downstream cooling, and reasonable transient and short-term effects resulting from forest practices.

Promulgation of forest practices regulations by the department of ecology and the forest practices board, shall be accomplished so that compliance with such forest practice regulations will achieve compliance with water pollution control laws.

(2) The department of ecology shall monitor water quality to determine whether revisions in such water quality standards or revisions in such forest practices regulations are necessary to accomplish the foregoing result, and either promulgate appropriate revisions to such water quality standards or propose appropriate revisions to such forest practices regulations or both.

(3) Notwithstanding any other provisions of chapter 90.48 RCW or of the rules and regulations promulgated thereunder, no permit system pertaining to nonpoint sources of pollution arising from forest practices shall be authorized, and no civil or criminal penalties shall be imposed with respect to any forest practices conducted in full compliance with the applicable provisions of RCW 76.09.010 through 76.09.280, forest practices regulations, and any approvals or directives of the department of natural resources thereunder.

(4) Prior to the department of ecology taking action under statutes or regulations relating to water quality, regarding violations of water quality standards arising from forest practices, the department of ecology shall notify the department of natural resources. [1975 1st ex.s. c 200 § 13; 1974 ex.s. c 137 § 30.]

NOTES:

Effective dates--1974 ex.s. c 137: See RCW 76.09.925.

Severability--1974 ex.s. c 137: See RCW 76.09.935.

Forest practices: Chapter 76.09 RCW.

Right of entry to administer this section: RCW 76.09.160.

RCW 90.48.425 Forest practices act and regulations relating to water quality protection to be utilized to satisfy federal water pollution act. The forest practices act, chapter 76.09 RCW, and the forest practices regulations adopted thereunder relating to water quality protection shall be utilized to satisfy the planning and program requirements of sections 208, 209, and 305 of the federal Water Pollution Control Act, as regards silvicultural activities, unless it is determined by the department of ecology that extraordinary conditions exist which make forest practices regulations unsuitable to satisfy such federal requirements. [1975 1st ex.s. c 200 § 14.]

NOTES:

Provisions of state law pertaining to federal clean water act: RCW 90.48.260, 90.48.262.

RCW 90.48.430 Watershed restoration projects--Approval process--Waiver of public review. A permit, certification, or other approval required by the department for a watershed restoration project as defined in RCW 89.08.460 shall be processed in compliance with RCW 89.08.450 through 89.08.510. Public review of proposed watershed restoration projects may be shortened or waived by the department. [1995 c 378 § 15.]

RCW 90.48.445 Aquatic noxious weed control--Water quality permits--Definition. (1) The director shall issue or approve water quality permits for use by federal, state, or local governmental agencies and licensed applicators for the purpose of using, for aquatic noxious weed control, herbicides and surfactants registered under state or federal pesticide control laws. The issuance of the permits shall be subject only to compliance with: Federal and state pesticide label requirements, the requirements of the federal insecticide, fungicide, and rodenticide act, the Washington pesticide control act, the Washington pesticide application act, and the state environmental policy act; and applicable requirements established in an option or options recommended for controlling the noxious weed by a final environmental impact statement published under chapter 43.21C RCW by the department prior to May 5, 1995, by the department of agriculture, or by the department of agriculture jointly with other state agencies. This section may not be construed as requiring the preparation of a new environmental impact statement to replace a final environmental impact statement published before May 5, 1995.

(2) The director of ecology may not utilize this permit authority to otherwise condition or burden weed control efforts. The director's authority to issue water quality modification permits for activities other than the application of surfactants and approved herbicides, to control aquatic noxious weeds, is unaffected by this section.

(3) As used in this section, "aquatic noxious weed" means an aquatic weed on the state noxious weed list adopted under RCW 17.10.080. [1995 c 255 § 3.]

NOTES:

Severability--Effective date--1995 c 255: See RCW 17.26.900 and 17.26.901.

RCW 90.48.450 Discharges from agricultural activity--Consideration to be given as to whether enforcement action would contribute to conversion of land to nonagricultural use--Minimize the possibility. (1) Prior to issuing a notice of violation related to discharges from agricultural activity on agricultural land, the department shall consider whether an enforcement action would contribute to the conversion of agricultural land to nonagricultural uses. Any enforcement action shall attempt to minimize the possibility of such conversion.

(2) As used in this section:

(a) "Agricultural activity" means the growing, raising, or production of horticultural or viticultural crops, berries, poultry, livestock, grain, mint, hay and dairy products.

(b) "Agricultural land" means at least five acres of land devoted primarily to the commercial production of livestock or agricultural commodities. [1981 c 297 § 31.]

NOTES:

Legislative finding, intent--1981 c 297: See note following RCW 70.94.640.

Severability--1981 c 297: See note following RCW 15.36.201.

RCW 90.48.455 Discharge of chlorinated organics--Engineering reports by pulp and paper mills--Permits limiting discharge. (1) The department may require each pulp mill and paper mill discharging chlorinated organics to conduct and submit an engineering report on the cost of installing technology designed to reduce the amount of chlorinated organic compounds discharged into the waters of the state. The department shall allow at least twenty-four months from June 11, 1992, for each pulp mill and each paper mill to submit an engineering report.

(2) The department may not issue a permit establishing limits to the discharge of chlorinated organic compounds by a pulp mill or a paper mill under RCW 90.48.160 or 90.48.260 until at least nine months after receiving an engineering report from a kraft mill and at least fifteen months after receiving an engineering report from a sulfite mill.

(3) Nothing in this section shall apply to dioxin compounds. [1992 c 201 § 1.]

RCW 90.48.465 Water discharge fees. (1) The department shall establish annual fees to collect expenses for issuing and administering each class of permits under RCW 90.48.160, 90.48.162, and 90.48.260. An initial fee schedule shall be established by rule within one year of March 1, 1989, and thereafter the fee schedule shall be adjusted no more often than once every two years. This fee schedule shall apply to all permits, regardless of date of issuance, and fees shall be assessed prospectively. All fees charged shall be based on factors relating to the complexity of permit issuance and compliance and may be based on pollutant loading and toxicity and be designed to encourage recycling and the reduction of the quantity of pollutants. Fees shall be established in amounts to fully recover and not to exceed expenses incurred by the department in processing permit applications and modifications, monitoring and evaluating compliance with permits, conducting inspections, securing laboratory analysis of samples taken during inspections, reviewing plans and documents directly related to operations of permittees, overseeing performance of delegated pretreatment programs, and supporting the overhead expenses that are directly related to these activities.

(2) The annual fee paid by a municipality, as defined in 33 U.S.C. Sec. 1362, for all domestic wastewater facility permits issued under RCW 90.48.162 and 90.48.260 shall not exceed the total of a maximum of fifteen cents per month per residence or residential equivalent contributing to the municipality's wastewater system. The department shall adopt by rule a schedule of credits for any municipality engaging in a comprehensive monitoring program beyond the requirements imposed by the department, with the credits available for five years from March 1, 1989, and with the total amount of all credits not to exceed fifty thousand dollars in the five-year period.

(3) The department shall ensure that indirect dischargers do not pay twice for the administrative expense of a permit. Accordingly, administrative expenses for permits issued by a municipality under RCW 90.48.165 are not recoverable by the department.

(4) In establishing fees, the department shall consider the economic impact of fees on small dischargers and the economic impact of fees on public entities required to obtain permits for storm water runoff and shall provide appropriate adjustments.

(5) All fees collected under this section shall be deposited in the water quality permit account hereby created in the state treasury. Moneys in the account may be appropriated only for purposes of administering permits under RCW 90.48.160, 90.48.162, and 90.48.260.

(6) Beginning with the biennium ending June 30, 1997, the department shall present a biennial progress report on the use of moneys from the account to the legislature. The report will be due December 31st of odd-numbered years. The report shall consist of information on fees collected, actual expenses incurred, and anticipated expenses for the current and following fiscal years. [1997 c 398 § 2; 1996 c 37 § 3; 1992 c 174 § 17; 1991 c 307 § 1; 1989 c 2 § 13 (Initiative Measure No. 97, approved November 8, 1988).]

NOTES:

Short title--Captions--Construction--Existing agreements--Effective date--Severability--1989 c 2: See RCW 70.105D.900 through 70.105D.921, respectively.

RCW 90.48.480 Reduction of sewer overflows--Plans--Compliance schedule--Report to the legislature. (1) The department of ecology shall work with local governments to develop reasonable plans and compliance schedules for the greatest reasonable reduction of combined sewer overflows. The plan shall address various options, including construction of storage tanks for sewage and separation of sewage and stormwater transport systems. The compliance schedule shall be designed to achieve the greatest reasonable reduction of combined sewer overflows at the earliest possible date. The plans and compliance schedules shall be completed by January 1, 1988. A compliance schedule will be a condition of any waste discharge permit issued or renewed after January 1, 1988.

(2) By September 1, 1987, the department of ecology shall report to the legislature any statutory changes necessary to implement the plans and compliance schedules described in subsection (1) of this section. The report shall include (a) a

recommended date by which all sewage treatment facilities shall achieve the greatest reasonable reduction of combined sewer overflows, and (b) a comprehensive assessment of the total cost to achieve compliance, the projected need and recommended distribution of local, state, and federal funding, and the availability of local, state, and federal funding. A thorough discussion of the potential funding sources shall accompany the report. [1985 c 249 § 2.]

RCW 90.48.490 Sewage treatment facilities--Plans to upgrade or construct. Plans for upgrading sewage treatment facilities and plans for new sewage treatment facilities shall address the greatest reasonable reduction of combined sewer overflows and implementation of pretreatment standards. [1985 c 249 § 3.]

RCW 90.48.495 Water conservation measures to be considered in sewer plans. The department of ecology shall require sewer plans to include a discussion of water conservation measures considered or underway and their anticipated impact on public sewer service. [1989 c 348 § 10.]

NOTES:

Severability--1989 c 348: See note following RCW 90.54.020.

Rights not impaired--1989 c 348: See RCW 90.54.920.

RCW 90.48.500 Pollution Disclosure Act of 1971. See chapter 90.52 RCW.

RCW 90.48.520 Review of operations before issuance or renewal of wastewater discharge permits--Incorporation of permit conditions. In order to improve water quality by controlling toxicants in wastewater, the department of ecology shall in issuing and renewing state and federal wastewater discharge permits review the applicant's operations and incorporate permit conditions which require all known, available, and reasonable methods to control toxicants in the applicant's wastewater. Such conditions may include, but are not limited to: (1) Limits on the discharge of specific chemicals, and (2) limits on the overall toxicity of the effluent. The toxicity of the effluent shall be determined by techniques such as chronic or acute bioassays. Such conditions shall be required regardless of the quality of receiving water and regardless of the minimum water quality standards. In no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria. [1987 c 500 § 1.]

RCW 90.48.900 Severability--1945 c 216. Should any section or provision of this act be held invalid by any court of competent jurisdiction, the same shall not affect the validity of the act as a whole or any part thereof other than that portion so held to be invalid. [1945 c 216 § 23.]

RCW 90.48.901 Severability--1967 c 13. If any provision of this 1967 amendatory act or its application to any person or circumstance is held invalid the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1967 c 13 § 30.]

RCW 90.48.902 Severability--1970 ex.s. c 88. If any provision of this 1970 amendatory act, or its application to any person or circumstance is held invalid, the remainder of the act, or the application of the provision to other persons or circumstances is not affected. [1970 ex.s. c 88 § 15.]

RCW 90.48.903 Severability--1971 ex.s. c 180. If any provision of this 1971 amendatory act, or its application to any person or circumstance is held invalid, the remainder of the act, or the application of the provision to other persons or circumstances is not affected. [1971 ex.s. c 180 § 12.]

RCW 90.48.904 Severability--1989 c 262. If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1989 c 262 § 6.]

RCW 90.48.906 Short title--1971 ex.s. c 180. This 1971 amendatory act may be cited as the "Coastal Waters Protection Act of 1971". [1971 ex.s. c 180 § 13.]

APPENDIX 11

CHAPTER 173–201A WAC
WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON

Last Update: 11/18/97

WAC	
173–201A–010	Introduction.
173–201A–020	Definitions.
173–201A–030	General water use and criteria classes.
173–201A–040	Toxic substances.
173–201A–050	Radioactive substances.
173–201A–060	General considerations.
173–201A–070	Antidegradation.
173–201A–080	Outstanding resource waters.
173–201A–100	Mixing zones.
173–201A–110	Short-term modifications.
173–201A–120	General classifications.
173–201A–130	Specific classifications—Freshwater.
173–201A–140	Specific classifications—Marine water.
173–201A–150	Achievement considerations.
173–201A–160	Implementation.
173–201A–170	Surveillance.
173–201A–180	Enforcement.

WAC 173–201A–010 Introduction.

(1) The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment thereof, and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW and the policies and purposes thereof.

(2) This chapter shall be reviewed periodically by the department and appropriate revisions shall be undertaken.

(3) The water use and quality criteria set forth in WAC 173–201A–030 through 173–201A–140 are established in conformance with present and potential water uses of the surface waters of the state of Washington and in consideration of the natural water quality potential and limitations of the same. Compliance with the surface water quality standards of the state of Washington require compliance with chapter 173–201A WAC, Water quality standards for surface waters of the state of Washington, and chapter 173–204 WAC, Sediment management standards.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–010, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–020 Definitions. The following definitions are intended to facilitate the use of chapter 173–201A WAC:

"Action value" means a total phosphorus (TP) value established at the upper limit of the trophic states in each ecoregion. Exceedance of an action value indicates that a problem is suspected. A lake–specific study may be needed to confirm if a nutrient problem exits.

"Acute conditions" are changes in the physical, chemical, or biologic environment which are expected or demonstrated to result in injury or death to an organism as a result of short–term exposure to the substance or detrimental environmental condition.

"AKART" is an acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART shall represent the most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. The concept of AKART applies to both point and nonpoint sources of pollution. The term "best management practices," typically applied to nonpoint source pollution controls is considered a subset of the AKART requirement. "*The Stormwater Management Manual for the Puget Sound Basin*" (1992), may be used as a guideline, to the extent appropriate, for developing best management practices to apply AKART for storm water discharges.

"Background conditions" means the biological, chemical, and physical conditions of a water body, outside the area of influence of the discharge under consideration. Background sampling locations in an enforcement action would be up–gradient or outside the area of influence of the discharge. If several discharges to any water body exist, and enforcement action is being taken for possible violations to the standards, background sampling would be undertaken immediately up–gradient from each discharge. When assessing background conditions in the headwaters of a disturbed watershed it may be necessary to use the background conditions of a neighboring or similar watershed as the reference conditions.

"Best management practices (BMP)" means physical, structural, and/or managerial practices approved by the department that, when used singularly or in combination, prevent or reduce pollutant discharges.

"Biological assessment" is an evaluation of the biological condition of a water body using surveys of aquatic community structure and function and other direct measurements of resident biota in surface waters.

"Bog" means those wetlands that are acidic, peat forming, and whose primary water source is precipitation, with little, if any, outflow.

"Carcinogen" means any substance or agent that produces or tends to produce cancer in humans. For implementation of this chapter, the term carcinogen will apply to substances on the United States Environmental Protection Agency lists of A (known human) and B (probable human) carcinogens, and any substance which causes a significant increased incidence of benign or malignant tumors in a single, well conducted animal bioassay, consistent with the weight of evidence approach specified in the United States Environmental Protection Agency's Guidelines for Carcinogenic Risk Assessment as set forth in 51 FR 33992 et seq. as presently published or as subsequently amended or republished.

"Chronic conditions" are changes in the physical, chemical, or biologic environment which are expected or demonstrated to result in injury or death to an organism as a result of repeated or constant exposure over an extended period of time to a substance or detrimental environmental condition.

"Created wetlands" means those wetlands intentionally created from nonwetland sites to produce or replace natural wetland habitat.

"Critical condition" is when the physical. chemical, and biological characteristics of the receiving water environment interact with the effluent to produce the greatest potential adverse impact on aquatic biota and existing or characteristic water uses. For steady–state discharges to riverine systems the critical condition may be assumed to be equal to the 7Q10 flow event unless determined otherwise by the department.

"Damage to the ecosystem" means any demonstrated or predicted stress to aquatic or terrestrial organisms or communities of organisms which the department reasonably concludes may interfere in the health or survival success or natural structure of such populations. This stress may be due to, but is not limited to, alteration in habitat or changes in water temperature, chemistry, or turbidity, and shall consider the potential build up of discharge constituents or temporal increases in habitat alteration which may create such stress in the long term.

"Department" means the state of Washington department of ecology.

"Director" means the director of the state of Washington department of ecology.

"Drainage ditch" means that portion of a designed and constructed conveyance system that serves the purpose of transporting surplus water; this may include natural water courses or channels incorporated in the system design, but does not include the area adjacent to the water course or channel.

"Ecoregions" are defined using EPAs *Ecoregions of the Pacific Northwest* Document No. 600/3–86/033 July 1986 by Omernik and Gallant.

"Fecal coliform" means that portion of the coliform group which is present in the intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within twenty-four hours at 44.5 plus or minus 0.2 degrees Celsius.

"Geometric mean" means either the nth root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.

"Ground water exchange" means the discharge and recharge of ground water to a surface water. Discharge is inflow from an aquifer, seeps or springs that increases the available supply of surface water. Recharge is outflow downgradient to an aquifer or downstream to surface water for base flow maintenance. Exchange may include ground water discharge in one season followed by recharge later in the year.

"Hardness" means a measure of the calcium and magnesium salts present in water. For purposes of this chapter, hardness is measured in milligrams per liter and expressed as calcium carbonate ($CaCO_3$).

"Irrigation ditch" means that portion of a designed and constructed conveyance system that serves the purpose of transporting irrigation water from its supply source to its place of use; this may include natural water courses or channels incorporated in the system design, but does not include the area adjacent to the water course or channel.

"Lakes" shall be distinguished from riverine systems as being water bodies, including reservoirs, with a mean detention time of greater than fifteen days.

"Lake-specific study" means a study intended to quantify existing nutrient concentrations, determine existing characteristic uses for lake class waters, and potential lake uses. The study determines how to protect these uses and if any uses are lost or impaired because of nutrients, algae, or aquatic plants. An appropriate study must recommend a criterion for total phosphorus (TP), total nitrogen (TN) in µg/l, or other nutrient that impairs characteristic uses by causing excessive algae blooms or aquatic plant growth.

"Mean detention time" means the time obtained by dividing a reservoir's mean annual minimum total storage by the thirty-day ten-year low-flow from the reservoir.

"Migration or translocation" means any natural movement of an organism or community of organisms from one locality to another locality.

"Mixing zone" means that portion of a water body adjacent to an effluent outfall where mixing results in the dilution of the effluent with the receiving water. Water quality criteria may be exceeded in a mixing zone as conditioned and provided for in WAC 173–201A–100.

"Natural conditions" or **"natural background levels"** means surface water quality that was present before any human-caused pollution. When estimating natural conditions in the headwaters of a disturbed watershed it may be necessary to use the less disturbed conditions of a neighboring or similar watershed as a reference condition.

"Nonpoint source" means pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the National Pollutant Discharge Elimination System program.

"Permit" means a document issued pursuant to RCW 90.48.160 et seq. or RCW 90.48.260 or both, specifying the waste treatment and control requirements and waste discharge conditions.

"pH" means the negative logarithm of the hydrogen ion concentration.

"Pollution" means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish, or other aquatic life.

"Primary contact recreation" means activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

"Secondary contact recreation" means activities where a person's water contact would be limited (wading or fishing) to the extent that bacterial infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided.

"Shoreline stabilization" means the anchoring of soil at the water's edge, or in shallow water, by fibrous plant root complexes; this may include long-term accretion of sediment or peat, along with shoreline progradation in such areas.

"Storm water" means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

"Storm water attenuation" means the process by which peak flows from precipitation are reduced and runoff velocities are slowed as a result of passing through a surface waterbody.

"Surface waters of the state" includes lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands and all other surface waters and water courses within the jurisdiction of the state of Washington.

"Temperature" means water temperature expressed in degrees Celsius (°C).

"Treatment wetlands" means those wetlands intentionally constructed on nonwetland sites and managed for the primary purpose of wastewater or storm water treatment. Treatment wetlands are considered part of a collection and treatment system, and generally are not subject to the criteria of this chapter.

"Trophic state" means a classification of the productivity of a lake ecosystem. Lake productivity depends on the amount of biologically available nutrients in water and sediments and may be based on total phosphorus (TP). Secchi depth and chlorophyll-a measurements may be used to improve the trophic state classification of a lake. Trophic states used in this rule include, from least to most nutrient rich, ultra-oligotrophic, oligotrophic, lower mesotrophic, upper mesotrophic, and eutrophic.

"Turbidity" means the clarity of water expressed as nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter.

"Upwelling" means the natural process along Washington's Pacific Coast where the summer prevailing northerly winds produce a seaward transport of surface water. Cold, deeper more saline waters rich in nutrients and low in dissolved oxygen, rise to replace the surface water. The cold oxygen deficient water enters Puget Sound and other coastal estuaries at depth where it displaces the existing deep water and eventually rises to replace the surface water. Such surface water replacement results in an overall increase in salinity and nutrients accompanied by a depression in dissolved oxygen. Localized upwelling of the deeper water of Puget Sound can occur year-round under influence of tidal currents, winds, and geomorphic features.

"USEPA" means the United States Environmental Protection Agency.

"Wetlands" means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds. and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands. (Waterbodies not included in the definition of wetlands as well as those mentioned in the definition are still waters of the state.)

"Wildlife habitat" means waters of the state used by, or that directly or indirectly provide food support to, fish, other aquatic life, and wildlife for any life history stage or activity.
[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19). § –201A–020. filed 11/18/97. effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29). § 173–201A–020. filed 11/25/92. effective 12/26/92.]

WAC 173–201A–030 General water use and criteria classes. The following criteria shall apply to the various classes of surface waters in the state of Washington:

(1) **Class AA (extraordinary).**

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater — fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(B) Marine water — fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater — dissolved oxygen shall exceed 9.5 mg/L.

(B) Marine water — dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 16.0°C (freshwater) or 13.0°C (marine water) due to human activities. When natural conditions exceed 16.0°C (freshwater) and 13.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=23/(T+5)$ (freshwater) or $t=8/(T-4)$ (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173–201A–040 and 173–201A–050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) **Class A (excellent).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 8.0 mg/L.

(B) Marine water - dissolved oxygen shall exceed 6.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 6.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 18.0°C (freshwater) or 16.0°C (marine water) due to human activities. When natural conditions exceed 18.0°C (freshwater) and 16.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173–201A–040 and 173–201A–050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) **Class B (good).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial and agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing and spawning.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 Ml.

(ii) Dissolved oxygen:

(A) Freshwater — dissolved oxygen shall exceed 6.5 mg/L.

(B) Marine water — dissolved oxygen shall exceed 5.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 5.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 21.0°C (freshwater) or 19.0°C (marine water) due to human activities. When natural conditions exceed 21.0°C (freshwater) and 19.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=34/(T+9)$ (freshwater) or $t=16/(T)$ (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) and 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173–201A–040 and 173–201A–050).

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.

(4) **Class C (fair).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial).

(ii) Fish (salmonid and other fish migration).

(iii) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(iv) Commerce and navigation.

(c) Water quality criteria - marine water:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(ii) Dissolved oxygen shall exceed 4.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 4.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Temperature shall not exceed 22.0°C due to human activities. When natural conditions exceed 22.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases shall not, at any time, exceed $t=20/(T+2)$.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(iv) pH shall be within the range of 6.5 to 9.0 with a human-caused variation within a range of less than 0.5 units.

(v) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vi) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173–201A–040 and 173–201A–050).

(vii) Aesthetic values shall not be interfered with by the presence of obnoxious wastes, slimes, aquatic growths, or materials which will taint the flesh of edible species.

(5) **Lake class.**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(ii) Dissolved oxygen - no measurable decrease from natural conditions.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature - no measurable change from natural conditions.

(v) pH - no measurable change from natural conditions.

(vi) Turbidity shall not exceed 5 NTU over background conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173–201A–040 and 173–201A–050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(6) **Establishing lake nutrient criteria.**

(a) The following table shall be used to aid in establishing nutrient criteria:

(Table 1) The ecoregional and trophic-state action values for establishing nutrient criteria:

Coast Range, Puget Lowlands, and Northern Rockies Ecoregions:		
Trophic State	**If Ambient TP (µg/) Range of Lake is:**	**Then criteria should be set at:**
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
	Action Value	
	>20	lake specific study may be initiated
Cascades Ecoregion:		
Trophic State	**If Ambient TP (µg/) Range of Lake is:**	**Then criteria should be set at:**
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
	Action Value	
	>10	lake specific study may be initiated
Columbia Basin Ecoregion:		
Trophic State	**If Ambient TP (µg/) Range of Lake is:**	**Then criteria should be set at:**
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
Upper mesotrophic	>20-35	35 or less
	Action Value	
	>35	lake specific study may be initiated.

Lakes in the Willamette, East Cascade Foothills, or Blue Mountain ecoregions do not have recommended values and need to have lake-specific studies in order to receive criteria as described in (c)(i) of this subsection.

(b) The following actions are recommended if ambient monitoring of a lake shows the epilimnetic total phosphorus concentration, as shown in Table 1 of this section, is below the action value for an ecoregion:

(i) Determine trophic status from existing or newly gathered data. The recommended minimum sampling to determine trophic status is calculated as the mean of four or more samples collected from the epilimnion between June through September in one or more consecutive years. Sampling must be spread throughout the season.

(ii) Propose criteria at or below the upper limit of the trophic state; or

(iii) Conduct lake-specific study to determine and propose to adopt appropriate criteria as described in (c) of this subsection.

(c) The following actions are recommended if ambient monitoring of a lake shows total phosphorus to exceed the action value for an ecoregion shown in Table 1 of this section or where recommended ecoregional action values do not exist:

(i) Conduct a lake-specific study to evaluate the characteristic uses of the lake. A lake-specific study may vary depending on the source or threat of impairment. Phytoplankton blooms, toxic phytoplankton, or excessive aquatic plants, are examples of various sources of impairment. The following are examples of quantitative measures that a study may describe: Total phosphorus, total nitrogen, chlorophyll-a, dissolved oxygen in the hypolimnion if thermally stratified, pH, hardness, or other measures of existing conditions and potential changes in any one of these parameters.

(ii) Determine appropriate total phosphorus concentrations or other nutrient criteria to protect characteristic lake uses. If the existing total phosphorus concentration is protective of characteristic lake uses, then set criteria at existing total phosphorus concentration. If the existing total phosphorus concentration is not protective of the existing characteristic lake uses, then set criteria at a protective concentration. Proposals to adopt appropriate total phosphorus criteria to protect characteristic uses must be developed by considering technical information and stakeholder input as part of a public involvement process equivalent to the Administrative Procedure Act (chapter 34.05 RCW).

(iii) Determine if the proposed total phosphorus criteria necessary to protect characteristic uses is achievable. If the recommended criterion is not achievable and if the characteristic use the criterion is intended to protect is not an existing use, then a higher criterion may be proposed in conformance with 40 CFR part 131.10.

(d) The department will consider proposed lake-specific nutrient criteria during any water quality standards rule making that follows development of a proposal. Adoption by rule formally establishes the criteria for that lake.

(e) Prioritization and investigation of lakes by the department will be initiated by listing problem lakes in a watershed needs assessment, and scheduled as part of the water quality program's watershed approach to pollution control. This prioritization will apply to lakes identified as warranting a criteria based on the results of a lake-specific study, to lakes warranting a lake-specific study for establishing criteria, and to lakes requiring restoration and pollution control measures due to exceedance of an established criterion. The adoption of nutrient criteria are generally not intended to apply to lakes or ponds with a surface area smaller than five acres; or to ponds wholly contained on private property owned and surrounded by a single landowner; and nutrients do not drain or leach from these lakes or private ponds to the detriment of other property owners or other water bodies; and do not impact designated uses in the lake. However, if the landowner proposes criteria the department may consider adoption.

(f) The department may not need to set a lake-specific criteria or further investigate a lake if existing water quality conditions are naturally poorer (higher TP) than the action value and uses have not been lost or degraded, per WAC 173-201A-070(2).

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19). § 173–201A–030, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order –29). § 173–201A–030, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–040 Toxic substances.

(1) Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.

(2) The department shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with subsection (1) of this section and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

(3) The following criteria shall be applied to all surface waters of the state of Washington for the protection of aquatic life. The department may revise the following criteria on a state-wide or waterbody-specific basis as needed to protect aquatic life occurring in waters of the state and to increase the technical accuracy of the criteria being applied. The department shall formally adopt any appropriate revised criteria as part of this chapter in accordance with the provisions established in chapter 34.05 RCW, the Administrative Procedure Act. The department shall ensure there are early opportunities for public review and comment on proposals to develop revised criteria. Values are µg/L for all substances except Ammonia and Chloride which are mg/L:

	Freshwater		Marine Water	
Substance	Acute	Chronic	Acute	Chronic
Aldrin/Dieldrin	2.5a	0.0019b	0.71a	0.0019b
Ammonia (un-ionized NH3) hh	f.c	g.d	0.233h.c	0.035h.d
Arsenic dd	360.0c	190.0d	69.0c.ll	36.0d.cc.ll
Cadmium dd	i.c	j.d	42.0c	9.3d
Chlordane	2.4a	0.0043b	0.09a	0.004b
Chloride (Dissolved) k	860.0h.c	230.0h.d	-	-
Chlorine (Total Residual)	19.0c	11.0d	13.0c	7.5d
Chlorpyrifos	0.083c	0.041d	0.011c	0.0056d
Chromium (Hex) dd	15.0c.l.ii	10.0d.jj	1,100.0c.l.ll	50.0d.ll
Chromium (Tri) gg	m.c	n.d	-	-
Copper dd	o.c	p.d	4.8c.ll	3.1d.ll
Cyanide ee	22.0c	5.2d	1.0c.mm	-
DDT (and metabolites)	1.1a	0.001b	0.13a	0.001b
Dieldrin/Aldrin e	2.5a	0.0019b	0.71a	0.0019b
Endosulfan	0.22a	0.056b	0.034a	0.0087b
Endrin	0.18a	0.0023b	0.037a	0.0023b
Heptachlor	0.52a	0.0038b	0.053a	0.0036b
Hexachlorocyclohexane (Lindane)	2.0a	0.08b	0.16a	-
Lead dd	q.c	r.d	210.0c.ll	8.1d.ll
Mercury s	2.1c.kk.dd	0.012d.ff	1.8c.ll.dd	0.025d.ff
Nickel dd	t.c	u.d	74.0c.ll	8.2d.ll
Parathion	0.065c	0.013d	-	-
Pentachlorophenol (PCP)	w.c	v.d	13.0c	7.9d
Polychlorinated Biphenyls (PCBs)	2.0b	0.014b	10.0b	0.030b
Selenium	20.0c.ff	5.0d.ff	290c.ll.dd	71.0d.x.ll.dd
Silver dd	y.a	-	1.9a.ll	-
Toxaphene	0.73c.z	0.0002d	0.21c.z	0.0002d
Zinc dd	aa.c	bb.d	90.0c.ll	81.0d.ll

Notes to Table:

a. An instantaneous concentration not to be exceeded at any time.

b. A 24-hour average not to be exceeded.

c. A 1-hour average concentration not to be exceeded more than once every three years on the average.

d. A 4-day average concentration not to be exceeded more than once every three years on the average.

e. Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are compared with the Dieldrin criteria.

f. Shall not exceed the numerical value given by:

$$0.52 \div (FT)(FPH)(2)$$

where:

$FT = 10^{[0.03(20-TCAP)]}$; $TCAP \le T \le 30$
$FT = 10^{[0.03(20-T)]}$: $0 \le T \le TCAP$
$FPH = 1 : 8 \le pH \le 9$
$FPH = (1 + 10^{(7.4-pH)}) \div 1.25 : 6.5 \le pH \le 8.0$
TCAP = 20°C: Salmonids present.
TCAP = 25°C: Salmonids absent.

g. Shall not exceed the numerical value given by:

$$0.80 \div (FT)(FPH)(RATIO)$$

where:

$RATIO = 13.5 : 7.7 \le pH \le 9$

$RATIO = (20.25 \times 10^{(7.7-pH)}) \div (1 + 10^{(7.4-pH)}) : 6.5 \le pH \le 7.7$

where: FT and FPH are as shown in (f) above except:
TCAP = 15°C: Salmonids present.
TCAP = 20°C: Salmonids absent.

h. Measured in milligrams per liter rather than micrograms per liter.

i. $\le (0.944)(e^{(1.128[\ln(\text{hardness})]-3.828)})$ at hardness = 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.136672 - [(In hardness)(0.041838)].

j. $\le (0.909)(e^{(0.7852[\ln(\text{hardness})]-3.490)})$ at hardness = 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.101672 - [(In hardness)(0.041838)].

k. Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.

l. Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.

m. $\le (0.316)e^{(0.8190[\ln(\text{hardness})] + 3.688)}$

n. $\le (0.860)e^{(0.8190[\ln(\text{hardness})] + 1.561)}$

o. $\le (0.960)(e^{(0.9422[\ln(\text{hardness})] - 1.464)})$

p. $\le (0.960)(e^{(0.8545[\ln(\text{hardness})] - 1.465)})$

q. $\le (0.791)(e^{(1.273[\ln(\text{hardness})] - 1.460)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(In hardness)(0.145712)].

r. $\leq (0.791)(e^{(1.273[\ln(\text{hardness})] -4.705)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].

s. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.

t. $\leq (0.998)(e^{(0.8460[\ln(\text{hardness})] +3.3612)})$

u. $\leq (0.997)(e^{(0.8460[\ln(\text{hardness})] +1.1645)})$

v. $\leq e^{[1.005(\text{pH}) -5.290]}$

w. $\leq e^{[1.005(\text{pH}) -4.830]}$

x. The status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 $\mu g/l$ in salt water.

y. $\leq (0.85)(e^{(1.72[\ln(\text{hardness})] -6.52)})$

z. Channel Catfish may be more acutely sensitive.

aa. $\leq (0.978)(e^{(0.8473[\ln(\text{hardness})] +0.8604)})$

bb. $\leq (0.986)(e^{(0.8473[\ln(\text{hardness})] +0.7614)})$

cc. Nonlethal effects (growth, C-14 uptake, and chlorophyll production) to diatoms (Thalassiosira aestivalis and Skeletonema costatum) which are common to Washington's waters have been noted at levels below the established criteria. The importance of these effects to the diatom populations and the aquatic system is sufficiently in question to persuade the state to adopt the USEPA National Criteria value (36 $\mu g/L$) as the state threshold criteria, however, wherever practical the ambient concentrations should not be allowed to exceed a chronic marine concentration of 21 $\mu g/L$.

dd. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA *Water Quality Standards Handbook*, December 1983, as supplemented or replaced. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173–220–060 or 173–226–110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173–220–050 or 173–226–130(3), as appropriate.

ee. The criteria for cyanide is based on the weak and dissociable method in the 17th Ed. *Standard Methods for the Examination of Water and Wastewater*, 4500-CN I, and as revised (see footnote dd. above).

ff. These criteria are based on the total-recoverable fraction of the metal.

gg. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.

hh. Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water. 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA *Ambient Water Quality Criteria for Ammonia (Saltwater)*-1989. EPA440/5-88-004. April 1989.

ii. Conversion factor to calculate dissolved metal concentration is 0.982.

jj. Conversion factor to calculate dissolved metal concentration is 0.962.

kk. Conversion factor to calculate dissolved metal concentration is 0.85.

ll. Marine conversion factors (CF) used for calculating dissolved metals concentrations. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. CF for mercury is applicable to the acute criterion only. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion = criterion x CF

Metal	CF
Arsenic	1.000
Cadmium	0.994
Chromium (VI)	0.993
Copper	0.83
Lead	0.951
Mercury	0.85
Nickel	0.990
Selenium	0.998
Silver	0.85
Zinc	0.946

mm. The cyanide criteria are: 9.1μg/l chronic and 2.8μg/l acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point. to Green Point to Deception Pass: and south from Deception Pass and of a line from Partridge Point to Point Wilson.

(4) *USEPA Quality Criteria for Water, 1986* shall be used in the use and interpretation of the values listed in subsection (3) of this section.

(5) Concentrations of toxic, and other substances with toxic propensities not listed in subsection (3) of this section shall be determined in consideration of *USEPA Quality Criteria for Water, 1986*, and as revised, and other relevant information as appropriate. Human health-based water quality criteria used by the state are contained in 40 CFR 131.36 (known as the National Toxics Rule).

(6) Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than or equal to one in one million.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19). § 173-201A-040. filed 11/18/97. effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order -29). § 173-201A-040. filed 11/25/92. effective 12/26/92.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173–201A–050 Radioactive substances.

(1) Deleterious concentrations of radioactive materials for all classes shall be as determined by the lowest practicable concentration attainable and in no case shall exceed:

(a) 1/12.5 of the values listed in WAC 246–221–290 (Column 2, Table II, effluent concentrations, rules and regulations for radiation protection); or

(b) USEPA Drinking Water Regulations for radionuclides, as published in the Federal Register of July 9, 1976, or subsequent revisions thereto.

(2) Nothing in this chapter shall be interpreted to be applicable to those aspects of governmental regulation of radioactive waters which have been preempted from state regulation by the Atomic Energy Act of 1954, as amended, as interpreted by the United States Supreme Court in the cases of *Northern States Power Co. v. Minnesota 405 U.S. 1035 (1972) and Train v. Colorado Public Interest Research Group, 426 U.S. 1 (1976)*.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19), § 173–201A–050, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–050, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–060 General considerations. The following general guidelines shall apply to the water quality criteria and classifications set forth in WAC 173–201A–030 through 173–201A–140 hereof:

(1) At the boundary between waters of different classifications, the water quality criteria for the higher classification shall prevail.

(2) In brackish waters of estuaries, where the fresh and marine water quality criteria differ within the same classification, the criteria shall be applied on the basis of vertically averaged salinity. The freshwater criteria shall be applied at any point where ninety-five percent of the vertically averaged daily maximum salinity values are less than or equal to one part per thousand. Marine criteria shall apply at all other locations; except that the marine water quality criteria shall apply for dissolved oxygen when the salinity is one part per thousand or greater and for fecal coliform organisms when the salinity is ten parts per thousand or greater.

(3) In determining compliance with the fecal coliform criteria in WAC 173–201A–030, averaging of data collected beyond a thirty-day period, or beyond a specific discharge event under investigation, shall not be permitted when such averaging would skew the data set so as to mask noncompliance periods.

(4)(a) The water quality criteria herein established for total dissolved gas shall not apply when the stream flow exceeds the seven-day, ten-year frequency flood.

(b) The total dissolved gas criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This gas abatement plan must be accompanied by fisheries management and physical and biological monitoring plans. The elevated total dissolved gas levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The specific allowances for total dissolved gas exceedances are listed as special conditions for sections of the Snake and Columbia rivers in WAC 173–201A–130 and as shown in the following exemption:

Special fish passage exemption for sections of the Snake and Columbia rivers: When spilling water at dams is necessary to aid fish passage, total dissolved gas must not exceed an average of one hundred fifteen percent as measured at Camas/Washougal below Bonneville dam or as measured in the forebays of the next downstream dams. Total dissolved gas must also not exceed an average of one hundred twenty percent as measured in the tailraces of each dam. These averages are based on the twelve highest hourly readings in any one day of total dissolved gas. In addition, there is a maximum total dissolved gas one hour average of one hundred twenty-five percent, relative to atmospheric pressure, during spillage for fish passage. These special conditions for total dissolved gas in the Snake and Columbia rivers are viewed as temporary and are to be reviewed by the year 2003.

(c) Nothing in these special conditions allows an impact to existing and characteristic uses.

(5) Waste discharge permits, whether issued pursuant to the National Pollutant Discharge Elimination System or otherwise, shall be conditioned so the discharges authorized will meet the water quality standards.

(a) However, persons discharging wastes in compliance with the terms and conditions of permits shall not be subject to civil and criminal penalties on the basis that the discharge violates water quality standards.

(b) Permits shall be subject to modification by the department whenever it appears to the department the discharge violates water quality standards. Modification of permits, as provided herein, shall be subject to review in the same manner as originally issued permits.

(6) No waste discharge permit shall be issued which results in a violation of established water quality criteria, except as provided for under WAC 173–201A–100 or 173–201A–110.

(7) Due consideration will be given to the precision and accuracy of the sampling and analytical methods used as well as existing conditions at the time, in the application of the criteria.

(8) The analytical testing methods for these criteria shall be in accordance with the *"Guidelines Establishing Test Procedures for the Analysis of Pollutants"* (40 C.F.R. Part 136) and other or superseding methods published and/or approved by the department following consultation with adjacent states and concurrence of the USEPA.

(9) Nothing in this chapter shall be interpreted to prohibit the establishment of effluent limitations for the control of the thermal component of any discharge in accordance with Section 316 of the federal Clean Water Act (33 U.S.C. 1251 et seq.).

(10) The primary means for protecting water quality in wetlands is through implementing the antidegradation procedures section (WAC 173–070).

(a) In addition to designated uses, wetlands may have existing beneficial uses that are to be protected that include ground water exchange, shoreline stabilization, and storm water attenuation.

(b) Water quality in wetlands is maintained and protected by maintaining the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses.

(c) Wetlands shall be delineated using the Washington State Wetlands Identification and Delineation Manual, in accordance with WAC 173–22–035.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19), § 173–201A–060, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–060, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–070 Antidegradation. The antidegradation policy of the state of Washington, as generally guided by chapter 90.48 RCW, Water Pollution Control Act, and chapter 90.54 RCW, Water Resources Act of 1971, is stated as follows:

(1) Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed.

(2) Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

(3) Water quality shall be maintained and protected in waters designated as outstanding resource waters in WAC 173–201A–080.

(4) Whenever waters are of a higher quality than the criteria assigned for said waters, the existing water quality shall be protected and pollution of said waters which will reduce the existing quality shall not be allowed, except in those instances where:

(a) It is clear, after satisfactory public participation and intergovernmental coordination, that overriding considerations of the public interest will be served;

(b) All wastes and other materials and substances discharged into said waters shall be provided with all known, available, and reasonable methods of prevention, control, and treatment by new and existing point sources before discharge. All activities which result in the pollution of waters from nonpoint sources shall be provided with all known, available, and reasonable best management practices; and

(c) When the lowering of water quality in high quality waters is authorized, the lower water quality shall still be of high enough quality to fully support all existing beneficial uses.

(5) Short-term modification of water quality may be permitted as conditioned by WAC 173–201A–110.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–070, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–080 Outstanding resource waters. Waters meeting one or more of the following criteria shall be considered for outstanding resource water designation. Designations shall be adopted in accordance with the provisions of chapter 34.05 RCW, Administrative Procedure Act.

(1) Waters in national parks, national monuments, national preserves, national wildlife refuges, national wilderness areas, federal wild and scenic rivers, national seashores, national marine sanctuaries, national recreation areas, national scenic areas, and national estuarine research reserves;

(2) Waters in state parks, state natural areas, state wildlife management areas, and state scenic rivers;

(3) Documented aquatic habitat of priority species as determined by the department of wildlife;

(4) Documented critical habitat for populations of threatened or endangered species of native anadromous fish;

(5) Waters of exceptional recreational or ecological significance.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–080, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-100 Mixing zones.

(1) The allowable size and location of a mixing zone and the associated effluent limits shall be established in discharge permits, general permits, or orders, as appropriate.

(2) A discharger shall be required to fully apply AKART prior to being authorized a mixing zone.

(3) Mixing zone determinations shall consider critical discharge conditions.

(4) No mixing zone shall be granted unless the supporting information clearly indicates the mixing zone would not have a reasonable potential to cause a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health as determined by the department.

(5) Water quality criteria shall not be violated outside of the boundary of a mixing zone as a result of the discharge for which the mixing zone was authorized.

(6) The size of a mixing zone and the concentrations of pollutants present shall be minimized.

(7) The maximum size of a mixing zone shall comply with the following:

(a) In rivers and streams, mixing zones, singularly or in combination with other mixing zones, shall comply with the most restrictive combination of the following (this size limitation may be applied to estuaries having flow characteristics that resemble rivers):

(i) Not extend in a downstream direction for a distance from the discharge port(s) greater than three hundred feet plus the depth of water over the discharge port(s), or extend upstream for a distance of over one hundred feet;

(ii) Not utilize greater than twenty-five percent of the flow; and

(iii) Not occupy greater than twenty-five percent of the width of the water body.

(b) In estuaries, mixing zones, singularly or in combination with other mixing zones, shall:

(i) Not extend in any horizontal direction from the discharge port(s) for a distance greater than two hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water; and

(ii) Not occupy greater than twenty-five percent of the width of the water body as measured during mean lower low water. For the purpose of this section, areas to the east of a line from Green Point (Fidalgo Island) to Lawrence Point (Orcas Island) are considered estuarine, as are all of the Strait of Georgia and the San Juan Islands north of Orcas Island. To the east of Deception Pass, and to the south and east of Admiralty Head, and south of Point Wilson on the Quimper Peninsula, is Puget Sound proper, which is considered to be entirely estuarine. All waters existing within bays from Point Wilson westward to Cape Flattery and south to the North Jetty of the Columbia River shall also be categorized as estuarine.

(c) In oceanic waters, mixing zones, singularly or in combination with other mixing zones, shall not extend in any horizontal direction from the discharge port(s) for a distance greater than three hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water. For the purpose of this section, all marine waters not classified as estuarine in (b)(ii) of this subsection shall be categorized as oceanic.

(d) In lakes, and in reservoirs having a mean detention time greater than fifteen days, mixing zones shall not be allowed unless it can be demonstrated to the satisfaction of the department that:

(i) Other siting, technological, and managerial options that would avoid the need for a lake mixing zone are not reasonably achievable;

(ii) Overriding considerations of the public interest will be served; and

(iii) All technological and managerial methods available for pollution reduction and removal that are economically achievable would be implemented prior to discharge. Such methods may include, but not be limited to, advanced waste treatment techniques.

(e) In lakes, and in reservoirs having a mean detention time greater than fifteen days, mixing zones, singularly or in combination with other mixing zones, shall comply with the most restrictive combination of the following:

(i) Not exceed ten percent of the water body volume;

(ii) Not exceed ten percent of the water body surface area (maximum radial extent of the plume regardless of whether it reaches the surface); and

(iii) Not extend beyond fifteen percent of the width of the water body.

(8) Acute criteria are based on numeric criteria and toxicity tests approved by the department, as generally guided under WAC 173–201A–040 (1) through (5), and shall be met as near to the point of discharge as practicably attainable. Compliance shall be determined by monitoring data or calibrated models approved by the department utilizing representative dilution ratios. A zone where acute criteria may be exceeded is allowed only if it can be demonstrated to the department's satisfaction the concentration of, and duration and frequency of exposure to the discharge, will not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem. A zone of acute criteria exceedance shall singularly or in combination with other such zones comply with the following maximum size requirements:

(a) In rivers and streams, a zone where acute criteria may be exceeded shall comply with the most restrictive combination of the following (this size limitation may also be applied to estuaries having flow characteristics resembling rivers):

(i) Not extend beyond ten percent of the distance towards the upstream and downstream boundaries of an authorized mixing zone, as measured independently from the discharge port(s);

(ii) Not utilize greater than two and one-half percent of the flow; and

(iii) Not occupy greater than twenty-five percent of the width of the water body.

(b) In oceanic and estuarine waters a zone where acute criteria may be exceeded shall not extend beyond ten percent of the distance established in subsection (7)(b) of this section as measured independently from the discharge port(s).

(9) Overlap of mixing zones.

(a) Where allowing the overlap of mixing zones would result in a combined area of water quality criteria nonattainment which does not exceed the numeric size limits established under subsection (7) of this section, the overlap may be permitted if:

(i) The separate and combined effects of the discharges can be reasonably determined; and

(ii) The combined effects would not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

(b) Where allowing the overlap of mixing zones would result in exceedance of the numeric size limits established under subsection (7) of this section, the overlap may be allowed only where:

(i) The overlap qualifies for exemption under subsections (12) and (13) of this section; and

(ii) The overlap meets the requirements established in (a) of this subsection.

(10) Storm water:

(a) Storm water discharge from any "point source" containing "process wastewater" as defined in 40 C.F.R. Part 122.2 shall fully conform to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section.

(b) Storm water discharges not described by (a) of this subsection may be granted an exemption to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section, provided the discharger clearly demonstrates to the department's satisfaction that:

(i) All appropriate best management practices established for storm water pollutant control have been applied to the discharge.

(ii) The proposed mixing zone shall not have a reasonable potential to result in a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health as determined by the department; and

(iii) The proposed mixing zone shall not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

(c) All mixing zones for storm water discharges shall be based on a volume of runoff corresponding to a design storm approved by the department. Exceedances from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section due to precipitation events greater than the approved design storm may be allowed by the department, if it would not result in adverse impact to existing or characteristic uses of the water body or result in damage to the ecosystem, or adversely affect public health as determined by the department.

(11) Combined sewer overflows complying with the requirements of chapter 173–245 WAC, may be allowed an average once per year exemption to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section, provided the discharge complies with subsection (4) of this section.

(12) Exceedances from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section may be considered by the department in the following cases:

(a) For discharges existing prior to November 24, 1992, (or for proposed discharges with engineering plans formally approved by the department prior to November 24, 1992);

(b) Where altering the size configuration is expected to result in greater protection to existing and characteristic uses;

(c) Where the volume of water in the effluent is providing a greater benefit to the existing or characteristic uses of the water body due to flow augmentation than the benefit of removing the discharge, if such removal is the remaining feasible option; or

(d) Where the exceedance is clearly necessary to accommodate important economic or social development in the area in which the waters are located.

(13) Before an exceedance from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section may be allowed under subsection (12) of this section, it must clearly be demonstrated to the department's satisfaction that:

(a) AKART appropriate to the discharge is being fully applied;

(b) All siting, technological, and managerial options which would result in full or significantly closer compliance that are economically achievable are being utilized; and

(c) The proposed mixing zone complies with subsection (4) of this section.

(14) Any exemptions granted to the size criteria under subsection (12) of this section shall be reexamined during each permit renewal period for changes in compliance capability. Any significant increase in capability to comply shall be reflected in the renewed discharge permit.

(15) The department may establish permit limits and measures of compliance for human health based criteria (based on lifetime exposure levels), independent of this section.

(16) Sediment impact zones authorized by the department pursuant to chapter 173–204 WAC, Sediment management standards, do not satisfy the requirements of this section.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–100, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–110 Short-term modifications. The criteria and special conditions established in WAC 173–201A–030 through 173–201A–140 may be modified for a specific water body on a short-term basis when necessary to accommodate essential activities, respond to emergencies, or to otherwise protect the public interest, even though such activities may result in a temporary reduction of water quality conditions below those criteria and classifications established by this regulation. Such activities must be conditioned, timed, and restricted (i.e., hours or days rather than weeks or months) in a manner that will minimize water quality degradation to existing and characteristic uses. In no case will any degradation of water quality be allowed if this degradation significantly interferes with or becomes injurious to characteristic water uses or causes long-term harm to the environment.

(1) A short-term modification may be issued in writing by the director or his/her designee to an individual or entity proposing the aquatic application of pesticides, including but not limited to those used for control of federally or state listed noxious and invasive species, and excess populations of native aquatic plants, mosquitoes, burrowing shrimp, and fish, subject to the following terms and conditions:

(a) A short-term modification will in no way lessen or remove the project proponent's obligations and liabilities under other federal, state and local rules and regulations.

(b) A request for a short-term modification shall be made to the department on forms supplied by the department. Such request shall be made at least thirty days prior to initiation of the proposed activity, and after the project proponent has complied with the requirements of the State Environmental Policy Act (SEPA);

(c) A short-term modification shall be valid for the duration of the activity requiring modification of the criteria and special conditions in WAC 173-201A–030 through 173–201A–140, or for one year, whichever is less. Ecology may authorize a longer duration where the activity is part of an ongoing or long-term operation and maintenance plan, integrated pest or noxious weed management plan, waterbody or watershed management plan, or restoration plan. Such a plan must be developed through a public involvement process consistent with the Administrative Procedure Act (chapter 34.05 RCW) and be in compliance with SEPA, chapter 43.21C RCW, in which case the standards may be modified for the duration of the plan, or for five years, whichever is less;

(d) Appropriate public notice as determined and prescribed by the director or his/her designee shall be given, identifying the pesticide, applicator, location where the pesticide will be applied, proposed timing and method of application, and any water use restrictions specified in USEPA label provisions;

(e) The pesticide application shall be made at times so as to:

(i) Minimize public water use restrictions during weekends; and

(ii) Avoid public water use restrictions during the opening week of fishing season, Memorial Day weekend, Independence Day weekend, and Labor Day weekend;

(f) Any additional conditions as may be prescribed by the director or his/her designee.

(2) A short-term modification may be issued for the control or eradication of noxious weeds identified as such in accordance with the state noxious weed control law, chapter 17.10 RCW, and Control of spartina and purple loosestrife, chapter 17.26 RCW. Short-term modifications for noxious weed control shall be included in a water quality permit issued in accordance with RCW 90.48.445, and the following requirements:

(a) Water quality permits for noxious weed control may be issued to the Washington state department of agriculture (WSDA) for the purposes of coordinating and conducting noxious weed control activities consistent with their responsibilities under chapter 17.10 and 17.26 RCW. Coordination may include noxious weed control activities identified in a WSDA integrated noxious weed management plan and conducted by individual landowners or land managers.

(b) Water quality permits may also be issued to individual landowners or land managers for noxious weed control activities where such activities are not covered by a WSDA integrated noxious weed management plan.

(3) The turbidity criteria established under WAC 173–201A–030 shall be modified to allow a temporary mixing zone during and immediately after necessary in-water or shoreline construction activities that result in the disturbance of in-place sediments. A temporary turbidity mixing zone is subject to the constraints of WAC 173–201A–100 (4) and (6) and is authorized only after the activity has received all other necessary local and state permits and approvals, and after the implementation of appropriate best management practices to avoid or minimize disturbance of in-place sediments and exceedances of the turbidity criteria. A temporary turbidity mixing zone shall be as follows:

(a) For waters up to 10 cfs flow at the time of construction, the point of compliance shall be one hundred feet downstream from activity causing the turbidity exceedance.

(b) For waters above 10 cfs up to 100 cfs flow at the time of construction, the point of compliance shall be two hundred feet downstream of activity causing the turbidity exceedance.

(c) For waters above 100 cfs flow at the time of construction, the point of compliance shall be three hundred feet downstream of activity causing the turbidity exceedance.

(d) For projects working within or along lakes, ponds, wetlands, estuaries, marine waters or other nonflowing waters, the point of compliance shall be at a radius of one hundred fifty feet from activity causing the turbidity exceedance.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19), § 173–201A–110, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–110, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–120 General classifications. General classifications applying to various surface water bodies not specifically classified under WAC –201A–130 or 173–201A–140 are as follows:

(1) All surface waters lying within national parks, national forests, and/or wilderness areas are classified Class AA or Lake Class.

(2) All lakes and their feeder streams within the state are classified Lake Class and Class AA respectively, except for those feeder streams specifically classified otherwise.

(3) All reservoirs with a mean detention time of greater than 15 days are classified Lake Class.

(4) All reservoirs with a mean detention time of 15 days or less are classified the same as the river section in which they are located.

(5) All reservoirs established on preexisting lakes are classified as Lake Class.

(6) All unclassified surface waters that are tributaries to Class AA waters are classified Class AA. All other unclassified surface waters within the state are hereby classified Class A.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29), § 173–201A–120, filed 11/25/92, effective 12/26/92.]

WAC 173–201A–130 Specific classifications-Freshwater. Specific fresh surface waters of the state of Washington are classified as follows:

(1)	American River.	Class AA
(2)	Big Quilcene River and tributaries.	Class AA
(3)	Bumping River.	Class AA
(4)	Burnt Bridge Creek.	Class A
(5)	Cedar River from Lake Washington to the Maplewood Bridge (river mile 4.1).	Class A
(6)	Cedar River and tributaries from the Maplewood Bridge (river mile 4.1) to Landsburg Dam (river mile 21.6).	Class AA
(7)	Cedar River and tributaries from Landsburg Dam (river mile 21.6) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(8)	Chehalis River from upper boundary of Grays Harbor at Cosmopolis (river mile 3.1, longitude 123°45'45" W) to Scammon Creek (river mile 65.8).	Class A
(9)	Chehalis River from Scammon Creek (river mile 65.8) to Newaukum River (river mile 75.2). Special condition - dissolved oxygen shall exceed 5.0 mg/L from June 1 to September 15. For the remainder of the year, the dissolved oxygen shall meet Class A criteria.	Class A
(10)	Chehalis River from Newaukum River (river mile 75.2) to Rock Creek (river mile 106.7).	Class A
(11)	Chehalis River, from Rock Creek (river mile 106.7) to headwaters.	Class AA
(12)	Chehalis River, south fork.	Class A
(13)	Chewuch River.	Class AA
(14)	Chiwawa River.	Class AA
(15)	Cispus River.	Class AA

(16)	Clearwater River.	Class A
(17)	Cle Elum River.	Class AA
(18)	Cloquallum Creek.	Class A
(19)	Clover Creek from outlet of Lake Spanaway to inlet of Lake Steilacoom.	Class A
(20)	Columbia River from mouth to the Washington-Oregon border (river mile 309.3). Special conditions - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined. Dissolved oxygen shall exceed 90 percent of saturation. Special condition - special fish passage exemption as described in WAC 173–201A–060 (4)(b).	Class A
(21)	Columbia River from Washington-Oregon border (river mile 309.3) to Grand Coulee Dam (river mile 596.6). Special condition from Washington-Oregon border (river mile 309.3) to Priest Rapids Dam (river mile 397.1). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9). Special condition - special fish passage exemption as described in WAC 173–201A–060 (4)(b).	Class A
(22)	Columbia River from Grand Coulee Dam (river mile 596.6) to Canadian border (river mile 745.0).	Class AA
(23)	Colville River.	Class A
(24)	Coweeman River from mouth to Mulholland Creek (river mile 18.4).	Class A
(25)	Coweeman River from Mulholland Creek (river mile 18.4) to headwaters.	Class AA
(26)	Cowlitz River from mouth to base of Riffe Lake Dam (river mile 52.0).	Class A
(27)	Cowlitz River from base of Riffe Lake Dam (river mile 52.0) to headwaters.	Class AA
(28)	Crab Creek and tributaries.	Class B
(29)	Decker Creek.	Class AA
(30)	Deschutes River from mouth to boundary of Snoqualmie National Forest (river mile 48.2).	Class A
(31)	Deschutes River from boundary of Snoqualmie National Forest (river mile 48.2) to headwaters.	Class AA
(32)	Dickey River.	Class A
(33)	Dosewallips River and tributaries.	Class AA
(34)	Duckabush River and tributaries.	Class AA
(35)	Dungeness River from mouth to Canyon Creek (river mile 10.8).	Class A
(36)	Dungeness River and tributaries from Canyon Creek (river mile 10.8) to headwaters.	Class AA
(37)	Duwamish River from mouth south of a line bearing 254° true from the NW corner of berth 3, terminal No. 37 to the Black River (river mile 11.0) (Duwamish River continues as the Green River above the Black River).	Class B
(38)	Elochoman River.	Class A
(39)	Elwha River and tributaries.	Class AA
(40)	Entiat River from Wenatchee National Forest boundary (river mile 20.5) to headwaters.	Class AA
(41)	Grande Ronde River from mouth to Oregon border (river mile 37). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(42)	Grays River from Grays River Falls (river mile 15.8) to headwaters.	Class AA

(43)	Green River (Cowlitz County).	Class AA
(44)	Green River (King County) from Black River (river mile 11.0 and point where Duwamish River continues as the Green River) to west boundary of Sec. 27-T21N-R6E (west boundary of Flaming Geyser State Park at river mile 42.3).	Class A
(45)	Green River (King County) from west boundary of Sec. 27-T21N-R6E (west boundary of Flaming Geyser State Park, river mile 42.3) to west boundary of Sec. 13-T21N-R7E (river mile 59.1).	Class AA
(46)	Green River and tributaries (King County) from west boundary of Sec. 13-T21N-R7E (river mile 59.1) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(47)	Hamma Hamma River and tributaries.	Class AA
(48)	Hanaford Creek from mouth to east boundary of Sec. 25-T15N-R2W (river mile 4.1). Special condition - dissolved oxygen shall exceed 6.5 mg/L.	Class A
(49)	Hanaford Creek from east boundary of Sec. 25-T15N-R2W (river mile 4.1) to headwaters.	Class A
(50)	Hoh River and tributaries.	Class AA
(51)	Hoquiam River (continues as west fork above east fork) from mouth to river mile 9.3 (Dekay Road Bridge) (upper limit of tidal influence).	Class B
(52)	Humptulips River and tributaries from mouth to Olympic National Forest boundary on east fork (river mile 12.8) and west fork (river mile 40.4) (main stem continues as west fork).	Class A
(53)	Humptulips River, east fork from Olympic National Forest boundary (river mile 12.8) to headwaters.	Class AA
(54)	Humptulips River, west fork from Olympic National Forest boundary (river mile 40.4) to headwaters.	Class AA
(55)	Issaquah Creek.	Class A
(56)	Kalama River from lower Kalama River Falls (river mile 10.4) to headwaters.	Class AA
(57)	Klickitat River from Little Klickitat River (river mile 19.8) to boundary of Yakima Indian Reservation.	Class AA
(58)	Lake Washington Ship Canal from Government Locks (river mile 1.0) to Lake Washington (river mile 8.6). Special condition - salinity shall not exceed one part per thousand (1.0 ppt) at any point or depth along a line that transects the ship canal at the University Bridge (river mile 6.1).	Lake Class
(59)	Lewis River, east fork, from Multon Falls (river mile 24.6) to headwaters.	Class AA
(60)	Little Wenatchee River.	Class AA
(61)	Methow River from mouth to Chewuch River (river mile 50.1).	Class A
(62)	Methow River from Chewuch River (river mile 50.1) to headwaters.	Class AA
(63)	Mill Creek from mouth to 13th Street Bridge in Walla Walla (river mile 6.4). Special condition - dissolved oxygen concentration shall exceed 5.0 mg/L.	Class B
(64)	Mill Creek from 13th Street Bridge in Walla Walla (river mile 6.4) to Walla Walla Waterworks Dam (river mile 11.5).	Class A
(65)	Mill Creek and tributaries from city of Walla Walla Waterworks Dam (river mile 21.6) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(66)	Naches River from Snoqualmie National Forest boundary (river mile 35.7) to headwaters.	Class AA
(67)	Naselle River from Naselle "Falls" (cascade at river mile 18.6) to headwaters.	Class AA
(68)	Newaukum River.	Class A
(69)	Nisqually River from mouth to Alder Dam (river mile 44.2).	Class A
(70)	Nisqually River from Alder Dam (river mile 44.2) to headwaters.	Class AA

(71)	Nooksack River from mouth to Maple Creek (river mile 49.7).	Class A
(72)	Nooksack River from Maple Creek (river mile 49.7) to headwaters.	Class AA
(73)	Nooksack River, south fork, from mouth to Skookum Creek (river mile 14.3).	Class A
(74)	Nooksack River, south fork, from Skookum Creek (river mile 14.3) to headwaters.	Class AA
(75)	Nooksack River, middle fork.	Class AA
(76)	Okanogan River.	Class A
(77)	Palouse River from mouth to south fork (Colfax, river mile 89.6).	Class B
(78)	Palouse River from south fork (Colfax, river mile 89.6) to Idaho border (river mile 123.4). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.	Class A
(79)	Pend Oreille River from Canadian border (river mile 16.0) to Idaho border (river mile 87.7). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.	Class A
(80)	Pilchuck River from city of Snohomish Waterworks Dam (river mile 26.8) to headwaters.	Class AA
(81)	Puyallup River from mouth to river mile 1.0.	Class B
(82)	Puyallup River from river mile 1.0 to Kings Creek (river mile 31.6).	Class A
(83)	Puyallup River from Kings Creek (river mile 31.6) to headwaters.	Class AA
(84)	Queets River and tributaries.	Class AA
(85)	Quillayute River.	Class AA
(86)	Quinault River and tributaries.	Class AA
(87)	Salmon Creek (Clark County).	Class A
(88)	Satsop River from mouth to west fork (river mile 6.4).	Class A
(89)	Satsop River, east fork.	Class AA
(90)	Satsop River, middle fork.	Class AA
(91)	Satsop River, west fork.	Class AA
(92)	Skagit River from mouth to Skiyou Slough-lower end (river mile 25.6).	Class A
(93)	Skagit River and tributaries (includes Baker, Suak, Suiattle, and Cascade rivers) from Skiyou Slough-lower end, (river mile 25.6) to Canadian border (river mile 127.0). Special condition - Skagit River (Gorge by-pass reach) from Gorge Dam (river mile 96.6) to Gorge Powerhouse (river mile 94.2). Temperature shall not exceed 21°C due to human activities. When natural conditions exceed 21°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C, nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.	Class AA
(94)	Skokomish River and tributaries.	Class AA
(95)	Skookumchuck River from Bloody Run Creek (river mile 21.4) to headwaters.	Class AA
(96)	Skykomish River from mouth to May Creek (above Gold Bar at river mile 41.2).	Class A
(97)	Skykomish River from May Creek (above Gold Bar at river mile 41.2) to headwaters.	Class AA
(98)	Snake River from mouth to Washington-Idaho-Oregon border (river mile 176.1). Special condition:	Class A
(a)	Below Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$. Special	

condition - special fish passage exemption as described in WAC 173-201A-060 (4)(b).

(b) Above Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined.

(99)	Snohomish River from mouth and east of longitude 122°13'40"W upstream to latitude 47°56'30"N (southern tip of Ebey Island at river mile 8.1). Special condition - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL and not have more than 10 percent of the samples obtained for calculating the mean value exceeding 400 colonies/100 mL.	Class A
(100)	Snohomish River upstream from latitude 47°56'30"N (southern tip of Ebey Island river mile 8.1) to confluence with Skykomish and Snoqualmie River (river mile 20.5).	Class A
(101)	Snoqualmie River and tributaries from mouth to west boundary of Twin Falls State Park on south fork (river mile 9.1).	Class A
(102)	Snoqualmie River, middle fork.	Class AA
(103)	Snoqualmie River, north fork.	Class AA
(104)	Snoqualmie River, south fork, from west boundary of Twin Falls State Park (river mile 9.1) to headwaters.	Class AA
(105)	Soleduck River and tributaries.	Class AA
(106)	Spokane River from mouth to Long Lake Dam (river mile 33.9). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(107)	Spokane River from Long Lake Dam (river mile 33.9) to Nine Mile Bridge (river mile 58.0). Special conditions:	Lake Class
(a)	The average euphotic zone concentration of total phosphorus (as P) shall not exceed 25μg/L during the period of June 1 to October 31.	
(b)	Temperature shall not exceed 20.0°C, due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed t=34/(T+9).	
(108)	Spokane River from Nine Mile Bridge (river mile 58.0) to the Idaho border (river mile 96.5). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed t=34/(T+9).	Class A
(109)	Stehekin River.	Class AA
(110)	Stillaguamish River from mouth to north and south forks (river mile 17.8).	Class A
(111)	Stillaguamish River, north fork, from mouth to Squire Creek (river mile 31.2).	Class A
(112)	Stillaguamish River, north fork, from Squire Creek (river mile 31.2) to headwaters.	Class AA
(113)	Stillaguamish River, south fork, from mouth to Canyon Creek (river mile 33.7).	Class A
(114)	Stillaguamish River, south fork, from Canyon Creek (river mile 33.7) to headwaters.	Class AA
(115)	Sulphur Creek.	Class B
(116)	Sultan River from mouth to Chaplain Creek (river mile 5.9).	Class A
(117)	Sultan River and tributaries from Chaplain Creek (river mile 5.9) to headwaters. Special	Class AA

	condition - no waste discharge will be permitted above city of Everett Diversion Dam (river mile 9.4).	
(118)	Sumas River from Canadian border (river mile 12) to headwaters (river mile 23).	Class A
(119)	Tieton River.	Class AA
(120)	Tolt River, south fork and tributaries from mouth to west boundary of Sec. 31-T26N-R9E (river mile 6.9).	Class AA
(121)	Tolt River, south fork from west boundary of Sec. 31-T26N-R9E (river mile 6.9) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(122)	Touchet River, north fork from Dayton water intake structure (river mile 3.0) to headwaters.	Class AA
(123)	Toutle River, north fork, from Green River to headwaters.	Class AA
(124)	Toutle River, south fork.	Class AA
(125)	Tucannon River from Umatilla National Forest boundary (river mile 38.1) to headwaters.	Class AA
(126)	Twisp River.	Class AA
(127)	Union River and tributaries from Bremerton Waterworks Dam (river mile 6.9) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(128)	Walla Walla River from mouth to Lowden (Dry Creek at river mile 27.2).	Class B
(129)	Walla Walla River from Lowden (Dry Creek at river mile 27.2) to Oregon border (river mile 40). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.	Class A
(130)	Wenatchee River from Wenatchee National Forest boundary (river mile 27.1) to headwaters.	Class AA
(131)	White River (Pierce-King counties) from Mud Mountain Dam (river mile 27.1) to headwaters.	Class AA
(132)	White River (Chelan County).	Class AA
(133)	Wildcat Creek.	Class A
(134)	Willapa River upstream of a line bearing 70° true through Mailboat Slough light (river mile 1.8).	Class A
(135)	Wishkah River from mouth to river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21-T18N-R9W).	Class B
(136)	Wishkah River from river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21-T18N-R9W) to west fork (river mile 17.7).	Class A
(137)	Wishkah River from west fork of Wishkah River (river mile 17.7) to south boundary of Sec. 33-T21N-R8W (river mile 32.0).	Class AA
(138)	Wishkah River and tributaries from south boundary of Sec. 33-T21N-R8W (river mile 32.0) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(139)	Wynoochee River from mouth to Olympic National Forest boundary (river mile 45.9).	Class A
(140)	Wynoochee River from Olympic National Forest boundary (river mile 45.9) to headwaters.	Class AA
(141)	Yakima River from mouth to Cle Elum River (river mile 185.6). Special condition - temperature shall not exceed 21.0°C due to human activities. When natural conditions exceed 21.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.	Class A
(142)	Yakima River from Cle Elum River (river mile 185.6) to headwaters.	Class AA

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-130, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-130, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-140 Specific classifications-Marine water. Specific marine surface waters of the state of Washington are classified as follows:

(1)	Budd Inlet south of latitude 47°04'N (south of Priest Point Park).	Class B
(2)	Coastal waters: Pacific Ocean from Ilwaco to Cape Flattery.	Class AA
(3)	Commencement Bay south and east of a line bearing 258° true from "Brown's Point" and north and west of line bearing 225° true through the Hylebos waterway light.	Class A
(4)	Commencement Bay, inner, south and east of a line bearing 225° true through Hylebos waterway light except the city waterway south and east of south 11th Street.	Class B
(5)	Commencement Bay, city waterway south and east of south 11th Street.	Class C
(6)	Drayton Harbor, south of entrance.	Class A
(7)	Dyes and Sinclair Inlets west of longitude 122°37'W.	Class A
(8)	Elliott Bay east of a line between Pier 91 and Duwamish head.	Class A
(9)	Everett Harbor, inner, northeast of a line bearing 121° true from approximately 47°59'5"N and 122°13'44"W (southwest corner of the pier).	Class B
(10)	Grays Harbor west of longitude 123°59'W.	Class A
(11)	Grays Harbor east of longitude 123°59'W to longitude 123°45'45"W (Cosmopolis Chehalis River, river mile 3.1). Special condition - dissolved oxygen shall exceed 5.0 mg/L.	Class B
(12)	Guemes Channel, Padilla, Samish and Bellingham Bays east of longitude 122°39'W and north of latitude 48°27'20"N.	Class A
(13)	Hood Canal.	Class AA
(14)	Mukilteo and all North Puget Sound west of longitude 122°39' W (Whidbey, Fidalgo, Guemes and Lummi islands and State Highway 20 Bridge at Deception Pass), except as otherwise noted.	Class AA
(15)	Oakland Bay west of longitude 123°05'W (inner Shelton harbor).	Class B
(16)	Port Angeles south and west of a line bearing 152° true from buoy "2" at the tip of Ediz Hook.	Class A
(17)	Port Gamble south of latitude 47°51'20"N.	Class A
(18)	Port Townsend west of a line between Point Hudson and Kala Point.	Class A
(19)	Possession Sound, south of latitude 47°57'N.	Class AA
(20)	Possession Sound, Port Susan, Saratoga Passage, and Skagit Bay east of Whidbey Island and State Highway 20 Bridge at Deception Pass between latitude 47°57'N (Mukilteo) and latitude 48°27'20"N (Similk Bay), except as otherwise noted.	Class A
(21)	Puget Sound through Admiralty Inlet and South Puget Sound, south and west to longitude 122°52'30"W (Brisco Point) and longitude 122°51'W (northern tip of Hartstene Island).	Class AA
(22)	Sequim Bay southward of entrance.	Class AA
(23)	South Puget Sound west of longitude 122°52'30"W (Brisco Point) and longitude 122°51'W (northern tip of Hartstene Island, except as otherwise noted).	Class A
(24)	Strait of Juan de Fuca.	Class AA
(25)	Totten Inlet and Little Skookum Inlet, west of longitude 122°56'32" (west side of Steamboat Island).	Class AA
(26)	Willapa Bay seaward of a line bearing 70° true through Mailboat Slough light (Willapa River, river mile 1.8).	Class A

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order –19). § 173–201A–140. filed 11/18/97. effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29). § 173–201A–140. filed 11/25/92. effective 12/26/92.]

WAC 173–201A–150 Achievement considerations. To fully achieve and maintain the foregoing water quality in the state of Washington, it is the intent of the department to apply the various implementation and enforcement authorities at its disposal, including participation in the programs of the federal Clean Water Act (33 U.S.C. 1251 et seq.) as appropriate. It is also the intent that cognizance will be taken of the need for participation in cooperative programs with other state agencies and private groups with respect to the management of related problems. The department's planned program for water pollution control will be defined and revised annually in accordance with section 106 of said federal act. Further, it shall be required that all activities which discharge wastes into waters within the state, or otherwise adversely affect the quality of said waters, be in compliance with the waste treatment and discharge provisions of state or federal law.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29). § 173–201A–150. filed 11/25/92. effective 12/26/92.]

WAC 173–201A–160 Implementation.

(1) **Discharges from municipal, commercial, and industrial operations.** The primary means to be used for controlling municipal, commercial, and industrial waste discharges shall be through the issuance of waste disposal permits, as provided for in RCW 90.48.160, 90.48.162, and 90.48.260.

(2) **Miscellaneous waste discharge or water quality effect sources.** The director shall, through the issuance of regulatory permits, directives, and orders, as are appropriate, control miscellaneous waste discharges and water quality effect sources not covered by subsection (1) of this section.

(3) **Nonpoint source and storm water pollution.**

(a) Activities which generate nonpoint source pollution shall be conducted so as to comply with the water quality standards. The primary means to be used for requiring compliance with the standards shall be through best management practices required in waste discharge permits, rules, orders, and directives issued by the department for activities which generate nonpoint source pollution.

(b) Best management practices shall be applied so that when all appropriate combinations of individual best management practices are utilized, violation of water quality criteria shall be prevented. If a discharger is applying all best management practices appropriate or required by the department and a violation of water quality criteria occurs, the discharger shall modify existing practices or apply further water pollution control measures, selected or approved by the department, to achieve compliance with water quality criteria. Best management practices established in permits, orders, rules, or directives of the department shall be reviewed and modified, as appropriate, so as to achieve compliance with water quality criteria.

(c) Activities which contribute to nonpoint source pollution shall be conducted utilizing best management practices to prevent violation of water quality criteria. When applicable best management practices are not being implemented, the department may conclude individual activities are causing pollution in violation of RCW 90.48.080. In these situations, the department may pursue orders, directives, permits, or civil or criminal sanctions to gain compliance with the standards.

(d) Activities which cause pollution of storm water shall be conducted so as to comply with the water quality standards. The primary means to be used for requiring compliance with the standards shall be through best management practices required in waste discharge permits, rules, orders, and directives issued by the department for activities which generate storm water pollution. The consideration and control procedures in (b) and (c) of this subsection apply to the control of pollutants in storm water.

(4) **Allowance for compliance schedules.**

(a) Permits, orders, and directives of the department for existing discharges may include a schedule for achieving compliance with water quality criteria contained in this chapter. Such schedules of compliance shall be developed to ensure final compliance with all water quality-based effluent limits in the shortest practicable time. Decisions regarding whether to issue schedules of compliance will be made on a case-by-case basis by the department. Schedules of compliance may not be issued for new discharges. Schedules of compliance may be issued to allow for:

(i) construction of necessary treatment capability;

(ii) implementation of necessary best management practices;

(iii) implementation of additional storm water best management practices for discharges determined not to meet water quality criteria following implementation of an initial set of best management practices;

(iv) completion of necessary water quality studies; or

(v) resolution of a pending water quality standards' issue through rule-making action.

(b) For the period of time during which compliance with water quality criteria is deferred, interim effluent limitations shall be formally established, based on the best professional judgment of the department. Interim effluent limitations may be numeric or nonnumeric (e.g., construction of necessary facilities by a specified date as contained in an ecology order or permit).

(c) Prior to establishing a schedule of compliance, the department shall require the discharger to evaluate the possibility of achieving water quality criteria via non-construction changes (e.g., facility operation, pollution prevention). Schedules of compliance may in no case exceed ten years, and shall generally not exceed the term of any permit.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97–23–064 (Order 94–19). § 173–201A–160. filed 11/18/97. effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29). § 173–201A–160. filed 11/25/92. effective 12/26/92.]

WAC 173–201A–170 Surveillance. A continuing surveillance program, to ascertain whether the regulations, waste disposal permits, orders, and directives promulgated and/or issued by the department are being complied with, will be conducted by the department staff as follows:

(1) Inspecting treatment and control facilities.

(2) Monitoring and reporting waste discharge characteristics.

(3) Monitoring receiving water quality.

[Statutory Authority: Chapter 90.48 RCW. 92–24–037 (Order 92–29). § 173–201A–170. filed 11/25/92. effective 12/26/92.]

WAC 173-201A-180 Enforcement. To insure that the provisions of chapter 90.48 RCW, the standards for water quality promulgated herein, the terms of waste disposal permits, and other will be relied upon by the department, in cooperation with the attorney general as it deems appropriate:

(1) Issuance of notices of violation and regulatory orders as provided for in RCW 90.48.120.

(2) Initiation of actions requesting injunctive or other appropriate relief in the various courts of the state as provided for in RCW 90.48.037.

(3) Levying of civil penalties as provided for in RCW 90.48.144.

(4) Initiation of a criminal proceeding by the appropriate county prosecutor as provided for in RCW 90.48.140.

(5) Issuance of regulatory orders or directives as provided for in RCW 90.48.240.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-180, filed 11/25/92, effective 12/26/92.]

APPENDIX 12

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

May 31, 1996

Mr. Phil Millam
Water Division Director
U.S. Environmental Protection Agency - Region 10
1200 Sixth Avenue
Seattle, WA 98101

Dear Mr. Millam:

In accordance with federal regulations 40 CFR 130.7 and Section 303(d) of the Clean Water Act, the Department of Ecology submits the attached list of waters requiring establishment of Total Maximum Daily Loads (TMDLs). These waters have been selected after an extensive public participation process and numerous internal reviews by Ecology staff. A responsiveness summary of comments received and rationale for decisions is enclosed.

As required, those segments and parameters which have been identified as high priority for establishment of TMDLs are shown in underlined text. All other segments and parameters in the list not shown with underlined text have been identified as a medium priority for establishing TMDLs. These medium priority segments will be re-examined for their priority through the scoping process of our watershed approach to water quality management.

The segments and schedule of TMDLs that are under development or completed is shown in Appendix I of the responsiveness summary. Ecology is also committed to preventing waters from being placed on the list. As such, we are in the process of establishing many TMDLs for waters which are not on the current list.

If you have any questions or if we can clarify any of the information enclosed, please contact Steve Butkus of my staff at (206) 407-6482.

Sincerely,

Michael T. Llewelyn
Program Manager
Water Quality Program

MTL:SB:lmb
Enclosure

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-01-0010	STRAIT OF GEORGIA	PCBs, Cadmium, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b,k)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, Dibenzofuran.
WA-01-0020	DRAYTON HARBOR	Fecal Coliform.
WA-01-0050	BELLINGHAM BAY (INNER) AND WHATCOM WATERWAY	Mercury, Arsenic, Copper, Lead, Zinc, Acenaphthene, Fluorene, Phenanthrene, Anthracene, 2-Methylnaphthalene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b,k)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, Bis(2-ethylhexyl) Phthalate, Dibenzofuran, PCBs, Phenol, 2,4-Dimethylphenol, Pentachlorophenol, Sediment Bioassay, pH, Fecal Coliform.
WA-01-0070	LUMMI BAY AND HALE PASSAGE	Fecal Coliform.
WA-01-0080	BELLINGHAM BAY (OUTER)	pH.
WA-01-1002	DAKOTA CREEK	Dissolved Oxygen, Fecal Coliform.
WA-01-1010	NOOKSACK RIVER	Chromium, Mercury, Fecal Coliform.
WA-01-1012	TENMILE CREEK	Ammonia-N, Dissolved Oxygen, Temperature, Fecal Coliform.
WA-01-1014	DEER CREEK	Dissolved Oxygen, pH, Fecal Coliform, Ammonia-N.
WA-01-1015	KAMM SLOUGH	Dissolved Oxygen, pH, Fecal Coliform.
WA-01-1016	MORMON DITCH	Dissolved Oxygen, pH, Fecal Coliform.
WA-01-1030	NOOKSACK RIVER, S.F.	Fine Sediment, Instream Flow.
WA-01-1040	NOOKSACK RIVER, S.F.	Fine Sediment, Temperature, Instream Flow.
WA-01-1060	NOOKSACK RIVER, N.F.	Temperature.
WA-01-1080	NOOKSACK RIVER	Fine Sediment.
WA-01-1101	SILVER CREEK	Dissolved Oxygen, Fecal Coliform.
WA-01-1102	UNNAMED CREEK	Dissolved Oxygen, Fecal Coliform.
WA-01-1103	TENNANT CREEK	Dissolved Oxygen, Fecal Coliform.
WA-01-1104	ANDERSON DITCH	Dissolved Oxygen, Fecal Coliform.
WA-01-1110	BERTRAND CREEK	Dissolved Oxygen, Fecal Coliform, Instream Flow.
WA-01-1111	DUFFNER DITCH	Dissolved Oxygen, Temperature.
WA-01-1115	FISHTRAP CREEK	Fecal Coliform, Instream Flow.
WA-01-1116	DOUBLE DITCH DRAIN	Fecal Coliform.
WA-01-1117	BENSON ROAD DITCH	Dissolved Oxygen, Fecal Coliform.
WA-01-1118	DEPOT ROAD DITCH	Dissolved Oxygen, Fecal Coliform.
WA-01-1119	BENDER ROAD DITCH	Dissolved Oxygen, Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-01-1120	ANDERSON CREEK	Fine Sediment.
WA-01-1124	HOFF CREEK	Temperature.
WA-01-1145	RACEHORSE CREEK	Fine Sediment, Temperature.
WA-01-1155	BOULDER CREEK	Temperature.
WA-01-1170	CORNELL CREEK	Temperature.
WA-01-1175	GALLOP CREEK	Temperature.
WA-01-1290	HOWARD CREEK	Fine Sediment.
WA-01-1310	CANYON LAKE CREEK	Temperature.
WA-01-1450	CALIFORNIA CREEK	Dissolved Oxygen.
WA-01-2010	SUMAS RIVER	Fecal Coliform.
WA-01-2020	JOHNSON CREEK	Dissolved Oxygen, Fecal Coliform.
WA-01-2030	SUMAS CREEK	Fecal Coliform.
WA-01-2040	PANGBORN CREEK	Dissolved Oxygen, pH, Fecal Coliform.
WA-01-2050	SQUAW CREEK	Fecal Coliform, Dissolved Oxygen, pH.
WA-01-3110	WHATCOM CREEK	Temperature, Fecal Coliform, Pentachlorophenol.
WA-01-3300	LUMMI RIVER	Fecal Coliform.
WA-02-0020	SAN JUANS OUTER WESTSIDE	Fecal Coliform.
WA-03-0020	PADILLA BAY, FIDALGO BAY, AND GUEMES CHANNEL	Bis(2-ethylhexyl) Phthalate, PCB-1254.
WA-03-1010	SKAGIT RIVER	Fecal Coliform.
WA-03-1011	CARPENTER CREEK	Fecal Coliform.
WA-03-1012	FISHER CREEK	Fecal Coliform.
WA-03-1015	SKAGIT RIVER, N.F.	Fecal Coliform.
WA-03-1016	GAGES SLOUGH	Fecal Coliform.
WA-03-1017	NOOKACHAMPS CREEK	Fecal Coliform.
WA-03-1018	HART SLOUGH/ BRICKYARD CREEK	Fecal Coliform.
WA-03-1019	HANSEN CREEK	Fecal Coliform.
WA-03-2010	SAMISH RIVER	Fecal Coliform.
WA-03-2100	FRIDAY CREEK	Fecal Coliform.
WA-03-3000	JOE LEARY SLOUGH	Temperature, Dissolved Oxygen, Fecal Coliform.

1996 Section 303(d) List - May 29, 1996
(Underlined text indicates a high priority for establishing a TMDL)

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-03-3100	INDIAN (BIG) SLOUGH	Temperature, Dissolved Oxygen, Fecal Coliform.
WA-03-3200	NO NAME SLOUGH	Dissolved Oxygen, Fecal Coliform.
WA-03-4000	BROWNS SLOUGH	Fecal Coliform.
WA-03-4100	WILEY SLOUGH	Fecal Coliform.
WA-03-8000	UNNAMED CREEK	Fecal Coliform.
WA-03-9020	BIG LAKE	Total Phosphorus.
WA-03-9040	CAMPBELL LAKE	Total Phosphorus.
WA-03-9110	KETCHUM LAKE	Total Phosphorus.
WA-05-1010	STILLAGUAMISH RIVER	Fecal Coliform, pH, Temperature.
WA-05-1012	JORGENSEN SLOUGH/CHURCH CREEK	Dissolved Oxygen, Fecal Coliform.
WA-05-1015	PORTAGE CREEK	Dissolved Oxygen, Turbidity, Fecal Coliform.
WA-05-1016	FISH CREEK	Fecal Coliform.
WA-05-1020	STILLAGUAMISH RIVER, N.F.	pH, Fecal Coliform.
WA-05-1021	DEER CREEK	Temperature.
WA-05-1023	LITTLE DEER CREEK	Temperature.
WA-05-1025	HIGGINS CREEK	Temperature.
WA-05-1040	STILLAGUAMISH RIVER, S.F.	Fecal Coliform, pH, Temperature.
WA-05-1050	STILLAGUAMISH RIVER, S.F.	Fecal Coliform.
WA-05-9070	LAKE HOWARD	Total Phosphorus.
WA-05-9090	LAKE KI	Total Phosphorus.
WA-05-9110	MARTHA LAKE	Total Phosphorus.
WA-05-9160	SUNDAY LAKE	Total Phosphorus, Total Nitrogen.
WA-06-0010	SARATOGA PASSAGE	PCBs, pH.,
WA-06-0020	PENN COVE	Fecal Coliform.
WA-07-0010	PORT GARDNER AND INNER EVERETT HARBOR	Dissolved Oxygen, pH, Fecal Coliform, PCBs, Sediment Bioassay, Mercury, Zinc, Benzo(b,k)fluoranthenes, Bis(2-ethylhexyl) Phthalate, Di-n-octyl Phthalate, 2-Methylphenol, 2,4-Dimethylphenol, Pentachlorophenol, Benzyl Alcohol, Naphthalene, Acenaphthene, Fluorene, Phenanthrene, 2-Methylnaphthalene, Fluoranthene, Chrysene, Benzo(a)pyrene, Benzo(g,h,i)perylene, Phenol, 4-Methylphenol.
WA-07-1005	STEAMBOAT SLOUGH	Arsenic, Ammonia-N.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-07-1010	SNOHOMISH RIVER	Dissolved Oxygen, Fecal Coliform, Arsenic, Copper, Naphthalene, Acenaphthene, Fluorene, Phenanthrene, 2-Methylnaphthalene, Dibenzofuran.
WA-07-1011	EBEY SLOUGH	pH, Fecal Coliform, Arsenic, Ammonia-N.
WA-07-1012	ALLEN CREEK	Fecal Coliform, Dissolved Oxygen.
WA-07-1015	QUILCEDA CREEK	Dissolved Oxygen, Fecal Coliform.
WA-07-1019	WOOD CREEK (MARSHLANDS)	Dissolved Oxygen.
WA-07-1020	SNOHOMISH RIVER	Temperature, Fecal Coliform.
WA-07-1030	PILCHUCK RIVER	Fecal Coliform.
WA-07-1040	PILCHUCK RIVER	Fecal Coliform, Temperature.
WA-07-1050	SNOHOMISH RIVER	Dissolved Oxygen, Fecal Coliform.
WA-07-1052	FRENCH CREEK	Dissolved Oxygen, Fecal Coliform.
WA-07-1060	SNOQUALMIE RIVER	Temperature.
WA-07-1100	SNOQUALMIE RIVER	Temperature.
WA-07-1104	RAGING RIVER	pH.
WA-07-1106	TOKUL CREEK	Temperature.
WA-07-1120	SNOQUALMIE RIVER, S.F.	Temperature, pH.
WA-07-1140	SNOQUALMIE RIVER, N.F.	Temperature.
WA-07-1160	SKYKOMISH RIVER	Fecal Coliform, Temperature.
WA-07-1163	WOODS CREEK	Fecal Coliform.
WA-07-1195	WALLACE RIVER	Temperature.
WA-07-1200	SKYKOMISH RIVER	Temperature.
WA-07-1201	MAY CREEK	Temperature.
WA-07-9060	BLACKMAN'S LAKE	Total Phosphorus.
WA-07-9190	CRABAPPLE LAKE	Total Phosphorus.
WA-07-9280	LAKE GOODWIN	Total Phosphorus.
WA-07-9440	LAKE LOMA	Total Phosphorus.
WA-07-9680	LAKE SHOECRAFT	Total Phosphorus.
WA-07-9710	SPADA LAKE	Turbidity.
WA-08-1010	JUANITA CREEK	Fecal Coliform.
WA-08-1012	FORBES CREEK	Fecal Coliform.
WA-08-1014	YARROW BAY CREEK	Fecal Coliform.

1996 Section 303(d) List - May 29, 1996
(Underlined text indicates a high priority for establishing a TMDL)

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-08-1016	FAIRWEATHER BAY CREEK	Fecal Coliform.
WA-08-1018	KELSEY CREEK	Fecal Coliform, DDT, Heptachlor Epoxide, Dieldrin.
WA-08-1020	THORNTON CREEK	Fecal Coliform.
WA-08-1030	McALEER CREEK	Fecal Coliform.
WA-08-1040	LYON CREEK	Fecal Coliform.
WA-08-1050	SAMMAMISH RIVER	Fecal Coliform.
WA-08-1060	SWAMP CREEK	Dissolved Oxygen, Fecal Coliform.
WA-08-1065	NORTH CREEK	Fecal Coliform.
WA-08-1070	SAMMAMISH RIVER	Fecal Coliform, Temperature, Dissolved Oxygen.
WA-08-1080	SAMMAMISH RIVER	Dissolved Oxygen, Fecal Coliform.
WA-08-1085	LITTLE BEAR CREEK	Fecal Coliform.
WA-08-1090	SAMMAMISH RIVER	Temperature, Fecal Coliform.
WA-08-1095	BEAR-EVANS CREEKS	Dissolved Oxygen, Fecal Coliform, Mercury.
WA-08-1100	SAMMAMISH RIVER	Dissolved Oxygen, Fecal Coliform.
WA-08-1110	ISSAQUAH CREEK SYSTEM	Fecal Coliform, Temperature.
WA-08-1115	TIBBETS CREEK	Temperature, Fecal Coliform.
WA-08-1116	LAUGHING JACOB'S CREEK	Fecal Coliform.
WA-08-1117	PINE LAKE CREEK	Fecal Coliform.
WA-08-1118	ETON CREEK	Fecal Coliform.
WA-08-1120	COAL CREEK	Fecal Coliform.
WA-08-1130	MAY CREEK	Fecal Coliform, Temperature, Copper, Lead, Zinc.
WA-08-1143	CEDAR RIVER	Fecal Coliform.
WA-08-1145	CEDAR RIVER	Fecal Coliform.
WA-08-2100	MERCER SLOUGH	Fecal Coliform, Dieldrin, DDT, 4,4'-DDE, 4,4'-DDD, PCBs.
WA-08-9020	BEAVER LAKE	Total Phosphorus.
WA-08-9070	COTTAGE LAKE	Total Phosphorus.
WA-08-9090	DESIRE LAKE	Total Phosphorus.
WA-08-9150	GREEN LAKE	Total Phosphorus.
WA-08-9170	LARSEN LAKE	Total Phosphorus.
WA-08-9190	MARTHA LAKE	Total Phosphorus.
WA-08-9280	SCRIBER LAKE	Total Phosphorus.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-08-9300	SILVER LAKE	Total Phosphorus.
WA-08-9340	UNION LAKE/LAKE WASHINGTON SHIP CANAL	Sediment Bioassay, PCBs, Dieldrin.
WA-08-9350	LAKE WASHINGTON	Sediment Bioassay, Fecal Coliform.
WA-09-0010	ELLIOTT BAY	Sediment Bioassay, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Silver, Zinc, 2-Methylnaphthalene, Acenapthene, Fluorene, Phenanthrene, LPAH, Benz(a)anthracene, Benzo(a)pyrene, Benzo(g,h,i)perylene, Benzo(b,k)fluoranthenes, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, HPAH, Butyl Benzyl Phthalate, Bis(2-ethylhexyl)phthalate, Dibenzofuran, PCBs, Phenol, Naphthalene, Acenaphthylene, Anthracene, Pyrene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Dimethyl Phthalate, Diethyl Phthalate, Di-n-butyl Phthalate, Hexachlorobutadiene, N-Nitrosodiphenylamine, 2,4-Dimethylphenol, Di-n-octyl Phthalate, Pentachlorophenol, 1,2,4-Trichlorobenzene, 2-Methylphenol, 4-Methylphenol, Benzyl Alcohol, Benzoic Acid, Fecal Coliform.
WA-09-1000	LONGFELLOW CREEK	Fecal Coliform.
WA-09-1005	FAUNTLEROY CREEK	Fecal Coliform.
WA-09-1010	DUWAMISH WATERWAY AND RIVER	Copper, Lead, Zinc, PAHs, PCBs, Dissolved Oxygen, pH, Fecal Coliform, Cadmium, Mercury, Arsenic, Silver, Chromium, Naphthalene, 2-Methylnaphthalene, Anthracene, 1,2,4-Trichlorobenzene, Chrysene, Pyrene, Benz(a)anthracene, Benzo(b,k)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, Hexachlorobenzene, Diethyl Phthalate, N-Nitrosodiphenylamine, Fluorene, Fluoranthene, Phenanthene, Acenaphthene, Dimethyl Phthalate, Benzoic Acid, Butyl Benzyl Phthalate, 1,4-Dichlorobenzene, Dibenzofuran, Phenol, 4-Methylphenol, 2,4-Dimethylphenol, Benzyl Alcohol, Bis(2-ethylhexyl)phthalate, Sediment Bioassay.
WA-09-1015	SPRINGBROOK (MILL) CREEK	Fecal Coliform, Temperature, Dissolved Oxygen, Sediment Bioassay, Cadmium, Copper, Mercury, Zinc.
WA-09-1020	GREEN RIVER	Mercury, Chromium, Temperature, Dissolved Oxygen, Fecal Coliform.
WA-09-1022	HILL (MILL) CREEK	Dissolved Oxygen, Temperature, Ammonia-N, Cadmium, Fecal Coliform, Zinc, Chromium.
WA-09-1026	SOOS CREEK	Fecal Coliform, Dissolved Oxygen, Temperature, Mercury.
WA-09-1028	NEWAUKUM CREEK	Dissolved Oxygen, Fecal Coliform.
WA-09-1030	GREEN RIVER	Temperature.
WA-09-1040	GREEN RIVER	Fecal Coliform.
WA-09-1041	GALE CREEK	Temperature.
WA-09-1050	SWAY CREEK	Temperature.
WA-09-2000	DES MOINES CREEK	Fecal Coliform.
WA-09-2010	COLD SPRINGS CREEK	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-09-2020	REDONDO CREEK	Fecal Coliform.
WA-09-2030	LAKOTA CREEK	Fecal Coliform.
WA-09-2040	JOE'S CREEK	Fecal Coliform.
WA-09-9120	LAKE HICKS (GARRETT LAKE)	Total Phosphorus.
WA-09-9160	LAKE MERIDIAN	Total Phosphorus.
WA-09-9210	LAKE NUMBER TWELVE	Exotic Aquatic Plants.
WA-10-0010	COMMENCEMENT BAY (OUTER)	Arsenic, Cadmium, Copper, Lead, Mercury, Silver, Zinc, Naphthalene, Acenaphthene, Fluorene, Phenanthrene, Fluoranthene, Diethyl Phthalate, Di-n-butyl Phthalate, Butyl Benzyl Phthalate, Bis(2-ethylhexyl) Phthalate, Dibenzofuran, N-Nitrosodiphenylamine, PCBs, Phenol, 2-Methylphenol, 2,4-Dimethylphenol, Benzyl Alcohol, Benzoic Acid.
WA-10-0020	COMMENCEMENT BAY (INNER)	Fecal Coliform, Sediment Bioassay, Bis(2-ethylhexyl)phthalate, Hexachlorbenzene, PCBs, Dieldrin, Copper, Arsenic, Lead, Zinc, Mercury, Hexachlorobutadiene, Butyl Benzyl Phthalate, Phenanthrene, Anthracene, Dibenzo(a,h)anthracene, Pyrene, Fluorene, Fluoranthene, Benz(a)anthracene, Chrysene, Acenaphthene, 1,2,4-Trichlorobenezene, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, 2-Methylnaphthalene, Dibenzofuran, Benzo(g,h,i)perylene, Naphthalene, 1,4-Dichlorobenzene, Dimethyl Phthalate, 2,4-Dimethylphenol, Cadmium, Chromium, Di-n-butyl Phthalate, Benzyl Alcohol, Phenol, 2-Methylphenol, Pentachlorophenol.
WA-10-0030	THEA FOSS (CITY) WATERWAY	Copper, Lead, Mercury, Zinc, Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Phenanthrene, 2-Methylnaphthalene, LPAH, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Total Benzofluoranthenes, Indeno(1,2,3-c,d)pyrene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, HPAH, 1,2-Dichlorobenzene, Dimethyl Phthalate, Butyl Benzyl Phthalate, Bis(2-ethylhexyl) Phthlate, PCBs.
WA-10-1011	HYLEBOS CREEK	Fecal Coliform.
WA-10-1012	FIFE DITCH	Ammonia-N, Dissolved Oxygen, Fecal Coliform.
WA-10-1013	HYLEBOS CREEK, W.F.	Fecal Coliform.
WA-10-1015	WAPATO CREEK	Fecal Coliform, Dissolved Oxygen, Instream Flow.
WA-10-1020	PUYALLUP RIVER	Fecal Coliform.
WA-10-1021	CLEAR CREEK	Fecal Coliform.
WA-10-1022	SWAN CREEK	Fecal Coliform.
WA-10-1025	CLARKS CREEK	Fecal Coliform.
WA-10-1026	UNNAMED CREEK	Fecal Coliform.
WA-10-1028	MEEKER DITCH	Fecal Coliform.
WA-10-1030	WHITE RIVER	Fecal Coliform, pH, Instream Flow.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-10-1032	BOISE CREEK	Temperature.
WA-10-1041	SCATTER CREEK	Temperature.
WA-10-1043	CLEARWATER RIVER	Temperature.
WA-10-1046	GREENWATER RIVER	Temperature.
WA-10-1060	PUYALLUP RIVER	Instream Flow.
WA-10-1070	PUYALLUP RIVER	Instream Flow.
WA-10-1081	VOIGHTS CREEK	Temperature.
WA-10-1085	SOUTH PRAIRIE CREEK	Fecal Coliform.
WA-11-1010	NISQUALLY RIVER	Fecal Coliform.
WA-11-1026	OHOP CREEK	Fecal Coliform.
WA-11-9040	CLEAR LAKE	Total Phosphorus.
WA-11-9090	HARTS LAKE	Total Phosphorus.
WA-11-9150	OHOP LAKE	Total Phosphorus.
WA-12-1110	CHAMBERS CREEK	Fecal Coliform, PCBs, Temperature.
WA-12-1115	CLOVER CREEK	Fecal Coliform, Dissolved Oxygen, Temperature.
WA-12-9010	AMERICAN LAKE	Total Phosphorus.
WA-12-9060	SNAKE LAKE	Total Phosphorus, Dissolved Oxygen, Fecal Coliform.
WA-12-9080	STEILACOOM LAKE	Sediment Bioassay, Total Phosphorus.
WA-13-0010	HENDERSON INLET	Fecal Coliform.
WA-13-0020	BUDD INLET (OUTER)	Fecal Coliform, Dissolved Oxygen, Total Nitrogen, pH.
WA-13-0030	BUDD INLET (INNER)	PAHs, PCBs, Chromium, Copper, Mercury, Zinc, Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, 2-Methylnaphthalene, Fluoranthene, Pyrene, Benz(a)anthracene, Benzo(b,k)fluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, Butyl Benzyl Phthalate, Bis(2-ethylhexyl) Phthalate, Dibenzofuran, Sediment Bioassay, Benz(a)anthracene, Benzo(b)fluorene, Benzo(k)fluorene, Chrysene, Dissolved Oxygen, Total Nitrogen, pH, Fecal Coliform.
WA-13-1010	DESCHUTES RIVER	Temperature, pH, Fecal Coliform, Mercury.
WA-13-1015	AYER (ELWANGER) CREEK	Fecal Coliform, pH, Dissolved Oxygen.
WA-13-1020	DESCHUTES RIVER	Temperature, pH.
WA-13-1022	REICHEL CREEK	Fecal Coliform.
WA-13-1024	HUCKLEBERRY CREEK	Temperature.
WA-13-1300	INDIAN CREEK	Fecal Coliform.
WA-13-1350	MOXLIE CREEK	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-13-1380	MISSION CREEK	Fecal Coliform.
WA-13-1400	DOBBS CREEK	Fecal Coliform, pH.
WA-13-1500	WOODLAND CREEK	Temperature, Fecal Coliform, Dissolved Oxygen, Turbidity, Instream Flow.
WA-13-1600	WOODARD CREEK	Dissolved Oxygen, pH, Fecal Coliform.
WA-13-1700	SLEEPY (LIBBEY) CREEK	Fecal Coliform, pH, Dissolved Oxygen.
WA-13-9020	CAPITOL LAKE (NORTH ARM)	Total Phosphorus.
WA-13-9030	CAPITOL LAKE (SOUTH ARM)	Total Phosphorus.
WA-13-9120	PATTERSON (PATTISON) LAKE (NORTH ARM)	Total Phosphorus.
WA-13-9200	WARD LAKE	PCB-1260.
WA-14-0010	SQUAXIN, PEALE, AND PICKERING PASSAGES	pH.
WA-14-0020	ELD INLET	Fecal Coliform.
WA-14-0050	SHELTON HARBOR (INNER)	Fecal Coliform.
WA-14-0100	HAMMERSLEY INLET	Fecal Coliform.
WA-14-0110	OAKLAND BAY	Fecal Coliform, Dissolved Oxygen.
WA-14-1190	PIERRE CREEK	Fecal Coliform.
WA-14-1195	BURNS CREEK	Fecal Coliform.
WA-14-1200	SCHNEIDER CREEK	Fecal Coliform.
WA-14-1600	GOLDSBOROUGH CREEK	Fecal Coliform.
WA-14-1650	SHELTON CREEK	Fecal Coliform.
WA-14-1800	UNCLE JOHN CREEK	Fecal Coliform.
WA-14-1850	CAMPBELL CREEK	Fecal Coliform.
WA-14-2010	TWANOH FALLS CREEK	pH.
WA-14-2020	UNNAMED CREEK	pH.
WA-14-2030	HAPPY HALLOW CREEK	Fecal Coliform.
WA-15-0020	EAGLE HARBOR	PAHs, Mercury, Arsenic, Naphthalene, Fluoranthene, Acenaphthene, Phenanthrene, Anthracene, Fluorene, PCB-1254, Benzo(a)pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.
WA-15-0030	PORT ORCHARD, AGATE PASSAGE, AND RICH PASSAGE	PCBs, Dissolved Oxygen.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-15-0040	SINCLAIR INLET	Sediment Bioassay, PCBs, Phenol, 2,4-Dimethylphenol, Phenanthrene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Benzo(g,h,i)perylene, Bis(2-ethylhexyl) Phthalate, Benzoic Acid, Benz(a)anthracene, Chrysene, 1,4-Dichlorobenzene, Butyl Benzyl Phthalate, 4-Methylphenol, Mercury, Arsenic, Cadmium, Copper, Lead, Zinc, Aldrin, Dieldrin.
WA-15-0050	DYES INLET AND PORT WASHINGTON NARROWS	PCBs, Bis(2-ethylhexyl) Phthalate, Phenol, Cadmium, Mercury, Silver, Antimony, Arsenic, Sediment Bioassay, Bis(2-ethylhexyl) Phthalate, 3,3'-Dichlorobenzidine, Benz(a)anthracene, Benzo(b)fluoranthene, Chrysene, Pentachlorophenol, Fecal Coliform.
WA-15-0060	CARR INLET	Dissolved Oxygen, Fecal Coliform.
WA-15-0070	HENDERSON BAY	Fecal Coliform.
WA-15-0080	PORT GAMBLE BAY	PCBs, Dieldrin.
WA-15-0100	LIBERTY BAY	PCBs, Bis(2-ethylhexyl) Phthalate, Benzoic Acid, Phenol, 4-Methylphenol, Fecal Coliform.
WA-15-0120	QUARTERMASTER HARBOR	PCBs, Dieldrin.
WA-15-1015	PURDY CREEK	Fecal Coliform.
WA-15-1060	LITTLE MISSION CREEK	pH.
WA-15-1300	MINTER CREEK	Fecal Coliform.
WA-15-1350	LITTLE MINTER CREEK	Fecal Coliform.
WA-15-1400	BURLEY CREEK	Fecal Coliform.
WA-15-1450	BEAR CREEK	Fecal Coliform.
WA-15-2010	UNION RIVER	Fecal Coliform.
WA-15-2030	DOGFISH CREEK	Fecal Coliform, Turbidity.
WA-15-2033	GROVERS CREEK	Fecal Coliform.
WA-15-2040	STIMSON CREEK	Fecal Coliform.
WA-15-2050	SHOOFLY CREEK	Fecal Coliform.
WA-15-3000	MAYO CREEK	pH, Temperature, Fecal Coliform.
WA-15-3010	UNNAMED CREEK	pH, Fecal Coliform.
WA-15-3020	RAVINE CREEK	Fecal Coliform.
WA-15-3030	PRIVATE CREEK	pH, Fecal Coliform.
WA-15-3040	LAGOON CREEK	pH.
WA-15-3050	PICNIC CREEK	Fecal Coliform, pH.
WA-15-4000	GORST CREEK	Fecal Coliform.
WA-15-4100	WRIGHT CREEK	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-15-4200	BLACKJACK CREEK	Fecal Coliform.
WA-15-4400	ANNAPOLIS CREEK	Fecal Coliform.
WA-15-4900	BEAVER CREEK	Fecal Coliform.
WA-15-5000	CLEAR CREEK	Fecal Coliform.
WA-15-5100	BARKER CREEK	Fecal Coliform.
WA-15-7000	BIG BEEF CREEK	Temperature.
WA-15-9150	KITSAP LAKE	Total Phosphorus.
WA-16-1010	SKOKOMISH RIVER	Fecal Coliform.
WA-16-1013	PURDY CREEK	Fecal Coliform.
WA-16-1014	WEAVER CREEK	Fecal Coliform.
WA-16-1015	TEN ACRE CREEK	Fecal Coliform.
WA-16-1016	HUNTER CREEK	Fecal Coliform.
WA-16-1020	SKOKOMISH RIVER, N.F.	Temperature, Instream Flow.
WA-17-0010	DABOB BAY AND QUILCENE BAY	Fecal Coliform.
WA-17-0020	PORT TOWNSEND AND KILISUT HARBOR	Dissolved Oxygen.
WA-17-0030	PORT TOWNSEND	PCBs.
WA-17-0050	SEQUIM BAY	Dissolved Oxygen, pH, PAHs, Fecal Coliform.
WA-17-1000	MARPLE CREEK	Fish Habitat.
WA-17-1001	JACKSON CREEK	Fish Habitat.
WA-17-1010	BIG QUILCENE RIVER	Instream Flow, Fish Habitat.
WA-17-2200	CHICKEN COOP CREEK	Fecal Coliform.
WA-17-3010	CHIMACUM CREEK	Fecal Coliform, Temperature.
WA-17-4000	JOHNSON CREEK	Fecal Coliform.
WA-17-5000	TARBOO CREEK	Temperature.
WA-18-0020	PORT ANGELES HARBOR	Dissolved Oxygen, PCBs.
WA-18-1010	DUNGENESS RIVER	Instream Flow.
WA-18-1012	MATRIOTTI CREEK	Fecal Coliform.
WA-18-1020	DUNGENESS RIVER	Instream Flow.
WA-18-1100	BELL CREEK	Fecal Coliform.
WA-18-1300	CASSALARY CREEK	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-18-1600	BAGLEY CREEK	Fecal Coliform.
WA-18-1900	DRY CREEK	Temperature.
WA-18-2010	ELWHA RIVER	Temperature, PCB-1254.
WA-19-2020	LITTLE HOKO RIVER	Temperature.
WA-19-2500	SEKIU RIVER	Temperature.
WA-19-2600	SEKIU RIVER, N.F.	Temperature.
WA-19-2700	SEKIU RIVER, S.F.	Temperature.
WA-19-4500	DEEP CREEK	Temperature, Fine Sediment.
WA-19-5000	CLALLAM RIVER	Temperature.
WA-20-1020	SOLDUCK RIVER	Temperature, Dissolved Oxygen.
WA-20-1030	BOGACHIEL RIVER	Temperature, Dissolved Oxygen.
WA-20-1033	MAXFIELD CREEK	Temperature.
WA-20-1035	LAKE CREEK	Temperature, Dissolved Oxygen.
WA-20-1037	BEAVER CREEK	Temperature.
WA-20-1050	CALAWAH RIVER, N.F.	Temperature.
WA-20-1052	FAHNESTOCK CREEK	Temperature.
WA-20-1053	UPPER COOL CREEK	Temperature.
WA-20-1054	DEVILS CREEK	Temperature.
WA-20-2090	FISHER CREEK	Temperature.
WA-20-2100	SPLIT CREEK	Temperature.
WA-20-2110	LINE CREEK	Temperature.
WA-20-2150	NOLAN CREEK	Temperature.
WA-20-2200	ANDERSON CREEK	Temperature.
WA-20-2270	WINFIELD CREEK	Temperature.
WA-20-2275	ELK CREEK	Temperature.
WA-20-2280	ALDER CREEK	Temperature.
WA-20-2300	WILLOUGHBY CREEK	Temperature.
WA-20-2330	ROCK CREEK	Temperature.
WA-20-2350	TOWER CREEK	Temperature.
WA-20-2400	MAPLE CREEK	Temperature.
WA-20-2500	OWL CREEK	Temperature.

1996 Section 303(d) List - May 29, 1996
(Underlined text indicates a high priority for establishing a TMDL)

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-20-2600	CANYON CREEK	Temperature.
WA-20-5010	COAL CREEK	Temperature.
WA-20-5100	DICKEY RIVER, W.F.	Temperature.
WA-20-5200	DICKEY RIVER, E.F.	Temperature.
WA-20-5300	DICKEY RIVER, N.F.	Temperature.
WA-20-6210	CROOKED CREEK, N.F.	Temperature.
WA-21-1100	COAL CREEK	Temperature.
WA-21-2010	HOQUIAM RIVER	Temperature.
WA-21-3000	KALALOCH CREEK	Temperature.
WA-21-4000	JOE CREEK	Dissolved Oxygen, Fecal Coliform.
WA-22-0020	GRAYS HARBOR (OUTER)	Fecal Coliform.
WA-22-0030	GRAYS HARBOR (INNER)	Fecal Coliform.
WA-22-1010	HUMPTULIPS RIVER	Temperature.
WA-22-4020	WYNOOCHEE RIVER	Temperature.
WA-22-4025	BLACK CREEK	Temperature.
WA-22-4040	CHEHALIS RIVER	Fecal Coliform, Temperature.
WA-22-4045	WILDCAT CREEK	Temperature.
WA-22-4085	RABBIT CREEK	Temperature.
WA-22-9030	DUCK LAKE	Total Phosphorus.
WA-23-1010	CHEHALIS RIVER	Fecal Coliform.
WA-23-1018	SCATTER CREEK	pH, Fecal Coliform.
WA-23-1019	LINCOLN CREEK	Fecal Coliform.
WA-23-1020	CHEHALIS RIVER	PCBs, Fecal Coliform.
WA-23-1023	SALZER CREEK	Fecal Coliform.
WA-23-1026	COAL CREEK	Fecal Coliform.
WA-23-1027	DILLENBAUGH CREEK	Fecal Coliform.
WA-23-1028	BERWICK CREEK	Fecal Coliform.
WA-23-1030	SKOOKUMCHUCK RIVER	pH.
WA-23-1070	NEWAUKUM RIVER	Fecal Coliform.
WA-23-1080	NEWAUKUM RIVER, N.F.	Fecal Coliform.
WA-23-1100	CHEHALIS RIVER	pH, Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-23-1104	BUNKER CREEK	Fecal Coliform.
WA-23-1106	CHEHALIS RIVER, S.F.	Fecal Coliform.
WA-23-1108	ELK CREEK	Fecal Coliform.
WA-23-1110	CHEHALIS RIVER	pH, Fecal Coliform.
WA-23-2060	DEMPSEY CREEK	Dissolved Oxygen, Fecal Coliform.
WA-23-9010	BLACK LAKE	Total Phosphorus.
WA-24-0020	WILLAPA BAY	Fecal Coliform, pH.
WA-24-1010	NORTH RIVER	Fecal Coliform.
WA-24-1011	SMITH CREEK	Temperature.
WA-24-1020	CEDAR RIVER	Fecal Coliform.
WA-24-1030	GRAYLAND DITCH	Dissolved Oxygen, Fecal Coliform.
WA-24-1050	PIONEER CREEK	Temperature.
WA-24-1080	TUTTLE CREEK	pH.
WA-24-2020	WILLAPA RIVER	Temperature, Dissolved Oxygen, pH, Fecal Coliform.
WA-24-2030	WILLAPA RIVER	Fecal Coliform, Temperature.
WA-24-2037	FORKS CREEK	Temperature.
WA-24-3010	NASELLE RIVER	Temperature.
WA-24-3020	NASELLE RIVER	Temperature.
WA-25-1015	GRAYS RIVER, W.F.	Temperature.
WA-25-3010	ELOCHOMAN RIVER	Temperature.
WA-25-3300	ABERNATHY CREEK	Temperature.
WA-25-3500	GERMANY CREEK	Temperature.
WA-25-5010	LONGVIEW DITCHES	Dissolved Oxygen, Fecal Coliform, Turbidity, Lead.
WA-25-9010	LAKE SACAJAWEA	Total Phosphorus.
WA-26-1020	COWEEMAN RIVER	Temperature, Dissolved Oxygen, pH, Fecal Coliform.
WA-26-1023	GOBLE CREEK	Temperature.
WA-26-1025	MULHOLLAND CREEK	Temperature.
WA-26-1026	BAIRD CREEK	Temperature.
WA-26-1030	COWEEMAN RIVER	Temperature.
WA-26-1040	COWLITZ RIVER	Temperature, pH, Fecal Coliform.
WA-26-1050	TOUTLE RIVER	Fecal Coliform.

1996 Section 303(d) List - May 29, 1996
(Underlined text indicates a high priority for establishing a TMDL)

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-26-1087	HERRINGTON CREEK	Temperature.
WA-26-1096	CINNABAR CREEK	Temperature, pH, Dissolved Oxygen.
WA-26-1110	CISPUS RIVER	Temperature.
WA-26-1115	CISPUS RIVER, N.F.	Temperature.
WA-26-1118	CISPUS RIVER	Temperature.
WA-26-1119	EAST CANYON CREEK	Temperature.
WA-26-1122	SILVER CREEK	Temperature.
WA-26-9110	SILVER LAKE	Total Phosphorus.
WA-27-1010	KALAMA RIVER	Temperature, pH.
WA-27-1012	HATCHERY (FALLERT) CREEK	Temperature.
WA-27-2020	LEWIS RIVER, E.F.	Temperature, pH, Fecal Coliform.
WA-27-2022	McCORMICK CREEK	Temperature, Fecal Coliform.
WA-27-2024	LOCKWOOD CREEK	Fecal Coliform.
WA-27-2025	MASON CREEK	Fecal Coliform.
WA-27-2026	ROCK CREEK (NORTH)	Fecal Coliform.
WA-27-2030	LEWIS RIVER, E.F.	Fecal Coliform.
WA-27-2032	YACOLT CREEK	Fecal Coliform.
WA-27-2034	ROCK CREEK (SOUTH)	Fecal Coliform.
WA-27-2100	MUDDY RIVER	Temperature.
WA-27-2140	CLEARWATER CREEK	Temperature.
WA-28-1010	LAKE RIVER	Temperature, Fecal Coliform.
WA-28-1020	SALMON CREEK	Fecal Coliform, Turbidity, Temperature.
WA-28-1023	COUGAR CANYON CREEK	Dissolved Oxygen, Fecal Coliform.
WA-28-1025	MILL CREEK	Fecal Coliform.
WA-28-1026	CURTIN CREEK	Fecal Coliform.
WA-28-1027	WEAVER (WOODIN) CREEK	Chlorine, Fecal Coliform.
WA-28-1030	LAKE RIVER	Temperature, Fecal Coliform.
WA-28-1040	BURNT BRIDGE CREEK	pH, Dissolved Oxygen, Temperature, Fecal Coliform.
WA-28-2020	LACAMAS CREEK	pH, Temperature, Dissolved Oxygen, Fecal Coliform.
WA-28-2023	CHINA DITCH	Dissolved Oxygen, Fecal Coliform, Temperature, pH.
WA-28-2024	FIFTH PLAIN CREEK	pH, Dissolved Oxygen, Fecal Coliform, Temperature.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-28-2025	SHANGHAI CREEK	pH, Dissolved Oxygen, Temperature.
WA-28-2026	MATNEY CREEK	pH, Dissolved Oxygen, Fecal Coliform, Temperature.
WA-28-3010	GIBBONS CREEK	Fecal Coliform.
WA-29-1025	BEAR CREEK	Temperature.
WA-29-1028	EIGHTMILE CREEK	Temperature.
WA-29-1030	TROUT CREEK	Temperature.
WA-29-3010	WHITE SALMON RIVER	Fecal Coliform.
WA-29-3015	RATTLESNAKE CREEK	Temperature, Fecal Coliform.
WA-29-3016	INDIAN CREEK	Temperature.
WA-29-3030	TROUT LAKE CREEK	Fecal Coliform.
WA-30-1018	SWALE CREEK	Temperature, Instream Flow.
WA-30-1020	LITTLE KLICKITAT RIVER	Instream Flow, Temperature.
WA-30-1021	BOWMAN CREEK	Instream Flow.
WA-30-1022	MILL CREEK	Instream Flow.
WA-30-1023	BLOCKHOUSE CREEK	Instream Flow.
WA-30-1025	BLOODGOOD CREEK	Instream Flow.
WA-30-1027	LITTLE KLICKITAT RIVER, WEST PRONG	Temperature.
WA-30-1028	LITTLE KLICKITAT RIVER, EAST PRONG	Temperature.
WA-30-1029	BUTLER CREEK	Temperature.
WA-32-1010	WALLA WALLA RIVER	Temperature, pH, Fecal Coliform, Instream Flow, Chlordane, Dieldrin, 4,4'-DDT, 4,4'-DDE, Heptachlor Epoxide, Hexachlorobenzene, PCBs, Heptachlor.
WA-32-1020	TOUCHET RIVER	Temperature, pH, Fecal Coliform.
WA-32-1025	TOUCHET RIVER, N.F. (E.F.)	Temperature.
WA-32-1030	WALLA WALLA RIVER	Instream Flow.
WA-32-1050	WALLA WALLA RIVER	Instream Flow.
WA-32-1060	MILL CREEK	Dissolved Oxygen, Instream Flow, Chlorine, Total Phosphorus, Total Nitrogen.
WA-32-1070	MILL CREEK	Temperature, pH, Fecal Coliform.
WA-32-1080	WALLA WALLA RIVER	Instream Flow.
WA-33-1010	SNAKE RIVER	Dieldrin, 4,4'-DDE, PCBs, Total Dissolved Gas, Dissolved Oxygen, pH, Temperature.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-34-1010	PALOUSE RIVER	Fecal Coliform, Temperature, Dissolved Oxygen, Ammonia-N, Chromium, 4,4'-DDE, Heptachlor Epoxide, PCBs, pH.
WA-34-1015	ROCK CREEK	Temperature, pH, Fecal Coliform.
WA-34-1017	PINE CREEK	pH, Dissolved Oxygen, Temperature.
WA-34-1020	PALOUSE RIVER, S.F.	Fecal Coliform, Temperature, pH, Dissolved Oxygen.
WA-34-1024	MISSOURI FLAT CREEK	Dissolved Oxygen.
WA-34-1025	PARADISE CREEK	Fecal Coliform, Temperature, Dissolved Oxygen, Ammonia-N.
WA-34-1030	PALOUSE RIVER	Temperature, Ammonia-N, Dissolved Oxygen, pH, Fecal Coliform.
WA-34-1032	SILVER CREEK	Dissolved Oxygen, Ammonia-N, Chlorine.
WA-34-3010	UNION FLAT CREEK	Temperature.
WA-34-4010	REBEL FLAT CREEK	Chlorine, Dissolved Oxygen, Fecal Coliform.
WA-34-9245	MEDICAL LAKE	Total Phosphorus.
WA-35-1010	SNAKE RIVER	Total Dissolved Gas, DDT, 4,4'-DDE, Dieldrin.
WA-35-1020	SNAKE RIVER	Temperature, pH.
WA-35-1030	ASOTIN CREEK	Fecal Coliform.
WA-35-2010	TUCANNON RIVER	Fecal Coliform, Temperature.
WA-35-2013	PATAHA CREEK	Fecal Coliform.
WA-35-2024	CUMMINGS CREEK	Temperature.
WA-35-2030	TUCANNON RIVER	Temperature.
WA-35-3010	GRANDE RONDE RIVER	Temperature, Fecal Coliform.
WA-36-1010	ESQUATZEL COULEE	Temperature, pH, Dissolved Oxygen.
WA-36-3000	EAST POTHOLES CANAL	pH, Dissolved Oxygen, Temperature.
WA-36-3010	SCOOTENEY WASTEWAY	Temperature, pH, Dissolved Oxygen.
WA-36-1100	ELTOPIA BRANCH CANAL	Temperature.
WA-37-1010	YAKIMA RIVER	Temperature, pH, Fecal Coliform, Turbidity, Instream Flow, Ammonia-N, DDT, 4,4'-DDE, 4,4'-DDD, PCB-1254, PCB-1260, Endosulfan, Heptachlor, Heptachlor Expoxide, Parathion, Endrin, Aldrin, Dieldrin.
WA-37-1012	SNIPES CREEK	DDT, Dissolved Oxygen, Temperature.
WA-37-1014	SPRING CREEK	DDT.
WA-37-1020	YAKIMA RIVER	Temperature, Instream Flow, PCB-1260, DDT, 4,4'-DDE, Dieldrin.
WA-37-1024	GRANGER DRAIN	DDT, 4,4'-DDE, 4,4'-DDD, Dieldrin, Endosulfan, Temperature, Dissolved Oxygen, pH, Ammonia-N, Fecal Coliform.
WA-37-1030	SULPHUR CREEK WASTEWAY	DDT, 4,4'-DDE, 4,4'-DDD, Dieldrin, Endosulfan, Temperature.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-37-1040	YAKIMA RIVER	Fecal Coliform.
WA-37-1047	WIDE HOLLOW CREEK	DDT, 4,4'-DDE, 4,4'-DDD, Dieldrin, Endosulfan, Temperature, Dissolved Oxygen, Fecal Coliform.
WA-37-1048	MOXEE DRAIN (BIRCHFIELD DRAIN)	DDT, 4,4'-DDE, 4,4'-DDD, Chlorpyrifos, Dieldrin, Endosulfan, Malathion, Temperature, Dissolved Oxygen, pH, Fecal Coliform.
WA-37-2105	SPRING CREEK	Temperature.
WA-37-9030	GIFFIN LAKE	Total Phosphorus.
WA-38-1010	NACHES RIVER	Temperature, pH.
WA-38-1015	COWICHE CREEK	Temperature, Instream Flow.
WA-38-1016	COWICHE CREEK, N.F.	Temperature, Fecal Coliform.
WA-38-1017	COWICHE CREEK, S.F.	Temperature, Fecal Coliform.
WA-38-1018	REYNOLDS CREEK	Temperature.
WA-38-1019	YAKIMA TIETON MAIN CANAL	Fecal Coliform.
WA-38-1035	RATTLESNAKE CREEK	Temperature.
WA-38-1036	LITTLE RATTLESNAKE CREEK	Temperature.
WA-38-1037	RATTLESNAKE CREEK	Temperature.
WA-38-1041	GOLD CREEK	Temperature.
WA-38-1060	AMERICAN RIVER	Temperature.
WA-38-1070	BUMPING RIVER	Temperature.
WA-38-1080	LITTLE NACHES RIVER	Temperature.
WA-38-1081	CROW CREEK	Temperature.
WA-38-1086	MATHEW CREEK	Temperature.
WA-38-1088	BEAR CREEK	Temperature.
WA-38-1091	BLOWOUT CREEK	Temperature.
WA-38-2110	NILE CREEK, N.F.	Temperature.
WA-38-3000	TIETON RIVER, S.F.	Temperature.
WA-38-9080	MYRON LAKE	Ammonia-N.
WA-39-1010	YAKIMA RIVER	DDT, 4,4'-DDE, Dieldrin.
WA-39-1012	WENAS CREEK	Instream Flow.
WA-39-1020	WILSON CREEK	Temperature, Fecal Coliform.
WA-39-1025	NANEUM CREEK	Temperature.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-39-1030	YAKIMA RIVER	DDT, 4,4'-DDE.
WA-39-1032	CHERRY CREEK	Temperature, DDT, 4,4'-DDE, Dieldrin.
WA-39-1034	COOKE CREEK	Dissolved Oxygen, Temperature, Fecal Coliform.
WA-39-1037	CRYSTAL CREEK	pH.
WA-39-1050	CLE ELUM RIVER	Temperature.
WA-39-1053	THORP CREEK	Temperature.
WA-39-1055	COOPER RIVER	Temperature.
WA-39-1057	WAPTUS RIVER	Temperature.
WA-39-1060	YAKIMA RIVER	Temperature, Dissolved Oxygen.
WA-39-1070	YAKIMA RIVER	Temperature.
WA-39-1073	BIG CREEK	Temperature, Instream Flow.
WA-39-1075	CABIN CREEK	Temperature.
WA-39-1077	LOG CREEK	Temperature.
WA-39-1110	SELAH DITCH	Ammonia-N, Chlorine, Dissolved Oxygen.
WA-39-1300	GALE CREEK	Temperature.
WA-39-1350	MEADOW CREEK	Temperature.
WA-39-1390	GOLD CREEK	Temperature.
WA-39-1400	SWAUK CREEK	Temperature.
WA-39-1420	SWAUK CREEK	Temperature.
WA-39-1425	WILLIAMS CREEK	Temperature.
WA-39-1435	BLUE CREEK	Temperature.
WA-39-1440	IRON CREEK	Temperature.
WA-39-1500	TANEUM CREEK	Instream Flow.
WA-39-1520	TANEUM CREEK	Temperature.
WA-39-1558	LOOKOUT CREEK	Temperature.
WA-39-1570	TANEUM CREEK, S.F.	Temperature.
WA-39-2000	TEANAWAY RIVER	Instream Flow, Temperature.
WA-39-2100	TEANAWAY RIVER, W.F.	Temperature.
WA-39-2150	TEANAWAY RIVER, M.F.	Temperature.
WA-39-2155	STAFFORD CREEK	Temperature.
WA-39-2200	TEANAWAY RIVER, N.F.	Temperature.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-39-2250	TEANAWAY RIVER, N.F.	Temperature.
WA-39-2300	TEANAWAY RIVER, W.F.	Temperature.
WA-39-2350	TEANAWAY RIVER, W.F.	Temperature.
WA-39-3000	MANASTASH CREEK	Instream Flow.
WA-39-3020	MANASTASH CREEK, S.F.	Temperature.
WA-39-3025	MANASTASH CREEK, S.F.	Temperature.
WA-41-1010	CRAB CREEK	Temperature, pH, Fecal Coliform, Dieldrin, DDT, 4,4'-DDE, PCB-1254, PCB-1260.
WA-41-1016	CRAB CREEK LATERAL	Temperature.
WA-41-1018	RED ROCK COULEE	Temperature, pH, Dissolved Oxygen.
WA-41-1030	CRAB CREEK	Temperature.
WA-41-1110	WINCHESTER WASTEWAY	pH, Temperature.
WA-41-1120	FRENCHMAN HILLS WASTEWAY	Temperature, pH.
WA-41-2010	ROCKY FORD CREEK	pH, Dissolved Oxygen, Temperature.
WA-41-3000	EAST POTHOLES CANAL	Temperature, Dissolved Oxygen.
WA-41-3500	LIND COULEE	Temperature, pH, Dissolved Oxygen.
WA-41-4000	WEST CANAL	Temperature.
WA-41-4500	W645 WASTEWAY	Temperature, Dissolved Oxygen.
WA-41-5000	SAND HALLOW CREEK	Temperature, pH.
WA-41-9250	MOSES LAKE	Total Phosphorus, Total Nitrogen.
WA-41-9280	POTHOLES RESERVOIR	Dieldrin.
WA-42-2000	MAIN CANAL	Temperature, Dissolved Oxygen.
WA-43-4000	CRAB CREEK	pH.
WA-43-9160	WEST MEDICAL LAKE	Fecal Coliform, Ammonia-N.
WA-45-1010	WENATCHEE RIVER	Temperature, pH, Instream Flow.
WA-45-1011	MISSION CREEK	DDT (total), 4,4'-DDT, 4,4'-DDE, Fecal Coliform, Instream Flow.
WA-45-1012	MISSION CREEK	Temperature.
WA-45-1013	PESHASTIN CREEK	Temperature, Instream Flow.
WA-45-1014	PESHASTIN CREEK	Temperature.
WA-45-1015	ICICLE CREEK	Instream Flow.
WA-45-1017	ICICLE CREEK	Temperature, Dissolved Oxygen, pH.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-45-1020	WENATCHEE RIVER	Temperature, pH, Dissolved Oxygen, Instream Flow.
WA-45-1100	BRENDER CREEK	Dissolved Oxygen, Fecal Coliform.
WA-45-1200	CHUMSTICK CREEK	Dissolved Oxygen, pH, Fecal Coliform, Instream Flow.
WA-45-1900	CHIWAUKUM CREEK	Temperature.
WA-45-3000	NASON CREEK	Temperature.
WA-45-4000	LITTLE WENATCHEE RIVER	Temperature.
WA-46-1010	ENTIAT RIVER	pH, Temperature, Instream Flow.
WA-47-1010	CHELAN RIVER	Fecal Coliform.
WA-47-1012	FIRST CREEK	Dissolved Oxygen.
WA-47-1014	MITCHELL CREEK	pH.
WA-47-1020	RAILROAD CREEK	Arsenic.
WA-47-1030	STEHEKIN RIVER	Arsenic.
WA-47-9020	LAKE CHELAN	4,4'-DDE, PCBs, pH.
WA-47-9037	ROSES (ALKALI) LAKE	4,4'-DDE.
WA-48-1010	METHOW RIVER	Temperature.
WA-48-1020	METHOW RIVER	Instream Flow.
WA-48-1021	BEAVER CREEK	Instream Flow.
WA-48-1030	TWISP RIVER	Temperature, Instream Flow.
WA-48-1040	METHOW RIVER	Instream Flow.
WA-48-1050	METHOW RIVER	Instream Flow, Temperature.
WA-48-1052	CHEWACK RIVER	Instream Flow.
WA-48-1059	WOLF CREEK	Instream Flow.
WA-48-1060	METHOW RIVER	Instream Flow.
WA-48-1061	EARLY WINTERS CREEK	Instream Flow.
WA-49-1010	OKANOGAN RIVER	Temperature, Dissolved Oxygen, pH, 4,4'-DDE, 4,4'-DDD, PCBs.
WA-49-1020	OKANOGAN RIVER	Temperature, Dissolved Oxygen.
WA-49-1021	SALMON CREEK	Instream Flow.
WA-49-1030	SIMILKAMEEN RIVER	Temperature, pH.
WA-49-1040	OKANOGAN RIVER	Temperature, Dissolved Oxygen, pH.
WA-49-9260	OSOOYOS LAKE	4,4'-DDE, 4,4'-DDD.
WA-52-2920	O'BRIEN CREEK, S.F.	pH.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-52-4000	SANPOIL RIVER, N.F.	Fecal Coliform.
WA-53-4300	COTTONWOOD CREEK	Chlorine, Ammonia-N.
WA-53-9010	CRESCENT BAY LAKE	Ammonia-N.
WA-54-1010	SPOKANE RIVER	Temperature, pH, PCBs, 4,4'-DDE, Dieldrin, Sediment Bioassay, Dissolved Oxygen.
WA-54-1015	CHAMOKANE CREEK	Temperature.
WA-54-1020	SPOKANE RIVER	Zinc, Chromium, PCBs, pH, Ammonia-N, Total Phosphorus, Fecal Coliform.
WA-54-9040	LONG LAKE	DDT, 4,4'-DDE, 4,4'-DDD, Heptachlor, Heptachlor Epoxide, Aldrin, Dieldrin, PCBs.
WA-55-1010	LITTLE SPOKANE RIVER	Fecal Coliform, Temperature, Dissolved Oxygen, PCBs, pH.
WA-55-1011	DEADMAN CREEK	Temperature, pH.
WA-55-1012	DRAGOON CREEK	Fecal Coliform, Dissolved Oxygen.
WA-56-1010	HANGMAN CREEK	Temperature, pH, 4,4'-DDE, Fecal Coliform, Dissolved Oxygen.
WA-57-1010	SPOKANE RIVER	Cadmium, Zinc, Mercury, PCBs, Sediment Bioassay, Temperature, Dissolved Oxygen.
WA-57-9020	NEWMAN LAKE	Total Phosphorus.
WA-58-2000	SHERMAN CREEK	Temperature.
WA-58-2500	SHERMAN CREEK, S.F.	Temperature.
<u>WA-59-1010</u>	<u>COLVILLE RIVER</u>	Temperature, Fecal Coliform, <u>Ammonia-N</u>, Chloride, pH, <u>Dissolved Oxygen</u>.
WA-59-2600	MILL CREEK, S.F.	Fecal Coliform.
WA-59-2800	MILL CREEK, N.F.	pH.
WA-59-3000	LITTLE PEND OREILLE RIVER	pH.
WA-59-3995	ADDY CREEK	pH.
WA-59-4000	STENSGAR CREEK	Dissolved Oxygen, Fecal Coliform.
WA-59-5000	BLUE CREEK	Dissolved Oxygen, Fecal Coliform.
WA-59-6000	CHEWELAH CREEK	pH.
WA-59-6010	CHEWELAH CREEK, S.F.	Fecal Coliform, Dissolved Oxygen, pH, Temperature.
WA-59-6057	BAYLEY CREEK, W.F.	pH.
WA-59-6110	COTTONWOOD CREEK	Fecal Coliform.
WA-59-7000	SHEEP CREEK	Dissolved Oxygen, Fecal Coliform.
WA-59-9070	GILLETTE LAKE	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-59-9180	STARVATION LAKE	Total Phosphorus.
WA-60-1015	MARTIN CREEK	Fecal Coliform.
WA-60-1016	EAST DEER CREEK	pH.
WA-60-1018	DEEP CREEK	pH.
WA-60-1019	DEEP CREEK	Dissolved Oxygen.
WA-60-2050	ST. PETER CREEK	Fecal Coliform.
WA-60-2100	LAMBERT CREEK	Fecal Coliform.
WA-60-2250	TROUT CREEK, N.F.	Fecal Coliform.
WA-60-3100	BOULDER CREEK, S.F.	Dissolved Oxygen, Temperature, Fecal Coliform.
WA-60-3170	U.S. CREEK	pH.
WA-60-3250	PIERRE CREEK	pH.
WA-60-3252	FISHER CREEK	Dissolved Oxygen.
WA-60-4000	INDEPENDENT CREEK	Dissolved Oxygen.
WA-60-6000	LONE RANCH CREEK	Fecal Coliform.
WA-60-6400	COTTONWOOD CREEK	Fecal Coliform.
WA-60-6530	TONATA CREEK	pH, Fecal Coliform.
WA-61-5000	FLAT CREEK	Fecal Coliform.
WA-61-5100	CROWN CREEK	pH, Fecal Coliform.
WA-61-7000	DEEP CREEK	pH.
WA-61-7100	DEEP CREEK, S.F.	Temperature.
WA-61-7200	SNACKOUT CREEK	Dissolved Oxygen, pH, Fecal Coliform.
WA-61-7250	MEADOW CREEK	pH, Fecal Coliform.
WA-61-7340	SILVER CREEK	pH.
WA-61-7400	ROCKY CREEK	Dissolved Oxygen.
WA-61-8910	CEDAR CREEK, E.F.	pH.
WA-62-1010	PEND OREILLE RIVER	pH, Aldrin, Dieldrin, Heptachlor, Heptachlor Epoxide, DDT, 4,4'-DDE, 4,4'-DDD.
WA-62-1020	PEND OREILLE RIVER	Temperature, pH.
WA-62-1960	LOST CREEK	Temperature, pH, Fecal Coliform.
WA-62-2210	LECLERC CREEK, WEST BRANCH	Dissolved Oxygen.
WA-62-3000	SKOOKUM CREEK	Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-62-3100	NOISY CREEK	pH.
WA-62-3310	IONE CREEK	Temperature.
WA-62-3500	SLATE CREEK	pH.
WA-62-4000	BRACKET CREEK	Fecal Coliform.
WA-CR-1010	COLUMBIA RIVER	Sediment Bioassay, Total Dissolved Gas, PCB-1254, Arsenic, 4,4'-DDE, Dieldrin, Bis(2-ethylhexyl) Phthalate, Temperature, Dissolved Oxygen, pH, Fecal Coliform.
WA-CR-1020	COLUMBIA RIVER	Mercury, Temperature, Sediment Bioassay, Total Dissolved Gas, pH.
WA-CR-1026	COLUMBIA RIVER	Total Dissolved Gas, Sediment Bioassay.
WA-CR-1028	COLUMBIA RIVER	Sediment Bioassay.
WA-CR-1030	COLUMBIA RIVER	Total Dissolved Gas, pH.
WA-CR-1040	COLUMBIA RIVER	Water Column Bioassay, Total Dissolved Gas, Temperature, pH.
WA-CR-1050	COLUMBIA RIVER	Temperature, Total Dissolved Gas, PCBs.
WA-CR-1060	FRANKLIN D. ROOSEVELT LAKE	PCBs, Sediment Bioassay, Total Dissolved Gas, pH, Fecal Coliform, Temperature, Dissolved Oxygen.
WA-PS-0010	SKAGIT BAY AND SIMILK BAY	Fecal Coliform, PCBs.
WA-PS-0020	PORT SUSAN	Fecal Coliform, PCBs.
WA-PS-0030	POSSESSION SOUND (NORTH)	Fecal Coliform, Arsenic, Cadmium, Copper, Lead, Mercury, Zinc, Naphthalene, Acenaphthene, Fluorene, Phenanthrene, 2-Methylnaphthalene, Bis(2-ethylhexyl) Phthalate, Dibenzofuran, Phenol, 2-Methylphenol, 4-Methylphenol, 2,4-Dimethylphenol, Benzyl Alcohol, pH, Dissolved Oxygen.
WA-PS-0070	TACOMA NARROWS	PCBs, Dieldrin.
WA-PS-0090	CASE INLET AND DANA PASSAGE	Dissolved Oxygen, pH, Fecal Coliform.
WA-PS-0100	HOOD CANAL (NORTH)	Copper, Lead, Mercury, Zinc, Acenaphthene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Total Benzofluoranthenes, Benzo(g,h,i)perylene, Chrysene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene, Pyrene, 4-Methylphenol, Pentachlorophenol, Dibenzo(a,h)anthracene, Dibenzofuran, Bis(2-ethylhexyl)phthalate.
WA-PS-0210	SAMISH BAY	Fecal Coliform.
WA-PS-0230	PUGET SOUND (N-CENTRAL) AND USELESS BAY	PCBs.
WA-PS-0240	PUGET SOUND (CENTRAL)	Fecal Coliform.
WA-PS-0250	HOOD CANAL (SOUTH)	Fecal Coliform.
WA-PS-0260	GREAT BEND/LYNCH COVE	Dissolved Oxygen, pH, Fecal Coliform.

WATERBODY SEGMENT NUMBER	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-PS-0270	PUGET SOUND (S-CENTRAL) AND EAST PASSAGE	Ammonia-N, Fecal Coliform.
WA-PS-0290	NISQUALLY REACH/DRAYTON PASSAGE	Fecal Coliform.

APPENDIX 13

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION	CLASS
		THE JURISDICTION OF THE YAKAMA INDIAN NATION)	
WA-37-1060	WANITY SLOUGH	MOUTH AT TOPPENISH CREEK RM 6.5 TO HEADWATERS AT YAKIMA RM 106.8 (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1100	TOPPENISH CREEK, N.F.	MOUTH AT TOPPENISH CREEK RM 55.4 TO HEADWATERS ON LOST HORSE PLATEAU. (SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RAA
WA-37-1590	PANTHER CREEK	MOUTH AT TOPPENISH CREEK RM 69.2 TO HEADWATERS ON LOST HORSE PLATEAU. (STREAM IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-2000	AHTANUM CREEK	MOUTH AT YAKIMA RM 106.9 TO CONFLUENCE OF N.F. AND S.F. (RM 23.1), (THE SEGEMNT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-2100	BACHELOR CREEK	MOUTH AT AHTANUM CREEK RM 3.2 TO DITCH INTAKE FROM AHTANUM CREEK RM 18.9	RA
WA-37-2105	SPRING CREEK	MOUTH AT BACHELOR CREEK RM 2.0 (NEAR HATCHERY) TO HEADWATERS	RA
WA-37-2110	BOWMAN DITCH	MOUTH AT BACHELOR CREEK RM 3.5 (NEAR AHTANUM ROAD-WEST OF AIRPORT) TO HEADWATERS (NEAR WILEY CITY)	RA
WA-37-2200	AHTANUM CREEK, S.F.	MOUTH AT AHTANUM CREEK RM 23.1 TO HEADWATERS. (SEGMENT IS PARTIALLY UNDER THE JURSIDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-2300	AHTANUM CREEK, N.F.	MOUTH AT AHTANUM CREEK RM 23.1 TO HEADWATERS ON DARLAND MOUNTAIN	RA
WA-37-9005	BOS LAKE	TRS 9N-22E-21	LAK
WA-37-9010	BYRON LAKE	LAT/LONG = 461134/1195304 TRS = 08N-23E-12 ELEV = 0 FT MEAN DEPTH = 0 FT MAX DEPTH = 6 FT VOLUME = 0 AF	LAK
WA-37-9020	FREEWAY LAKE	LAT/LONG = 463739/1203021 TRS = 13N-19E-07 ELEV = 0 FT MEAN DEPTH = 14 FT MAX DEPTH = 21 FT VOLUME = 347 AF	LAK
WA-37-9030	GIFFIN LAKE	LAT/LONG = 461439/1210148 TRS = 09N-22E-23 ELEV = 0 FT MEAN DEPTH = 4 FT MAX DEPTH = 7 FT VOLUME = 377 AF	LAK
WA-37-9040	HORSESHOE LAKE	LAT/LONG = 461458/1200336 TRS = 09N-22E-22 ELEV = 0 FT MEAN DEPTH = 1 FT MAX DEPTH = 2 FT VOLUME = 19 AF	LAK
WA-37-9050	HORSESHOE LAKE	LAT/LONG = 461359/1200043 TRS = 09N-22E-25 ELEV = 0 FT MEAN DEPTH = 2 FT MAX DEPTH = 6 FT VOLUME = 180 AF	LAK
WA-37-9055	McWORTER LAKE	TRS 10N-27E-15	LAK
WA-37-9060	MORGAN LAKE	LAT/LONG = 461416/1200031 TRS = 09N-22E-25 ELEV = 0 FT MEAN DEPTH = 2 FT MAX DEPTH = 4 FT VOLUME = 91 AF	LAK
WA-37-9070	OLEYS (WASHINGTON) LAKE	LAT/LONG = 461634/1195925 TRS = 09N-23E-07 ELEV = 0 FT MEAN DEPTH = 2 FT MAX DEPTH = 2 FT VOLUME = 26 AF	LAK
WA-38-1010	NACHES RIVER	MOUTH AT YAKIMA RM 116.3 TO TIETON RIVER (RM 17.5)	RA
WA-38-1015	COWICHE CREEK	MOUTH AT NACHES RM 2.7 TO HEADWATERS (INCLUDES BOTH N.F. (19.1 MILES) AND S.F. (25.2 MILES))	RA
WA-38-1016	COWICHE CREEK, N.F.	MOUTH AT COWICHE CREEK RM 7.5 TO HEADWATERS	RA
WA-38-1017	COWICHE CREEK, S.F.	MOUTH AT COWICHE CREEK RM 75. TO HEADWATERS	RA
WA-38-1018	REYNOLDS CREEK	MOUTH AT S.F. COWICHE RM 11.8 TO HEADWATERS ON STORBACH MOUNTAIN	RA
WA-38-1020	TIETON RIVER	MOUTH AT NACHES RM 17.5 TO RIMROCK LAKE DAM	RAA
WA-38-1026	HAUSE CREEK	MOUTH AT TIETON RM 18.0 TO HEADWATERS	RAA
WA-38-1030	NACHES RIVER	TIETON RIVER (RM 17.5) TO NATIONAL FOREST BOUNDARY (RM 35.7)	RA
WA-38-1035	RATTLESNAKE CREEK	MOUTH AT NACHES RM 27.8 TO NATIONAL FOREST BOUNDRY (RM 1.2)	RA
WA-38-1036	LITTLE RATTLESNAKE	MOUTH AT RATTLESNAKE CREEK RM 1.1 TO NATIONAL FOREST BOUNDARY (RM 5.0)	RA

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION	CLASS
		DEPTH = 8 FT MAX DEPTH = 26 FT VOLUME = 163 AF	
WA-36-9210	WASHTUCNA LAKE	LAT/LONG = 463850/1182955 TRS = 13N-34E-01 ELEV = 0 FT MEAN DEPTH = 4 FT MAX DEPTH = 9 FT VOLUME = 225 AF	LAK
WA-36-9220	WEIR LAKE	LAT/LONG = 464126/1190823 TRS = 14N-29E-23 ELEV = 0 FT MEAN DEPTH = 20 FT MAX DEPTH = 81 FT VOLUME = 2860 AF	LAK
WA-37-1010	YAKIMA RIVER	MOUTH AT COLUMBIA RM 335.2 TO TOPPENISH CREEK (RM 80.4). (RM 59.8 TO TOP OF SEGMENT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1011	BENTON CREEK	MOUTH AT YAKIMA RM 29.8 TO HEADWATERS NEAR KENNEDY ROAD	RA
WA-37-1012	SNIPES CREEK	MOUTH AT YAKIMA RM 41.8 (DOWNSTREAM OF PROSSER) TO HEADWATERS	RA
WA-37-1013	DAYS CREEK	MOUTH AT YAKIMA RM 35.0 TO HEADWATERS NEAR TRUHLICKA ROAD	RA
WA-37-1014	SPRING CREEK	MOUTH AT YAKIMA RM 41.8 TO HEADWATERS	RA
WA-37-1019	YAKIMA TIETON MAIN CANAL	MOUTH AT N.F. COWICHE CREEK RM 8.4 IN FRENCH CANYON TO OUTFLOW AT HEADWORKS ON TIETON RM 14.2	RA
WA-37-1020	YAKIMA RIVER	TOPPENISH CREEK (RM 80.4) TO SUNNYSIDE DAM BRIDGE (RM 103.8). (THIS ENTIRE SEGMENT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1023	DERUYTHER CREEK	MOUTH AT GRANGER DRAIN NEAR PRICE ROAD TO HEADWATERS NEAR INDEPENDANCE ROAD	RA
WA-37-1024	GRANGER DRAIN	MOUTH AT YAKIMA RM 83 (AT GRANGER) TO HEADWATERS	RA
WA-37-1025	MARION DRAIN	MOUTH AT YAKIMA RM 82.9 (NEAR GRANGER) TO HEADWATERS NEAR LABBEE AIRPORT. (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1030	SULPHUR CREEK WASTEWAY	MOUTH AT YAKIMA RM 61.0 TO WASTEWAY HEADWATERS	RA
WA-37-1035	STATUS CREEK	MOUTH AT YAKIMA RM 69.6 TO HEADWATERS (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1037	DRY CREEK	MOUTH AT STATUS CREEK RM 18.7 TO HEADWATERS. INCLUDES N.F., M.F. AND S.F. (STREAM IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1039	KUSSHI CREEK	MOUTH AT STATUS CREEK RM 37.2 TO HEADWATERS. INCLUDES N.F. AND S.F. (STREAM IS ENTIRELY UNDER THE JURISIDCTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1040	YAKIMA RIVER	SUNNYSIDE DAM BRIDGE (RM 103.8) TO NACHES RIVER (RM 116.3). (THE SEGMENT FORM RM 103.8 TO 106.9 IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1047	WIDE HOLLOW CREEK	MOUTH AT YAKIMA RM 104.7 TO HEADWATERS	RA
WA-37-1048	MOXEE (BIRCHFIELD) DRAIN	MOUTH AT YAKIMA RM 107.6 (NEAR UNION GAP) TO HEADWATERS ALONG BIRCHFIELD ROAD	RA
WA-37-1050	TOPPENISH CREEK	MOUTH AT YAKIMA RM 80.4 (SOUTH OF GRANGER) TO HEADWATERS (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION).	RA
WA-37-1054	MILL CREEK	MOUTH AT TOPPENISH CREEK RM 30.9 TO HEADWATERS ON WHISKEY JIM FLAT. (STREAM IS ENTIRELY UNDER THE JURISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1055	SIMCOE CREEK	MOUTH AT TOPPENISH CREEK RM 32.7 TO THE CONFLUENCE OF THE N.F. AND S.F. (RM 18.9). (STREAM IS ENTIRELY UNDER THE JUSISDICTION OF THE YAKAMA INDIAN NATION)	RA
WA-37-1057	YESMOWIT CREEK	MOUTH AT SIMCOE CREEK RM 14.0 TO HEADWATERS. (STREAM IS ENTIRELY UNDER	RA