Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide Total Maximum Daily Load

Detailed Implementation Plan

October 2003
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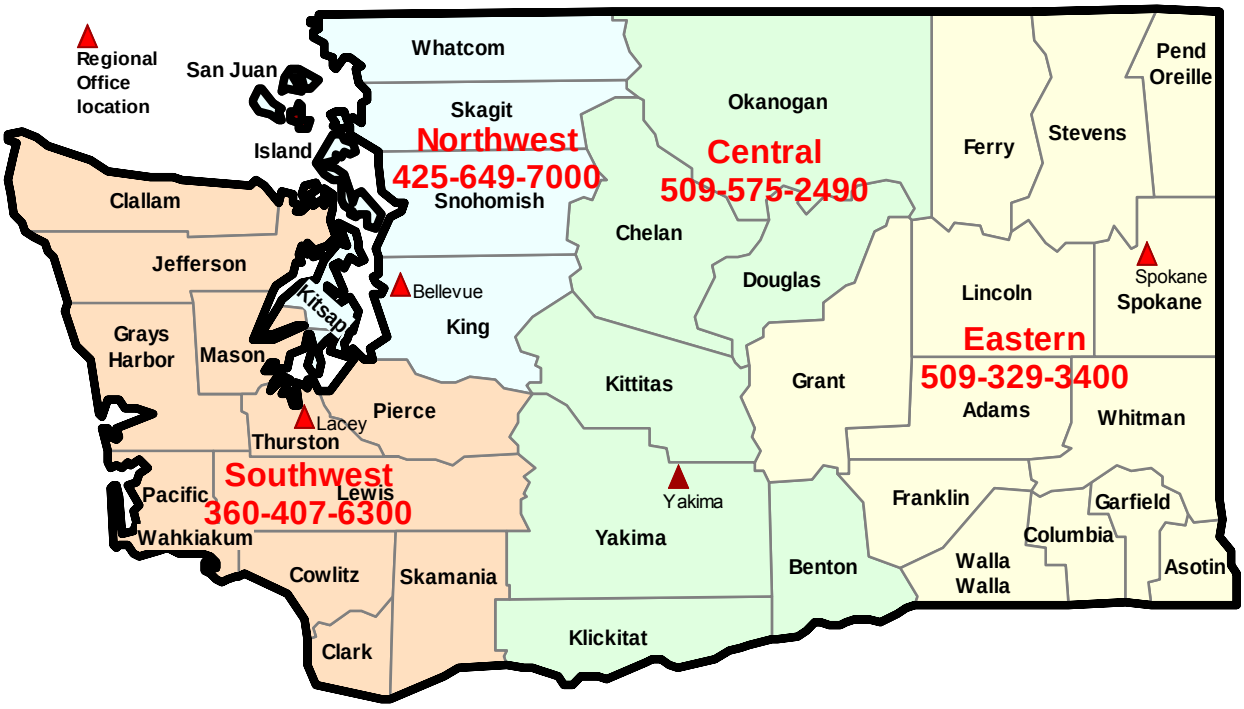

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Acknowledgements

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Thanks also to staff of the Washington Department of Ecology, who helped direct and edit the development of this detailed implementation plan.

Abstract

This detailed implementation plan (DIP) document outlines the steps that will be taken in an effort to reduce levels of suspended sediment, turbidity and organochlorine pesticides[1] in the Upper Yakima River basin, in central Washington State. This document expands the sediment and pesticide reduction strategies found in earlier reports written for the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticides Total Maximum Daily Load (TMDL)*. This DIP also specifies the ways in which implementation activities may reduce these pollutants and generally improve stream "health." Lastly, the DIP explains how water quality monitoring will be used to track progress and to indicate when adaptive management procedures may need to be employed.

Several sources of suspended sediment and turbidity have been identified in the Upper Yakima River basin: erosion of earthen roads, erosion of streambanks and riverbanks, and entry of sediment laden agricultural return flows into local waterbodies. Additionally, suspended sediment can carry organochlorine pesticides, so some of the sources noted above may also add to organochlorine concentrations in these waterbodies. Implementation measures are planned to address all of these causes.

Actions taken pursuant to this DIP fall into three categories: 1) voluntary stewardship actions, 2) actions that are taken in accordance with a pre-existing law, legal agreement or land management plan, and 3) monitoring activities. If resources are available planned monitoring activities include additional sediment and turbidity assessment through the basin; sediment source tracking; continued monitoring of organochlorine pesticide levels; assessment of pesticide uptake rates by fish; specific organochlorine pesticide transport studies; spatial modeling of erosion, sediment and pesticide transport; sediment studies in the Upper Yakima River basin; and possibly other studies.

Progress toward final goals will be measured by achievement of intermediate milestones, including completion of educational activities, implementation of best management practices (BMPs), irrigation upgrades, and achievement of interim targets. Other milestones will include reduction of turbidity, suspended sediment and organochlorine pesticide levels.

Final TMDL targets are expected to be achieved on schedule (by October 2011) for several reasons. A dedicated workgroup, composed of landowners, natural resource managers and other interested citizens, is working hard to identify and implement appropriate BMPs wherever possible. Various agencies are helping to coordinate and obtain funding for BMP implementation projects, and more of these projects are planned for the near future. Monitoring programs are now in place, which are establishing baseline data to measure future success as well as help identify which pollution sources are natural (background) vs. those related to current anthropogenic activities.

[1] See definitions in Appendix A.

Introduction

The Upper Yakima River basin is located in central Washington State, and is classified as water resource inventory area (WRIA) 39. Land uses in the basin vary from forestland, range, and intensively irrigated agriculture to urban and suburban areas. From April through October, levels of organochlorine pesticides in the Upper Yakima River basin occasionally exceed state water quality standards. Levels of turbidity and suspended sediment in the Upper Yakima River basin often exceed state water quality standards[2] during this period as well.

The Washington Department of Ecology (Ecology) completed an assessment of suspended sediment, turbidity, organochlorine pesticides, bacteria, and metals in the Upper Yakima River basin in 1999[3]. The primary monitoring and assessment area consists of the mainstem Yakima River and its major tributaries from river mile 121.7 (Harrison Bridge, near the town of Selah) upstream to river mile 191 (4.5 miles northwest of Cle Elum on Interstate 90).

In late 2000, a technical advisory workgroup (TAW) – composed of Upper Yakima River basin landowners, agency personnel and others who have a strong interest in and history of caring for the river – was formed to guide Ecology's efforts on the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide Total Maximum Daily Load* (TMDL) project.

In 2002, TMDL technical evaluation was completed by Ecology to address suspended sediment, turbidity and organochlorine pesticide levels in the Upper Yakima River basin (Joy, 2002). Suspended sediment is considered to be the main transport mechanism for the organochlorine pesticides, and turbidity is both a surrogate for the suspended sediment and a pollutant in its own right. As part of this technical evaluation, TMDL targets were established with the assistance and direction of the technical advisory workgroup:

1. DDT and dieldrin targets were calculated for Cherry Creek in order to meet aquatic toxicity and human health criteria.
2. DDT and dieldrin targets were calculated for the Upper Yakima River mainstem, based on fish tissue concentrations. A dieldrin target for the Cle Elum area, and DDT and dieldrin targets for the Yakima River at Umtanum Creek (near Wymer), were established.
3. Turbidity targets were calculated for seven sub-basins to decrease suspended sediment loading. Meeting these sub-basin turbidity targets will help meet a main stem turbidity target of not more than a 5 NTU increase between Nelson (river mile 191) and Harrison Bridge (river mile 121.7) by 2011.

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[2] Suspended sediment (as TSS) exceeded narrative criteria, and turbidity exceeded both numeric and narrative criteria, for extended periods that could be harmful to salmonids.

[3] Water quality monitoring to re-assess pollution by cadmium, mercury, silver and copper in the main stem Yakima River occurred from March 1999 to January 2000. Water quality monitoring to re-assess organochlorine pesticides in the water column, as well as turbidity and suspended sediments, occurred from April 1999 to October 1999 throughout the Upper Yakima River basin. Evaluation of main stem Yakima River fish tissue for organochlorine pesticides occurred in October 1999.

Ecology then drafted, and the workgroup reviewed, a TMDL submittal document (Creech and Joy, 2002). The summary implementation strategy (SIS) portion of the submittal document sets forth the goals, objectives and strategies for achieving cleaner water in the Upper Yakima River watershed by meeting the targets noted above. After a public review process, the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* was accepted by the US Environmental Protection Agency (EPA) Region 10 in September 2002.

This "detailed implementation plan" (DIP) document[4] is based on the previously written SIS and provides a framework for achieving the TMDL targets[5] established in the *Upper Yakima River Basin Suspended Sediment and Organochlorine Pesticide Total Maximum Daily Load Evaluation*. The DIP builds on the technical assessment and submittal documents (referenced above) and on the findings contained in these documents.

In order to meet the water quality targets outlined in this TMDL, numerous appropriate BMPs will need to be employed to effectively reduce suspended sediment, turbidity and organochlorine pesticides in the Upper Yakima River basin. These BMPs will include methods to increase streambank stability and improve the quality of agricultural return flows, as well as many other approaches.

The fundamental implementation strategy for achieving reductions of suspended sediment, turbidity and organochlorine pesticides in the Upper Yakima River watershed is that if each of the remedies noted above is pursued, the subsequent changes should result in meeting the goals of the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL*. This DIP document specifies the ways in which implementation activities may reduce these pollutants and generally improve stream "health," and how water quality monitoring will be used to track progress and to indicate when adaptive management procedures may need to be employed.

Full compliance with the water quality targets outlined in the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* is expected to be achieved in 2011.

Approach

Actions taken pursuant to this TMDL fall into three categories: voluntary stewardship actions, actions that are taken in accordance with a law or legal agreement, and monitoring activities. Voluntary stewardship actions will be implemented in concert with landowner needs, abilities and desires; supplemental funding will accelerate implementation by landowners. The water quality of the project area is currently being monitored, and will be repeated at least every five to ten years. (See the section on *"Management Roles, Activities and Schedules"* for more detail.)

[4] The "detailed implementation plan" is required and described in the Memorandum of Agreement Between the United States Environmental Protection Agency and Washington Department of Ecology Regarding the Implementation of Section 303(d) of the Federal Clean Water Act

[5] See Appendix B: "TMDL Targets"

Further, after months of careful deliberation, the technical advisory workgroup and Ecology agree on the following:

- Establishing monitoring baselines for suspended sediment, turbidity and organochlorine pesticide is of paramount importance, in order to evaluate future progress
- Best management practices will be implemented wherever practical to reduce contaminated runoff from irrigated agriculture
- The forest management organizations will comply with the Forests and Fish rules to reduce sediment inputs connected with timber harvest activities

The technical advisory workgroup, in conjunction with Ecology, will continue to be a main driver of all further decisions made regarding this TMDL.

Pollution Sources and Responsibility for Reductions

Pollution Sources

As noted previously, the main sources of sediment and turbidity input are eroding riverbanks and streambanks, contaminated return flows from farm fields and erosion of earthen roads. Main sources of organochlorine pesticides include agricultural return flows and erosion of other areas where these pesticides were historically applied.

Possible sources of elevated suspended sediment and turbidity:

Eroding riverbanks and streambanks: Unstable streambanks initiate and contribute to bank erosion, add sediment to the stream, endanger mature trees, and retard growth of new streamside vegetation. Causes of streambank instability include:

- Damaged riparian areas can start self-perpetuating erosive process for streambank
- Insufficient riparian vegetation exists to hold soils in place
- Excessive use of riparian areas by livestock, recreational users and others can damage bank structure
- High winter flows can remove large sections of stream bank, exposing vertical face of unvegetated bank to erosive forces. While high winter flows are naturally occurring in many areas of the Upper Yakima River basin, these flows may also be exacerbated by human activities in some areas.

Agricultural return flows: Irrigation water flowing across farm fields can transport soil particles into adjacent waterways, which then increases turbidity and suspended sediment levels of the receiving waters.

Eroding roads: Earthen roads can erode during snowmelt and storm events, and the loosened sediment then wash overland into streams and rivers. Undersized or improperly placed culverts can add to road erosion.

Possible sources of organochlorine pesticides (OCPs):

Return flows from irrigated agriculture: OCPs were used as pesticides on some farm fields until they were banned almost 30 years ago. OCPs are very persistent in the environment and have a strong affinity for sediment particles; OCPs are still attached to soil particles on some fields where they were legally used in the past. Tailwater from irrigated farm fields may contain suspended sediment contaminated with OCPs, which will increase the OCP levels of receiving waters. Occasionally (but rarely) old stores of OCPs are used as agricultural pesticides.

Erosion of other sites: OCPs may be attached to soil particles from other sites, and transported off-site as noted above. OCPs were used on orchards and in forests for insect control, so potentially may be found in many places.

Re-suspension from bottom of waterbody: OCP-bearing soil particles at the bottom of waterbodies, originally washed from farm fields and other locations, may be re-suspended during turbulent high flow events and re-enter the water column.

Responsibility for Reductions

Agriculture: The conservation agencies (the Kittitas County Conservation District (KCCD), the North Yakima Conservation District (NYCD) and the Natural Resources Conservation Service (NRCS)) are the entities responsible for technical assistance, educational outreach and (where possible) financial support to promote implementation of agricultural BMPs throughout the watershed. Additionally, the Kittitas County Water Purveyors (KCWP) will provide technical assistance, educational outreach, and financial support as funding allows. Individual irrigators are responsible for the implementation of irrigation BMPs. All landowners with shorelines are responsible for implementing BMPs that prevent bank erosion, where appropriate.

Forestry: Private and state timber owners are responsible for implementing appropriate BMPs (as specified in the Forests and Fish rules) on their lands. The Washington Department of Natural Resources (DNR) is responsible for oversight of the Forests and Fish rules. The Cooperative Monitoring Evaluation and Research (CMER) committee is responsible for evaluation of the Forests and Fish rules to support the adaptive management process. The US Forest Service (USFS) is responsible for implementation of appropriate BMPs (as specified in the Memorandum of Agreement with Ecology) on their lands.

Monitoring: The Kittitas County Water Purveyors (KCWP) are currently (2002-05) conducting water quality monitoring for turbidity and suspended sediment at selected sites in the Upper Yakima River basin per grant agreement, the NYCD is currently conducting water quality monitoring in Upper Yakima County, and the KCCD is currently conducting water quality monitoring in the Teanaway River basin. Monitoring arrangements may be modified in future years. Ecology continues to collect data from the three long-term ambient monitoring stations in

the project area. Ecology will evaluate monitoring data and/or coordinate monitoring in 2006 and 2011 to assess TMDL success.

Data Management: The KCWP has agreed to gather and manage all water quality data that is related to this TMDL; generally, this will include new data collected within the project area, using an approved quality assurance project plan. The data will be compiled into an Excel database, which the public and Ecology can access upon request to the KCWP. The KCWP will also compare the data to TMDL targets, and evaluate if targets are being met by appropriate dates at each compliance point noted in the TMDL. Where possible, the KCWP will analyze data in order to identify trends toward meeting targets. Such data management is dependent on funding levels, with Ecology ultimately responsible for this data management if the KCWP is unable to do it.

Other: Kittitas County, Yakima County and Washington State Department of Transportation (WSDOT) are responsible for maintaining roads and roadside ditches within their various jurisdictions. The US Army's Yakima Training Center (YTC) is responsible for minimizing erosion resulting from military practice maneuvers. Individual homeowners who live adjacent to waterbodies within the project area are responsible for avoiding actions that cause destabilization and erosion of streambanks. All shoreline landowners are responsible for protecting riparian vegetation and streambank stability, wherever possible and appropriate.

Ecology is the entity ultimately responsible for determining compliance with interim and final targets. Ecology will also continue to sponsor workgroup meetings; these meetings will occur at least annually until the final target date of the TMDL, with the purpose of discussing TMDL progress, exchanging BMP information, and the like.

Using the concepts noted above, Tables 1 and 2 below summarize potential sources of suspended sediment, turbidity and OCPs, as well as the groups that may be involved with implementation of appropriate BMPs to reduce the impact of these sources.

Management Roles and Activities

Management Roles

The table below organizes the responsible entities, and general actions for the implementation of the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL*. The information listed in the table is part of the overall strategy and may change as personnel and monetary resources are better defined during the development of the DIP.

Note: Please refer to the list of acronyms and abbreviations in Appendix A for assistance with Table 3, below.

Table 1: Key groups (listed alphabetically) and their contributions

Groups	Management Contributions
All shoreline landowners *(includes all commercial, residential, agricultural, city, state and federal enterprises)*	Protect riparian vegetation. Where possible and appropriate, restore riparian vegetation using native plants.
CMER	Monitoring of Forests and Fish rules in support of adaptive management
DNR	Administration and enforcement of Forests and Fish rules. Determine if private and state timber owners are meeting water quality requirements of Forests and Fish rules.
DNR	Implement sediment-reduction BMPs on lands owned by DNR.
Ecology	Distribute a brochure (in Spanish and English) regarding prevention of erosion from project area streambanks
Ecology	Evaluate if the water quality samples at points of compliance meet the interim and final targets
Ecology, KCWP, KCCD	Determine if alternate outreach efforts are needed.
Ecology, Technical Advisory Workgroup (TAW)	Complete the DIP
Homeowners with waterfront property	Avoid actions that will cause streambank destabilization or erosion, or will otherwise add sediment to area waterways. Implement sediment control BMPs.
Irrigation Entities (Districts and Companies)	Where possible and appropriate, implement BMPs to prevent entry of suspended sediment into area waterways.
Irrigators	Implement appropriate BMPs to prevent entry of sediment-laden agricultural return flows into area waterways
KCCD and KCWP	Administer public education program for Kittitas Valley irrigators, and other landowners and resource users
KCCD, NRCS and Ecology	Continue to fund agricultural BMP implementation: controlling agricultural runoff, reducing suspended sediment in drains and tributaries, preventing streambank destabilization and erosion. The KCWP will also lend assistance as funding allows.
KCCD, NRCS, KCWP, NYCD	Extend outreach efforts and technical assistance to all agricultural producers (irrigators, livestock managers, hobby farmers and others) in the watershed.

Groups	Management Contributions
KCWP, KCCD, NYCD	Determine if changes in monitoring sites, tests or frequency are needed.
KCWP, NYCD, KCCD	Continue to monitor water quality of the watershed's surface waters (as possible given funding availability)
Kittitas County, Yakima County	Administration of Critical Area Ordinances and Shoreline Master Programs
Kittitas County, Yakima County, WSDOT	Continue to maintain roads and roadside ditches to prevent entry of sediment into area waterways
Livestock managers	Implement livestock management BMPs to prevent streambank destabilization and erosion
Private and state timber owners	Implement forest management practices as required by Forests and Fish rules; includes road improvement and maintenance.
Technical Advisory Workgroup (TAW)	Identify future monitoring needs and funding sources, and develop strategy.
TAW	Review if interim target has been met, and if not, devise action plan to meet target.
TAW	Review if final TMDL targets have been met, and if not, identify new timeline and BMPs needed.
US Forest Service (USFS)	Implement forest management practices as required by MOA with Ecology; includes road improvement and maintenance.
YTC	Take actions to minimize erosion into waterbodies following military maneuvers at the US Army's Yakima Training Center

Activities

As stated previously, actions taken pursuant to the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* fall into three categories: voluntary stewardship actions, actions that are taken in accordance with a pre-existing law or legal agreement, and monitoring activities.

1. Voluntary stewardship activities. Some of the sources of elevated suspended sediment, turbidity and organochlorine pesticide levels in the Upper Yakima River basin are the result of natural causes, while others are the result of legacy anthropogenic actions exacerbated by more-recent natural processes. Consequently, the remedies for these sources are undertaken to help improve overall stream health over time. Not all sites need the same treatment and a good start is likely a technical assistance visit from a trained professional. Stewardship actions, which will be taken as funding allows, can include, but are not limited to:

    a. Restoration (planting) of riparian vegetation – either completed individually or as part of a larger, watershed-wide restoration project

b. Installation of streambank stabilization structures – after first seeking professional advice from one of the resource advisory agencies (NRCS, KCCD, WSU Extension or others).
    i. Install large woody debris (LWD)
    ii. Install rock barbs
    iii. Install tree revetments (felled whole trees tied to bank with cable and/or large rocks)
    iv. Regrading and stabilization of severely eroding banks.

c. Reduce sediment inputs
    i. Install measures to reduce/eliminate bank erosion (see above)
    ii. Irrigators use PAM when irrigating
    iii. Soil moisture monitoring for irrigators
    iv. Upland livestock watering measures

d. Education and technical assistance
    i. Road-side signs and information booths
    ii. Newsletter
    iii. Newspaper articles
    iv. Circulate videotapes
    v. "New landowner" information packet (e.g., Small Ranch Manual and Rural Living Handbook)
    vi. Presentations and discussions at agricultural and grange meetings

2. Actions that are taken in accordance with a pre-existing law or legal agreement. These actions can include, but are not limited to:
    a. For forest managers on private lands, compliance with the Forests and Fish rules [6]
        i. Protection of riparian areas, including leaving an appropriate buffer and mature trees
        ii. Improved road maintenance on currently used roads, closure of unused roads
    b. For the USFS, compliance with the Memorandum of Agreement with Ecology [7]
        i. Protection of riparian areas, including leaving a buffer and mature trees
        ii. Improved road maintenance on currently used roads, closure of unused roads
    c. Protection of existing riparian vegetation (especially trees) [8]

[6] Forests and Fish rules, as written in the Forests and Fish Report, dated 4/29/99

[7] Memorandum of Agreement between the USDA Forest Service, Region 6 and the Washington State Department of Ecology for Meeting Responsibilities under Federal and State Water Quality Laws, signed 11/21/00

i. Prevention of removal/damage due to prolonged livestock use

ii. Prevention of removal/damage due to inappropriate recreational use

iii. Prevention of removal/damage due to other uses

d. Prevention of entry of sediment into the river, where sediment-laden waters result from activities not listed above [9]

i. Prevention of eroding earthen roads, or road-related erosion

A. Road repair projects

B. Culvert replacement projects

ii. Prevention of sediment laden return flows from irrigated agriculture

A. Irrigation improvements (sprinklers, piping, irrigation scheduling, filter strips and other techniques)

B. Construction of settling ponds

C. Use of polyacrylamide (PAM)

D. Reduction in return flow volumes

iii. Prevention of sediment-laden runoff from other sources (building construction, road construction, etc.)

3. Monitoring. Considerable additional monitoring has been recommended in both the technical assessment and submittal document for the TMDL (see section on "Monitoring Plan" for more details):

a. Suspended sediment and turbidity

i. Monitor turbidity, total suspended solids, and discharge over two irrigation seasons in each of the sub-basins with TMDL targets

ii. Identify sources of suspended sediment between the Yakima River at Nelson and the USBR Yakima River at Ellensburg gage

iii. Identify sources of suspended sediment and turbidity in the Cherry Creek/Wilson Creek sub-basin, and in the Sorenson Creek sub-basin

iv. Monitor sediment levels, and identify sediment sources, in the Teanaway Basin.

b. Organochlorine pesticides

i. Periodically monitor organochlorine pesticides from sites in Cherry Creek sub-basin

ii. Monitor fish tissue at historical main stem sites, and between Cle Elum and Wymer

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[8] Kittitas County Critical Areas Ordinances, as authorized by RCW 90.58 (Washington Shoreline Management Act) – note that certain agricultural exemptions may apply

[9] RCW 90.48 – pollution of state waterways prevented

iii. Study uptake rates of organochlorine pesticides by Yakima basin fish from food, water, and sediment

iv. Study dieldrin transport from contaminated field soils to nearby drains or creeks

c. Model erosion, sediment and pesticide transport in irrigated and non-irrigated areas of the basin.

d. Effectiveness monitoring – specific water quality monitoring performed to determine if implementation measures of TMDLs have been successful.

Tables 2 and 3, below, summarize the possible pollutant sources, possible causes and suggested actions to be taken to reduce or eliminate the pollution. Note that some actions listed on the tables are voluntary, while others will be taken in accordance with a pre-existing law or legal agreement.

Table 2: Sources of elevated suspended sediment and turbidity in the Upper Yakima River basin, recommended actions and groups responsible for implementation.

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
1. Unstable streambanks	Unstable streambanks contribute to bank erosion, contribute more sediment to the stream, endanger mature trees, and retard growth of new streamside vegetation.	1.1 High winter flows remove large sections of bank, increasing instability of streambanks	Reduce winter high flow levels: • Consider reconnecting stream with historic stream channels • Consider increasing sinuosity of streams and river Outreach, technical assistance and financial assistance. NRCS field office technical guides (FOTGs) provide guidance and examples of appropriate best management practices. Permits for instream work Coordination with Yakima Basin Watershed Plan (or other basin planning) during planning and implementation states	Actual implementation • Private homeowners • Farmers and ranchers • USFS • Private timber companies • DNR • YTC • WDFW • Irrigation districts and companies Technical assistance and (where possible) financial assistance • KCCD • NYCD • KCWP • NRCS • Ecology

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
		1.2 Damaged riparian areas can start self-perpetuating erosive process of streambank	Stabilize streambanks using one or more of these methods (note that landowners should not attempt to install bank stabilization structures without first seeking professional advice from one of the resource advisory agencies (NRCS, KCCD, WSU Extension or others). Additionally, instream work may require permits from the Washington Department of Fish and Wildlife (WDFW), Ecology and/or others): • Install large wood debris along bank • Install tree revetments along bank • Install rock barbs Following streambank stabilization, protect riparian areas to maintain streambank • Outreach, technical assistance and financial assistance. Implementation by irrigators Technical and (where possible) financial assistance: NRCS, KCCD and NYCD NRCS field office technical guides (FOTGs) provide guidance and examples of appropriate best management practices.	Actual implementation • Private homeowners • Farmers and ranchers • USFS • Private timber companies • DNR • YTC • WDFW • Irrigation districts and companies Technical assistance and (where possible) financial assistance • KCCD • NYCD • KCWP • NRCS • Ecology

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
		1.3 Insufficient riparian vegetation to hold soils in place	Plant and maintain riparian vegetation, where possible and appropriate. Protect riparian vegetation from future degradation. Outreach, technical assistance and financial assistance. NRCS field office technical guides (FOTGs) provide guidance and examples of appropriate best management practices.	Actual implementation • Private homeowners • Farmers and ranchers • USFS • Private timber companies • DNR • YTC • WDFW • Irrigation districts and companies Technical assistance and (where possible) financial assistance • KCCD • NYCD • KCWP • NRCS • Ecology

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
		1.4 Excessive use of riparian areas by livestock damages bank structure	Improved management of livestock in riparian areas: • Managed in-closures and ex-closures of riparian areas • Rotational grazing adjacent to and including riparian areas • Behavioral training of livestock in and around riparian areas • Installation of "rocked" watering locations where necessary • Properly managed livestock (includes cattle, horses, etc.) can be an effective tool in riparian restoration Other applicable BMPs Outreach, technical assistance and financial assistance	Actual implementation: • Livestock managers • Owners of land leased for livestock use Technical assistance and (where possible) financial assistance • KCCD • NYCD • KCWP • NRCS • Ecology
		1.5 In some agricultural areas, stream blockage may cause re-channeling of stream and severe erosion of adjacent fields during periods of high flows.	Consider maintenance of waterway, where necessary and appropriate	All owners of public and private shorelands that allow recreation use

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
		1.6 Excessive or inappropriate use of riparian areas by recreational users damages bank structure	Install signs re: protection of riparian areas Consider moving recreational areas away from riparian areas Consider armoring recreational access points that can't be moved from riparian areas	All owners of public and private shorelands that allow recreation use

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
2. Agricultural return flows	Tailwater from irrigated farm fields may contain suspended sediment, which then increases both sediment and turbidity in waterbody that it enters.	2.1 Irrigation water flowing across farm fields picks up soil particles, and carries them into adjacent waterways, increasing turbidity and suspended sediment levels of receiving waters. Fields irrigated within a year of tilling are most vulnerable to movement of soil particles in this manner.	Remove soil particles from irrigation return flows prior to entry into waterbodies: • Install sedimentation/settling pond at the bottom of the field (can also install pump back system to conserve water) • Vegetative filter strip Prevent initial movement of soil particles off recently tilled fields by irrigation water: • Upgrade irrigation methods (sprinklers, piping, irrigation scheduling), reducing flow across field • Apply PAM to irrigation water to help take soil particles out of suspension • Straw mulch • Conservation tillage ("no-till") farming methods • Reduce volume of water used for irrigation by monitoring soil moisture. • Reduced irrigation water velocity • Pulse irrigation • "Grassy swale" between field and drain Outreach, technical assistance and financial assistance and for irrigators. NRCS field office technical guides (FOTGs) provide guidance and examples of appropriate best management practices.	Actual implementation: • Irrigators Technical assistance and (where possible) financial assistance: • KCCD • NYCD • KCWP • NRCS • Ecology

Source	Explanation	Possible Causes	Implementation Actions	Responsibility for Implementation of Remedies
3. Eroding roads and culverts	Earthen roads erode during snowmelt and storm events, and sediment washes overland into streams and rivers. Soil around poorly maintained, undersized or improperly placed culverts can erode into waterbody.	3.1 Sediment deposition enters streams and river	Reduce sediment deposition by improving maintenance of earthen roads, and maintaining or replacing culverts where necessary Outreach, technical assistance and financial assistance	Actual implementation: • Private timber managers • USFS • DNR • WSDOT • WDFW • Kittitas County Public Works Technical assistance and (where possible) financial assistance: • DNR • NRCS • Ecology

Table 3: Sources of organochlorine pesticides (OCPs) in the Upper Yakima River basin, recommended actions and groups responsible for implementation.

Source	Explanation	Possible Causes	Possible Remedies	Responsibility for Implementation of Remedies
1. Return flows from irrigated agriculture	Tailwater from irrigated farm fields may contain suspended sediment; OCPs have a strong affinity for sediment particles and will generally stay attached to soil particles if present	1.1 OCPs were used as pesticides on farm fields until banned almost 30 years ago. OCPs are very persistent in the environment, and may still be attached to soil particles on fields where they were legally used. Irrigation water flowing across farm fields picks up soil particles contaminated with OCPs, and carries them into adjacent waterways, increasing OCP levels of receiving waters. Fields irrigated within a year of tilling are most vulnerable.	Remove soil particles from irrigation return flows prior to entry into waterbodies • Install sedimentation/settling pond at the bottom of the field (can also install pump back system to conserve water) • Vegetative filter strip Prevent initial movement of soil particles off recently tilled field by irrigation water • Upgrade irrigation methods (sprinklers, piping, irrigation scheduling), reducing flow across field • Apply PAM to irrigation water to help take soil particles out of suspension • Straw mulch • Conservation tillage ("no-till") farming methods • Reduce volume of water used for irrigation by monitoring soil moisture. • Reduced irrigation water velocity • Pulse irrigation • "Grassy swale" between field and drain Outreach, technical assistance and financial assistance and for irrigators. NRCS field office technical guides (FOTGs) provide guidance and examples of appropriate best management practices.	Actual implementation: • Irrigators Technical assistance and (where possible) financial assistance: • KCCD • NYCD • KCWP • NRCS • Ecology

Source	Explanation	Possible Causes	Possible Remedies	Responsibility for Implementation of Remedies
		1.2 Occasionally old stores of OCPs may be used as pesticides in present day	Ensure that no additional OCPs are applied by offering free chemical collection days	• Department of Agriculture • Kittitas County Solid Waste Department • Ecology
2. Erosion of other sites	OCPs may be attached to soil particles from other sites	2.1 OCPs were used on orchards and in forest for insect control, so potentially may be found in many places	Identify other sites that may be sources, then use same steps as for agriculture-related OCPs	• Ecology • KCCD • NRCS
3. Re-suspension from bottom of waterbody	OCP-bearing soil particles at the bottom of waterbodies may be re-suspended when disturbed or during turbulent high flow events	3.1 OCPs attached to soil particles were washed off fields and into waterbodies, where they settled to the bottom of the waterbody. Now, during high flow events or after other disturbances, contaminated particles may re-enter the water column	Educate the public regarding the importance of avoiding disturbance of bottom sediments in contaminated waterways.	• Ecology • KCCD • Kittitas County Health Department • DNR

Measuring Progress Toward Goals

As noted earlier, the goals of the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* are to reduce levels of suspended sediment, turbidity and organochlorine pesticides in order to meet TMDL targets. These pollution reductions will likely require increased bank stabilization, increased maintenance of earthen roads, and a significant decrease in contaminant levels in agricultural return flows. Progress toward many of the TMDL goals can be measured using the "milestones" table (Table 4), below. The ultimate goal of the TMDL is to meet targets by 2011.

Different implementation schedules will be used for different types of activities. Actions that are taken in accordance with a pre-existing law or legal agreement will be completed in line with the schedules for each legal instrument. Voluntary stewardship actions will be implemented in concert with landowner needs, abilities and desires; supplemental funding will accelerate implementation by landowners. A schedule of these actions is detailed in Appendix C, and suggested intermediate milestones for the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* are listed in Table 4.

Monitoring for suspended sediment and turbidity is currently underway, and will be repeated at least every five to ten years thereafter to assess progress.

As stated earlier, Ecology is the entity ultimately responsible for determining compliance with interim and final targets. Ecology will continue to sponsor workgroup meetings. These meetings will occur at least annually until the final target date of the TMDL, with the purpose of discussing TMDL progress, exchanging and reviewing data and BMP information, trends and the like. If the workgroup believes that progress toward goals is inadequate, then adaptive management may be considered and initiated.

Table 4: Intermediate TMDL milestones

		Description	Measurement Method	Goal	When Attained	Who
1	**Education**					
	a	Ongoing educational activities	Number of education activities and area covered	Three educational activities each year	Annually	KCCD, KCWP
	b	Create, publish and distribute educational publications regarding river protection and restoration	Number of educational publications released	Two publications each year, sent to all residents of Upper Yakima River basin	Annually	KCCD, KCWP
2	**Irrigation upgrade projects completed**					
	a	Sprinkler conversions	Percentage of farmland (other than permanent pasture) converted to sprinkler irrigation	Wherever economically feasible	2011	• Implementation by irrigators • Technical and (where possible) financial assistance: NRCS, KCCD and NYCD
	b	Other improvements	Percentage of farmland (other than permanent pasture) using other irrigation improvements	Wherever economically feasible	2011	• Implementation by irrigators • Technical and (where possible) financial assistance: NRCS, KCCD and NYCD
3		**Reduction of contaminant levels in agricultural return flows**	Percentage of rill-irrigators growing row crops or first-year hay using PAM or other sediment reduction BMPs	All rill-irrigators growing row crops or first-year hay now using PAM or other sediment reduction BMPs	2011	• Implementation by irrigators • Technical and (where possible) financial assistance: NRCS, KCCD and NYCD
4	**Road improvements**					
	a	Large tracts of land in watershed (federal, state and private)	Percentage of roads improved and maintained to minimize erosion	All roads improved to minimize erosion, and maintained appropriately	Ongoing	• US Timberlands • Boise Cascade • Plum Creek • DNR • WDFW • USFS
	b	Small tracts of land in watershed	Percentage of roads improved and maintained to minimize erosion	Where possible and appropriate, all roads improved and maintained to minimize erosion	Ongoing	• Owners of small tracts of land in watershed • Technical and (where possible) financial assistance: NRCS, DNR, KCCD, NYCD

	Description		Measurement Method	Goal	When Attained	Who
5	**Riparian revegetation**					
	a	Plant new vegetation along streambanks, where possible and appropriate	Total number of plants (seedlings, bushes, etc.) planted, miles covered	Plant as much new vegetation as reasonably possible	Ongoing	• All shoreline landowners • Technical and (where possible) financial assistance: NRCS, KCCD and NYCD
	b	Protect, water and otherwise nurture new plants during first year	Percentage of plants that survived the first year	80% survival rate for first year	Ongoing	All shoreline landowners
	c	Revisit plants after five years to assess survival rate	Percentage of plants that survived five years	50% survival rate after five years	Ongoing	All shoreline landowners. (KCCD, NRCS, NYCD may assist, if funded)
6	**Riparian management and waterway maintenance**		Number of farms with riparian management and waterway maintenance plans in place (where appropriate)	Majority of farms and ranches have plans in place	Ongoing	• Agricultural managers with field adjacent to area waterways • Technical and (where possible) financial assistance: NRCS, KCCD and NYCD

Schedules for achievement of these milestones, by appropriate responsible groups, have been developed and placed at Appendix C. Over time, progressive milestones will be measured and tracked using these schedules. Tracking of progress toward goals will be coordinated by Ecology, with assistance from other responsible groups identified earlier.

Monitoring Plan

Monitoring is included as part of the implementation strategy. It serves to track and evaluate the effectiveness of implementation measures. Several monitoring procedures, to be implemented concurrently, are described below. A detailed monitoring plan appears in Appendix D.

KCCD and KCWP monitoring and studies in the Wilson Creek/Cherry Creek sub-basin have been helpful for identifying water quality problem areas. These two groups should continue to work together and may want to become the core of a monitoring clearinghouse in the basin. The clearinghouse would encourage close coordination with the US Bureau of Reclamation (USBR), Ecology, the US Geological Survey (USGS), and other monitoring performed by government or private groups. The clearinghouse should especially try to include groups working in the Upper Yakima River basin and other headwater areas. Staff and projects from Central Washington University should also be encouraged to participate. Ties to lower Yakima or basin-wide monitoring efforts may be more efficient through such a clearinghouse.

<u>Monitoring needs identified during the course of the TMDL evaluation</u>:

1. During the target years (2006 and 2011), re-assessment of water quality in the main stem Yakima River and at the mouths of each of the sub-basins with TMDL targets.

2. Siting background stations in each of the sub-basins with TMDL targets, and monitoring turbidity, total suspended solids, and discharge over two irrigation seasons; or selecting representative basins for monitoring based on land use, geology, or other analytical factors.
3. Intensive site placement and monitoring between the Yakima River at Nelson and the USBR Yakima River at Ellensburg gage to identify sources of suspended sediment.
4. Tracking and documenting obvious sources of excessive suspended sediment and turbidity in the Cherry Creek/Wilson Creek sub-basin, and in the Sorenson Creek sub-basin.
5. Periodic monitoring of organochlorine pesticides from sites in Cherry Creek sub-basin, and monitoring fish tissue at historical main stem sites, and between Cle Elum and Wymer.
6. Designing a monitoring project to better understand uptake rates of organochlorine pesticides by fish in the Yakima basin from various environmental compartments, e.g. food, water, and sediment.
7. Designing a monitoring project to track dieldrin transport from contaminated field soils to nearby drains or creeks to better understand the chemodynamics involved.
8. Collecting necessary data to construct a spatial model that simulates erosion, sediment and pesticide transport in irrigated and non-irrigated areas of the basin. May include non-irrigation season monitoring where appropriate to determine sources of sediment into the irrigation system outside the irrigation season.
9. Monitoring sediment levels, and identifying sediment sources, in the Teanaway Basin.

Effectiveness Monitoring: Ecology has established an Effectiveness Monitoring group that will assist in determining the effectiveness of BMPs applied as a result of a TMDL. This group will periodically select waters where TMDLs have been in place, and evaluate the status of the waters toward achieving the load allocations and water quality standards. This information will be processed through the regional office to the applicable groups engaged in implementation activities.

The purpose of effectiveness monitoring is to provide assurance that control measures put in place during TMDL implementation achieve the expected load reductions. Ecology is responsible for determining, through effectiveness monitoring, the status of waterbodies subsequent to the development and implementation of each TMDL. The timing of this monitoring will be dependent upon the type of pollution parameter addressed, the period after which positive results should be identifiable, and the availability of resources. Effectiveness monitoring priorities will be selected by each regional office and verified through the annual scoping process.

In order to be thorough in accomplishing this task, monitoring personnel will follow a review sequence. The sequence will include consultations with the original TMDL modeler to determine critical parts of the implementation plan and to verify critical locations. They will also contact the regional office TMDL coordinator to learn the results of implementation monitoring

and the status of the TMDL implementation plan. Both monitoring and regional staff will make an effort to identify a local partnership to assist with the actual data collection. On completion of these steps, an examination of the resulting data will be made and a water quality status determination will be announced for the waterbody in an advisory memorandum followed by a technical report.

Reasonable Assurance

Overview

When establishing a TMDL, reductions of a particular pollutant are allocated among the pollutant sources (both point and nonpoint sources) in the waterbody. TMDLs (and related DIPs) must show "reasonable assurance" that the nonpoint sources will meet their allocated amount of reductions. Among the appropriate types of reasonable assurance for this sediment/turbidity/pesticide TMDL are implementation of BMPs, developing and implementing nonpoint source control plans, and greater public awareness of related legal encouragements to remediate water quality problems.

In the Upper Yakima River basin, the local workgroup has recommended establishing an inventory of current conditions and considers this a high priority. Funding sources and technical support exist and additional resources will be sought to support these activities. Government requests for funding from other sources concerning programs and actions to reduce suspended sediment, turbidity and organochlorine pesticides will be shared with local irrigators and other property owners in an effort to gain the maximum possible consensus to the best and most economical solutions. In addition, existing rules, ordinances, and agreements address the protection of riparian buffer zones and sediment effects over the area covered by this TMDL. Adaptive management and enforcement of existing legal instruments may be used if compliance with laws and legal agreements does not occur. The proposed monitoring will track progress and identify whether additional measures are needed.

Current Implementation Efforts

Many local residents, the KCWP, the KCCD, the NRCS, several timber companies and others are already implementing sediment reduction, bank stabilization and riparian restoration activities. Recent activities by local landowners on private riparian lands have included irrigation upgrades, implementation of sediment reduction and riparian protection BMPs, planting trees along stream banks, and installing bank stabilization measures. DNR and private forest landowners are actively involved in implementing the Forests and Fish Rules, and the USFS is implementing road and trail improvements along with Water Quality Restoration Planning to address sediment issues on their lands.

Other specific examples of recent restoration activities include the following:

- Many Upper Yakima River basin irrigators have performed irrigation upgrades, thereby reducing pollutant loading in return flows or eliminating surface water irrigation return flows altogether.
- Some open irrigation ditches have been replaced with pipe, to conserve water and increase instream flows.
- The NRCS is currently implementing the 2002 Farm Bill, which includes a number of cost share programs. The largest is the Environmental Quality Incentives Program (EQIP), which can provide cost share funding for irrigation upgrades, piping and numerous other sediment reduction BMPs.
- Many irrigators are using PAM to reduce pollutants in irrigation return flows; Kittitas County Public Works and the Washington State Conservation Commission have provided cost-share funding for PAM.
- The Irrigation Efficiencies Program, administered by the KCCD, will help fund upgrades of irrigation equipment in exchange for placing saved water rights in a water trust.
- The Yakima Tributaries Access and Habitat Project (YTAHP), is administered by the South Central Washington Resource Conservation and Development (RC&D) Office. Other project participants include the KCWP, KCCD, NYCD, WDFW, and the Ahtanum Irrigation District. Projects resulting from YTAHP include converting from flood to sprinkler irrigation, riparian revegetation, removal of a perched culvert, and abandonment of irrigation diversion structures (due to consolidation).
- The KCWP, a consortium of Kittitas County irrigation districts, irrigation companies, and creek diverters, has identified as one of its primary goals: "participation in local and regional efforts that support Clean Water Act compliance for water purveyors and irrigated agriculture." In order to ensure compliance with turbidity targets for this TMDL, the KCWP has proposed a creative and assertive approach to water quality monitoring, outreach, BMP implementation, and resolution of water quality violations. The KCWP will measure turbidity levels in tailwater leaving fields, and compare to KCWP-determined levels that will ensure compliance with targets. Under the KCWP's three-step program, the first violation (i.e., not meeting KCWP-determined turbidity levels for tailwater) will prompt landowner education. After the third violation, the KCWP will file a formal complaint to Ecology. The program will begin during the 2003 irrigation season.
- The USFS-Cle Elum Ranger District (RD) has received additional funding from Kittitas County for watershed restoration work. The USFS-Cle Elum RD has also developed a "Respect the River" program, to educate recreational users about riparian protection, manage and restore riparian vegetation, reduce streambank soil erosion, and improve floodplain water storage.
- All the large acreage timber owners (DNR, Plum Creek Timber, US Timberlands, and Boise Cascade) are actively complying with the Forests and Fish rules, and have established BMPs for grazing programs.

- Watershed analyses have been completed by Plum Creek Timber and Boise Cascade.
- Habitat Conservation Plans (HCPs) have been completed by Plum Creek Timber and Washington State Dept of Natural Resources, for timber harvest operations on their lands.
- US Timberlands and Plum Creek Timber have initiated restrictions on recreational use and off-road vehicle use to reduce bank erosion.
- Plum Creek Timber and Boise Cascade have acquired "Sustainable Forestry Initiative" Certification, which has a water quality component to reduce water pollution during harvest operations.
- The US Army's Yakima Training Center (YTC) has established a standard practice of revegetating land after maneuvers, and has constructed numerous instream structures to trap silt. The YTC has also developed programs for annual riparian restoration, annual instream erosion control, and sagebrush restoration. Additionally, the YTC regularly performs extensive erosion modeling.
- In spring 2001, Washington Conservation Corps crews planted thousands of trees in Teanaway Basin.

Adaptive Management

If planned implementation activities are not producing expected or required results, Ecology or other entities may choose to do additional studies to identify the significant sources of suspended sediment, turbidity and organochlorine pesticides to the river system. If the causes can be determined, and the remedies are required by law or legal agreement, then additional implementation measures may be needed. If the causes cannot be determined, or if the causes are found to be naturally occurring, then the TMDL targets may need to be revised. For non-federal forested areas, the agreements in the Forests and Fish Report incorporate adaptive management as needed to meet the allocations in this report. The USFS also has a policy of adaptive management. Re-evaluation of this TMDL is anticipated to occur at the interim and final target dates (2006 and 2011). If progress toward reduced suspended sediment, turbidity and organochlorine pesticide levels is slower than anticipated, then the TMDL may be modified as a result.

Supporting Regulations, Legal Agreements and Enforcement

Several laws, regulations, legal agreements and land management plans support the efforts of this DIP by guiding riparian area activities on lands under a variety of property ownership. These include the Memorandum of Agreement with the USFS/Region 6 (covers activities on USFS lands); the Forests and Fish Rules (covers activities on private and state-owned forested lands); the Kittitas County Critical Areas Ordinance, Title 17A (certain sections cover riparian habitat areas on non-federal lands in Kittitas County); the Shoreline Management Act (covers shorelands within 200 feet of rivers, on non-federal lands); the Washington Water Code (covers water use throughout the basin); and Washington State water quality laws and regulations (covers water quality in all waterbodies in the basin). Washington's Water Pollution Control Act (Chapter 90.48 RCW) provides broad authority to issue permits and regulations, and prohibits all discharges of pollutants to water. The act declares that it is the policy of the state to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of

all known, available, and reasonable means to prevent and control water pollution. The act defines waters of the state and pollution and authorizes the Department of Ecology to control and prevent pollution, to make and enforce rules, including water quality standards.

Compliance with existing laws and legal agreements will preclude enforcement or other legal action by appropriate organizations. Where compliance is not forthcoming, education, outreach, technical and financial assistance will be used to their maximum extent prior to initiating any enforcement actions. See the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* submittal report (Creech and Joy, 2000) for more detail on legal issues related to this DIP.

Public Involvement

The development of this DIP has involved the public every step of the way. The TMDL workgroup made many contributions to this DIP document, and also reviewed and edited two draft versions of the document. The timelines for implementation activities have been created in consultation with all of the landowners, agencies and organizations involved. Earlier versions of this document have been presented to all agencies with responsibilities outlined for comment prior to publication. TMDL workgroup meetings regarding this DIP were held in February and April of 2003, and a public comment period was held in July 2003 (see Appendix E).

During the entire TMDL implementation period, monitoring data and status reports will be available for public review, and periodic updates will be provided to area media and other interested parties.

Funding Opportunities

Numerous funding sources are available to continue the work of restoration and water temperature reduction in the Teanaway River basin, including:

- The NRCS often provides cost-share funding to agricultural producers for farm plan implementation and conservation improvements via EQIP. Additionally, the EQIP program can now fund forest road improvements, giving priority to fish passage improvements. The NRCS can also provide cost-share funding to growers through the Conservation Reserve Enhancement Program (CREP), the Continuous Conservation Reserve Program (CCRP) and the Wildlife Habitat Incentives Program (WHIP).
- The KCCD provides cost-share funding for agricultural improvements. All KCCD cost share programs are associated with other funding sources, such as Kittitas County (PAM cost share program), Irrigation Efficiencies Program, the Bonneville Power Administration, the Salmon Recovery Funding Board, Ecology's water metering program, and water quality improvement grants from Ecology.
- Ecology funds water quality facilities and activities through its water quality grants program.

- The Bonneville Power Administration has provided considerable funding to improve riparian areas in the Upper Yakima Basin and to study and improve Teanaway water quality, and may do so in the future.
- The Yakima River Basin Water Enhancement Program (YRBWEP) has also provided considerable funding for irrigation efficiency upgrades and acquisition of critical habitat and will likely do so in the future.
- Other programs that will likely provide future funding include Washington State's Water Irrigation Efficiencies Program, Washington Water Acquisition Program (for leasing of water rights), the DNR small landowners program, the Mid Columbia Regional Fisheries Enhancement Group, and so on.
- The State Salmon Recovery Funding Board may also provide funding for projects that ultimately enhance fish habitat in the Upper Yakima watershed.

As noted earlier, private individuals and organizations have also contributed significantly to restoration of the Upper Yakima through considerable private financial expenditures as well as donation of many hundreds of hours of volunteer time. Ecology greatly appreciates this support and hopes that it will continue in the future, as is possible based on means and capability. Multi-source funding is preferred where possible.

References

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Joy, J., and B. Patterson, 1997. A suspended sediment and DDT Total Maximum Daily Load evaluation report for the Yakima River. Publication No. 97-321. Washington Department of Ecology, Olympia, WA 87 pages.

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APPENDIX A

Definitions and Acronyms

Appendix A: Definitions and Acronyms

Definitions

Adaptive management: A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs.

Background levels: The level of a pollutant the represents the chemical, physical, and biological conditions that result from natural processes like weathering.

Best management practices (BMPs): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Load allocation (LA): The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources.

Loading capacity: The amount of a given pollutant, which can be discharged to the waterbody and still meet water quality standards and, subsequently, allocates that load among the various sources. The sum of the load allocations, wasteload allocations and the margin of safety must be equal to or less than the loading capacity.

Margin of safety: A required element of a TMDL that is meant to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality.

Narrative criteria (numeric standards): General statements that establish water quality goals or outcomes and consequences that should result from maintaining a specified condition.

Nonpoint source: Nonpoint source pollution is the single largest source of water pollution nationwide, and refers to pollution that enters any waters of the state from any *dispersed landbased or water-based activities*. Nonpoint source pollution can include, but is not limited to: atmospheric deposition; surface water runoff from agricultural lands, urban areas, or forest lands; or subsurface or underground sources.

Numeric criteria: Specific, quantitative limits that are applied to specific conditions and sets of circumstances.

Organochlorine pesticides: Pesticides (generally insecticides) that are hydrocarbon compounds containing chlorine. They are not easily broken down and can persist in the environment for many years. Includes DDT, dieldrin, chlordane, and aldrin.

Pesticide: Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.

Point source: Any discernible, *confined, and discrete conveyance* from which pollutants are or may be discharged (e.g., an industrial facility's discharge pipe.) See Section 502 of the Clean Water Act.

Riparian zone (or "riparian area"): 1. the land area and associated vegetation bordering the bank of a river or other body of water; 2. a transition zone between dry land and water communities; 3. the zone of direct interaction between terrestrial and stream systems.

Salmonid: Belonging or pertaining to the family Salmonidae, including the salmons, trouts, chars (e.g., bull trout and Dolly Varden), and whitefishes

Seasonal variation: The change in pollution levels from one season to the next.

Sinuosity: The amount of bending, winding, and curving in a stream or river.

Suspended sediment: Sediment held in a surrounding fluid; in this case, sediment held in water.

Turbidity: Reduced clarity of water due to presence of suspended matter.

Wasteload allocation (WLA): The amount of the total loading capacity allocated to an individual point source of pollution. Also used to describe the total amount of the loading capacity allocated to all point sources in a TMDL (e.g. the sum of individual wasteload allocations).

Water column: Vertical section of a waterbody.

Acronyms and Abbreviations

BMPs – best management practices

CMER – Cooperative Monitoring Evaluation and Research

CCRP – Continuous Conservation Reserve Program

CREP – Conservation Reserve Enhancement Program

CWA – Clean Water Act

DIP – detailed implementation plan

DNR – Washington Department of Natural Resources

Ecology – Washington Department of Ecology

EPA – US Environmental Protection Agency

EQIP – Environmental Quality Incentives Program

FOTG – Field Office Technical Guide (from NRCS, outlines approved best management practices)

KCCD – Kittitas County Conservation District

KCWP – Kittitas County Water Purveyors

LA – load allocation

MOA – Memorandum of Agreement

NRCS – Natural Resources Conservation Service

NTU – nephelometric turbidity units

NYCD – North Yakima Conservation District

OCPs – organochlorine pesticides

PAM – polyacrylamide

RCW – Revised Code of Washington

SIS – summary implementation strategy

TAW – technical advisory workgroup

TMDL – total maximum daily load

TSS – total suspended solids

USGS – US Geological Survey

USBR – US Bureau of Reclamation

USFS – US Forest Service

WAC – Washington Administrative Code

WDFW – Washington Department of Fish and Wildlife

WHIP – Wildlife Habitat Incentives Program

WLA – wasteload allocation

WSDOT – Washington Department of Transportation

YTC – Yakima Training Center

APPENDIX B

TMDL Targets

Appendix B: TMDL Targets

Interim Targets: October 2006

- Cherry Creek and Wipple Wasteway water column concentrations of individual DDT compounds, total DDT, and dieldrin will not exceed aquatic toxicity criteria (0.001 ug/L DDT compounds, or total DDT, and 0.0019 ug/L dieldrin).
- Concentrations of total DDT or individual DDT compounds will not exceed 32 ug/Kg wet weight in fish fillet samples collected from the Upper Yakima River.
- Dieldrin concentrations in fish fillet samples will be monitored for progress toward meeting a compliance target of 0.65 ug/Kg wet weight. If progress has not been made relative to samples collected in 1999, studies will be undertaken to determine additional sources, transport, mechanisms, and uptake of dieldrin in the basin.
- The 90th percentile of the turbidity values collected at the mouths of the Teanaway River, Manastash Creek, Sorenson Creek at Fogerty Ditch, and Wilson Creek below Cherry Creek will not exceed 10 NTU over the 90th percentile background value established for the site.
- The 90th percentile of the turbidity values collected at the Yakima River at Umtanum Creek (RM 139.8) and the Yakima River at Harrison Bridge (RM 121.7) will not exceed 10 NTU over the 90th percentile turbidity value of samples collected from the Yakima River at Nelson (RM 191).

Final Targets: October 2011

- Cherry Creek and Wipple Wasteway water column concentrations of individual DDT compounds, total DDT, and dieldrin will not exceed human health criteria (0.00059 ug/L DDT or DDE compounds, or total DDT, 0.00083 ug/L DDD, and 0.00014 ug/L dieldrin). If progress has not been made relative to samples collected in 1999 and 2006, additional studies will be undertaken to determine the best ways to prevent transport of dieldrin from the basin soils.
- Dieldrin concentrations in fish fillet samples will make substantial progress toward meeting a compliance target of 0.65 ug/Kg wet weight in the Upper Yakima basin.
- The 90th percentile of the turbidity values collected at the mouths of the Teanaway River, Manastash Creek, Sorenson Creek at Fogerty Ditch, Wilson Creek below Cherry Creek, Taneum Creek, and Wenas Creek will not exceed 5 NTU over the 90th percentile background value. The geometric mean turbidity at the mouth of Packwood Ditch will not exceed 5 NTU over the geometric mean turbidity of the background site.
- The 90th percentile of the turbidity values collected at the Yakima River at Umtanum Creek (RM 139.8) and the Yakima River at Harrison Bridge (RM 121.7) will not exceed 5 NTU over the 90th percentile turbidity value of samples collected from the Yakima River at Nelson (RM 191).

APPENDIX C

Schedules and Tracking

Appendix C: Schedules and Tracking

In an attempt to predict and project future successes in the Upper Yakima River basin, the following tables contain elements that take a conservative estimate of implementation that is reasonably expected to occur during the life of the TMDL (2001-2011), based on planning and funding sources that have been identified and secured at the time this document was completed. Much of the "goal" column has been left unfilled in several tables as future funding sources are unknown; these columns should be filled in over time, as plans develop and funds are located. Additionally, note that all projections for voluntary stewardship actions are dependent on availability of appropriate funding to complete implementation at the level estimated; should, in a given year, all funding for any type of voluntary implementation become unavailable after reasonable efforts have been made to secure such funding, then that type of voluntary implementation may be considered unavailable for that year. Further, this plan can be changed at any time with mutual consent from the *Upper Yakima Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL* technical advisory workgroup and Ecology.

1) Public education program. The KCWP and KCCD will jointly administer a public education program for Kittitas Valley irrigators and other landowners and resource users. The KCWP/KCCD will prepare and mail at least 2 educational items each year re: irrigation upgrades, water conservation, riparian protection and restoration, etc.

Table C-1: Public education program.

Year	Educational Items mailed to Kittitas Valley Residents		Percent Achievement
	Goal	Result	
2002	2 items		
2003	2 items		
2004	2 items		
2005	2 items		
2006	2 items		
2007	2 items		
2008	2 items		
2009	2 items		
2010	2 items		
2011	2 items		

2) Implementation of sediment-reduction best management practices (BMPs) by landowners. Landowners will implement appropriate BMPs to control suspended sediment and turbidity in runoff and other return flows back to waterbodies in the project area. By the final target date of the TMDL (October 2011), most landowners in the project area will be employing BMPs to control sediment levels in return flows from fields, roads, construction sites, etc. (note: many landowners are already using a variety of BMPs, so the "percent achievement" number in the table below should start fairly high).

Table C-2: Implementation of sediment reduction BMPs for landowners.

Year	Percentage of Kittitas Valley landowners using BMPs to control sediment in runoff		Percent Achievement
	Goal	Result	
2003			
2004			
2005			
2006			
2007			
2008			
2009			
2010			
2011			

3) Road improvements by large-acreage state and private timber owners. Each year during the first five years after the adoption of the rule package recommended in the Forests and Fish Report, large-acreage state and private timber owners will submit road maintenance and abandonment (RMA) plans covering approximately 20 percent (or more) of their property base to DNR for approval. The timber managers are currently implementing the plan as well, and will continue to do so.

Table C-3: Road improvements by large-acreage state and private timber owners.

Year	Road Improvements and Maintenance		Percent Achievement
	Goal	Result	
2000	Forest landowners submit RMA plans for ≥ 20% of property base to DNR		
2001	Same as 2000		
2002	Same as 2000		
2003	Same as 2000		
2004	Same as 2000		
2005	Implement plan		
2006	Implement plan		
2007	Implement plan		
2008	Implement plan		
2009	Implement plan		
2010	Implement plan		
2011	Implement plan		

4) Road improvements by USFS. Under the Memorandum of Agreement (MOA) between the USFS/Region 6, Ecology and EPA, the USFS will improve, maintain and/or close forest roads at the rate specified in the MOA.

Table C-4: Road improvements by USFS

Year	Road Improvements and Maintenance		Percent Achievement
	Goal	Result	
2002			
2003			
2004			
2005			
2006			
2007			
2008			
2009			
2010			
2011			

5) Funding of irrigation upgrades and private road improvements. EQIP funding levels are expected to increase significantly over the next 6 years.

Table C-5: Natural Resources Conservation Service (NRCS) funding levels

Year	Irrigation Upgrades, Road Improvements and Maintenance		Percent Achievement
	Goal	Result	
2003	$500,000		
2004	$500,000		
2005	$500,000		
2006	$500,000		
2007	$500,000		
2008	$500,000		
2009	$500,000		
2010	$500,000		
2011	$500,000		

6) Revegetation of streambanks. Planting of trees and shrubs, to increase shade and stabilize banks, will be administered by the KCCD, NRCS, local landowners and others. Funding will come from the Bonneville Power Administration, Ecology and others.

Table C-6: Revegetation of riverbanks.

Year	Revegetation of Streambanks		Percent Achievement
	Goal	Result	
2003	¼ mile of streambank		
2004	¼ mile of streambank		
2005	¼ mile of streambank		
2006			
2007			
2008			
2009			
2010			
2011			

7) Bank stabilization. Stabilization actions, such as installation of revetments and barbs, will be completed by NRCS, KCCD and others. Funding will be provided by Bonneville Power Administration, Ecology and others. Individual landowners should not attempt to install bank stabilization structures without first seeking professional advice from one of the resource advisory agencies (NRCS, KCCD, WSU Extension or others); additionally, instream work may require permits from the Washington Department of Fish and Wildlife (WDFW), Ecology and/or others).

Table C-7: Riverbank stabilization.

Year	Riverbank Stabilization Completed		Percent Achievement
	Goal	Result	
2003			
2004	20 sites		
2005	20 sites		
2006			
2007			
2008			
2009			
2010			
2011			

APPENDIX D

Detailed Monitoring Plan

Appendix D: Detailed Monitoring Plan

There are three levels of monitoring included in this plan: 1) ambient water quality, 2) implementation and 3) source identification. Each is used to evaluate the adequacy of implementation of restoration measures [e.g., "best management practices" (BMPs)]. Every five years Ecology will prepare and publish a status of monitoring efforts and data.

Ambient Water Quality

The KCWP are currently monitoring several sites for turbidity and suspended sediment throughout the Upper Yakima River basin. The KCCD began collecting suspended sediment and turbidity data in the Teanaway Basin in October 2002, and plans to continue until September of 2004. Ecology continues to collect data from the three long term ambient monitoring stations in the project area. In all cases, data will be compared to water quality standards after data is evaluated for correctness. Additionally, it will be important to use a ratio turbidimeter to evaluate turbidity levels for this TMDL, in order to ensure consistency between monitoring results.

Monitoring stations, which have been established for both suspended sediment and turbidity monitoring, are described below in Tables D-1 and D-2.

Table D-1: KCWP monitoring stations for suspended sediment and turbidity in the Upper Yakima River basin.

Station Description	Longitude (West)	Latitude (North)
Naneum Creek at Charlton Road	120.47517	47.10312
Naneum Creek near CID	120.47192	47.00632
Naneum Creek at Fiorito Pond	120.50512	46.93813
Cherry Creek above Wipple	120.49111	46.93225
Wilson Creek at Canyon Road	120.50706	46.91744
Wipple Wasteway above Cherry Ck	120.48546	46.92916
Fogarty Ditch/Sorenson Creek	120.55096	46.95148
Packwood Canal Spill	120.60248	47.00988
West Side Tailend Spill	120.56859	46.94750
CID Tailend Spill	120.47469	46.92246
EWC Tailend Spill	120.46475	46.93143
KRD Turbine Ditch Spill	120.49514	46.90334

Table D-2: KCCD monitoring stations for suspended sediment and turbidity in the Teanaway basin.

Station Name	Station Location	Latitude	Longitude
Mainstem Teanaway at Lambert Bridge	Upstream side of the Bridge	47° 10' 30.51" N	120° 50' 09.84" W
Mainstem Teanaway at Red Bridge	Upstream side of bridge	47° 12' 05.27" N	120° 46' 53.05" W
West Fork Teanaway at Mouth	Upstream of first bridge across the West Fork	47° 15' 25.08" N	120° 53' 56.55" W
Middle Fork Teanaway at West Fork Teanaway Road	Upstream of bridge	47° 15' 31.90" N	120° 53' 51.42" W
North Fork Teanaway at Mouth	Upstream side of 1st bridge across North Fork	47° 15' 26.60" N	120° 52' 48.29" W
North Fork Teanaway at Dickey Creek	Upstream side of bridge	47° 17' 17.11" N	120° 51' 33.15" W
North Fork at Camp Lake Road (USFS Road 9701)	Upstream side of bridge just above mouth of Jungle Creek		
Lick Creek @ NF Teanaway Road	Upstream side of culvert (this site is dry much of the year)		
Middle Creek @ NF Teanaway Road	Upstream side of culvert		
Indian Creek @ NF Teanaway Road	Upstream side of culvert		
Jack Creek @ NF Teanaway Road	Upstream side of culvert		
Stafford Creek at USFS Road 9737	Upstream side of bridge		
Beverly Creek at USFS Road 9737	Upstream side of bridge		

Implementation

The KCCD and the NRCS have been coordinating many of the implementation activities. Ecology will work with these agencies to provide frequent status reports of implementation.

Source Identification

Where water quality monitoring identifies particular stream reaches or other locations that often exceed standards for turbidity or pesticides, efforts will be made to identify causes of the pollution. The KCWP and KCCD will be working to identify these sites, to determine if the water quality violations are natural and/or the result of human activities, and, where necessary, identify the specific land uses or management practices that may be causing the problem. As appropriate, the KCWP and KCCD will then work with landowners to reduce pollution sources, with assistance from Ecology as needed.

APPENDIX E

Summary of Responses to Public Comments

Appendix E: Summary of Responses to Public Comments

Ecology received written comments from these groups or individuals on the detailed implementation plan for the *Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide TMDL*:

- The Kittitas County Water Purveyors (KCWP)
- Kittitas County Conservation District (KCCD)
- Kittitas County Cattlemen's Association
- Washington State University Extension Service
- Washington State Department of Transportation
- Mr. Don Davis

Because many of the comment letters contained similar themes, comments are grouped below by issues (rather than by commenter). Comments are in bold/italic font, with Ecology's responses in plain font.

Comments and responses were grouped into four main categories:

1. Comments regarding best management practices, in general
2. Comments related to irrigation upgrades.
3. Comments related to riparian revegetation and bank stabilization.
4. Other general comments.

Additionally, some commenters (in particular the KCWP and KCCD) had numerous specific valuable comments regarding word choice and correction of basic information. Most of these suggestions were accepted into the document without discussion.

Copies of all comment letters are available on request from Ecology.

1. Comments regarding best management practices, in general

a. The definition of best management practices (BMPs) should be clarified. In this document, BMPs seem to be defined as whatever management practices work to either minimize irrigation return flow or reduce sediment in return flows. This is acceptable for the purposes of the TMDL, however US Natural Resources Conservation Service (NRCS) BMPs are those defined in NRCS Field Office Technical Guides (FOTGs). The TMDL BMPs may be more flexible, while the FOTG BMPs may be needed to comply with NRCS funding programs.

As the commenter indicates, for the purposes of this TMDL, BMPs are generally accepted practices that "work to either minimize irrigation return flow or reduce sediment in return flows." Ecology agrees that the BMPs recommended by the TMDL may be more flexible

than the FOTG BMPs; however, because the FOTGs are regularly updated, it would limit this TMDL to quote the individual FOTGs rather than refer to them as a source of important information. The text has been updated to indicate greater emphasis on NRCS FOTGs.

b. I agree BMPs are likely to help achieve targets, however nowhere is there a statement as to the demonstrated efficacy of certain BMPs to achieve desired results. Also, what if they are employed and don't lead to meeting the targets?

The NRCS has lots of information regarding which BMPs may be most appropriate for sediment reduction. Other sources of sediment-reduction BMP information are DNR (forestry practices), WSU Extension and the KCCD. Because various sediment BMPs have been used for many years under many different circumstances, research can generally predict whether or not a BMP will be appropriate for a given situation. However, it is always possible that a certain BMP is not the best possible solution for a problem (landowners can make other choices depending on cost or desire), in which case the resource advisory agencies can be contacted to help the producer adjust his/her management practices.

2. Comments regarding irrigation improvements

a. The common justification for switching from rill irrigation [to sprinker irrigation] is the greater erosion potential of surface irrigation, but this applies primarily to cropland, not permanent pasture with two-foot-deep root systems. Healthy permanent pasture or grassland is the most effective means of holding sediments, much more so than tillage crops. Permanent pasture is also not likely the source of soil contaminated with OCPs

Ecology agrees with this comment. The DIP document has been modified to clarify this point.

b. Also, established hay ground is generally not a source of high turbidity runoff and irrigation upgrades may provide only minimal reduction in sediment loading. Row crops (including rotations of corn, wheat, oats) and newly seeded fields are more likely sources of high turbidity runoff. Most intensively managed fields are systems may not provide an economically positive cost-benefit ratio, and only a modest environmentally positive cost-benefit ratio. Landowners are making choices to improve [land] not managed for long-term row crop production, but are rotated with perennial hay crops. The rotations into corn or grains may only be in 2 of 8 years of crop growth, such that investment in hand-lines, wheel-lines, circles or lateral move sprinkler irrigation delivery and return flow management by installing piped conveyance systems, piped or sprinkled delivery systems and return flow management (reuse, settling ponds, buffer strips). These independent choices should be encouraged and supported as they will likely be the key to meeting TMDL targets.

Lands that are periodically (even if only every 2 to 8 years) tilled and rotated can still be major contributors of sediment-laden water, during the irrigation season immediately after tilling. However, as this commenter notes, there are a number of choices that can be used to reduce the sediment that may be moved off fields by irrigation return flows – conversion to sprinkler irrigation is only one type of BMP appropriate for this scenario.

c. ***Irrigation improvements are important to minimize the volume of irrigation return flow and to reduce its sediment load. However, conversion from gravity irrigation techniques to sprinklers should not be solely emphasized or used as the measure of success to the degree listed in the draft. The cost (estimated at $2,000/acre) is impractical for lower value land (rocky or hilly ground, pasture, and/or junior water rights) and in some cases of questionable efficacy in the windy Kittitas Valley. In addition, the presence of effective lower cost, more flexible alternatives should be given considerable weight.***

… A goal of 80% of the farms in Kittitas County upgrading to sprinklers is the wrong measuring stick for success. Given the cost of these BMPs, the sizes and shapes of fields, the crops produced and the type of irrigation water (junior rights, senior rights, return flow, etc.), trying to convert 80% of the 95,000 irrigated acres to sprinklers by 2011 would be impossible. The cost share funds available for these activities are limited. Irrigation Efficiencies only works for those with private creek rights, not irrigation district rights. Conversion to sprinklers is not the highest priority for NRCS cost share funding.

… The resistance and/or failure of livestock producers to convert will be counted as part of failure to meet the goal of 80% of farms upgraded or if not upgraded, using PAM …. it is not incompatible with the goals of the TMDL to leave pastures, which are not separated out in the table of goals (rill-irrigated farms), under surface irrigation. It is not feasible in the long term for most cattle producers to convert to sprinklers and would produce little, if any, improvement in sediment retention. However, the measurement methods and goals do not reflect this reality …..

… How will percentages [of farms converted to rill irrigation] be determined? Will the KCCD conduct a crop survey and create a map in 2006 and 2011? Change or remove irrigation upgrades on 80% of farms (what does this mean? How many acres?). The KCWP membership provides irrigation water to approximately 91,000 acres; 80% would be 72,800 acres. Given much of the acreage is pasture and likely not producing significant sediment, a more reasonable number may be improvements on 40% to 50% of intensively managed lands (perhaps 50,000 acres total), or 20,000 acres to 25,000 acres with irrigation improvements.

Since the problem is not necessarily the land, but the rotation (new seeding, corn or grain rotations, for example) and the water management, the use of PAM or gated pipe may bring the valley within compliance targets without the capital improvements and ongoing maintenance and electric costs of sprinkler systems. Landowners may well

install sprinklers to meet their irrigation needs, however I would strongly discourage the acreage under sprinklers as a measure of success ….

As the commenters above clearly point out, it is not feasible to determine an a priori one-size-fits-all approach to reducing sediment levels in Kittitas Valley waterways. Landowners can best determine which sediment reduction methods work best on their farm. The DIP document has been modified to clarify this point.

3. Comments regarding riparian restoration and bank stabilization

a. Do No Harm vs. Restoration: The level of effort at which individuals are expected to participate is a concern. The concept of do no harm is understandable, however restoration … is questionable with respect to this TMDL and other regulatory requirements. Restoration efforts may involve considerable financial expenditure, technical consultations, permits, contracts, and operations and maintenance budgets. The TMDL could encourage stream restoration work either individually or as coordinated through a watershed program, which may offer technical and financial assistance.

Ecology agrees with this comment.

b. The management of riparian areas is mentioned several times in the TMDL. It would be helpful to define range riparian management techniques or provide riparian management guidelines that identify specific goals or assist landowners to define objectives. Also, management techniques should be adapted or changed based on field observations. This could also be described as a riparian landscape vision and acceptable maintenance practices.

The NRCS has a wealth of information, and numerous specific guidelines, on riparian management. The KCCD is also knowledgeable in guiding riparian management projects. Ecology relies on these resource management agencies to provide specific direction on numerous BMPs.

c. Some riparian conditions, such as trees and large woody debris may cause stream blockage and possibly associated erosion and suspended sediment. Some management practices may work at cross purposes and actions must be allowed to amend practices or adjust conditions (a backhoe may be needed to clear debris; BMPs to reduce TSS may increase fecal coliform bacteria). A provision to streamline or possibly obtain a blanket HPA to perform certain maintenance practices would assist in implementing timely maintenance to support water quality. Landowners with riparian areas also contend with many natural events such as flood, fire, bank erosion and wildlife use that may affect water quality or farm/ranch operations.

For landowners who are interested in planting trees, it will be necessary to conduct vegetation control in the understory to prevent high stem densities and dominance of reed canary grass (Phalaris arundinaceae). Extremely dense woody vegetation will

choke out desirable grass and sedge species and may result in massive amounts of large woody debris that, when released (or removed), could cause large, infrequent bank erosion and scouring events. In general, in this valley, forested riparian corridors will be more manageable in the long term with relatively widely spaced trees, a strong herbaceous component in the understory, and annual maintenance through grazing, clipping, thinning, pruning, etc

Establishing rapid-growth woody vegetation in wet areas with a relatively long growing season and very favorable growing conditions such as we have in the Kittitas Valley necessitates the provision of long-term maintenance. Without long-term maintenance, planting new vegetation on streambanks may backfire, for lack of a better word. The proliferation of riparian tree species has a great potential to stabilize streambanks; unchecked, those same plants can restrict water flow such that maintenance is required to thin the overstory and remove excess debris from channels and streambanks where all other understory vegetation will have been choked out. The amount of sediment released by the exercise of clearing out undesirable wood will depend in large part on how often the exercise is conducted. More frequent, less intensive activity will be far less disturbing than less frequent action requiring more severe impact on the riparian area. If there are no provisions for maintenance in an attempt to avoid de-stabilizing streambanks, future unanticipated sediment problems could be the result of a blow-out, not a maintenance activity. Sediments released may include upland soils in that type of event, not just streambed deposits.

Woody vegetation provides a good macrostructure for holding streambanks together, but for retaining topsoil and taking suspended sediments in irrigation flows out of the water column, grass is remarkably effective. Numerous scientific studies have documented the efficacy of fitler strips as narrow as a few feet. (Filter strips are simply areas of grass, not necessarily fenced and unamanaged "buffers"). In perennial streams (or ditches) there are commonly sedges and rushes present, which have unbelievably extensive root systems and are perhaps a greater contributor than trees to bank stability. A healthy pasture will filter overland flow, experience good water infiltration, and will build soil, not lose it.

Planting trees in what are now riparian areas, created by irrigation water, would certainly provide some stability to streambanks in soil types prone to erosion. However, they will not provide much filtration function. Trees will also attract livestock and wildlife, which will prove antagonistic to the fecal coliform standard. It is an active scientific debate whether those trees would bring about any change in water temperature either. Given the source of these landowners' irrigation water, it probably would not. Fencing livestock out to prohibit them from loafing under trees is not very cost-effective and has many management downfalls. The most critical consideration for ranchers will be bank shear and associated streambank sloughing from high livestock concentration. This can be largely avoided through providing hardened water access, providing adequate forage and salt away from the stream, and paying attention to culling or moving dominant cows who may be teaching the herd bad habits. Off-stream water sources are also very effective but are not always feasible for a variety of reasons.

Re: Table 2, Unstable stream banks:

- ***Add-Stream blockage or thick woody vegetation will cause re-channeling which affects suspended sediment.***
- ***Add-Consider stream maintenance where necessary***

Several commenters noted that riparian plantings will require maintenance. Commenters also noted that installation of such plantings to stabilize streambanks and filter sediment-laden runoff may affect other area TMDLs either positively or negatively. Ecology acknowledges both of these facts. Since compliance with the TMDL is voluntary, landowners should contact the resource conservation and advisory agencies (NRCS, KCCD, WSU Extension, and others) to determine what types of plantings, and what type of maintenance, may be necessary for their specific sites. The document has been modified to ensure that this opinion is clearly expressed in the text.

d. The table of Intermediate TMDL milestones on page 19 lists three actions to be taken by "all shoreline landowners" toward improving riparian vegetation with the obvious goal of stabilizing streambanks.

A. Plant new vegetation along streambanks, where possible and appropriate. (Trees and shrubs)

B. Protect, water, and otherwise nurture new plants during first year.

C. Revisit plants after five years to assess survival rate.

The phrase "where possible" in (a) could have several different meanings. It could mean where it is physically possible to plant; it could mean where it there are the necessary biological conditions for new vegetation of various types to establish and grow; or it could mean where it is possible to establish new vegetation without adverse future consequences resulting from the planting.

"Where possible" can mean any of the interpretations noted above. Since compliance with this TMDL is voluntary, "where possible and appropriate" could also mean, "if the landowner wants to do it."

e. It is debatable whether natural conditions in the valley included trees. Natural conditions would obviously not include irrigation return flows which account for almost all of the surface water in summer and fall. High water tables near the Yakima River would likely support saprophytic riparian species, but outside of the influence of available shallow groundwater, there may not have been many trees; there certainly was not a closed canopy on every ephemeral stream.

For the purposes of this TMDL, Ecology does not intend to determine what type or size of vegetation may be considered "natural conditions" in certain areas of the Kittitas Valley. Certainly, installation of plants that are considered native to this part of Washington state are preferable to those that are non-native. However, for the purposes of this sediment TMDL, planting any vegetation to stabilize streambanks and filter sediment-laden runoff is preferable to no vegetation.

f. A good start for the installation of the in-stream structures <u>is most definitely</u> a visit from a trained professional. Again not all stream bank erosion situations are "bad", some are the natural course of the river or stream. If that is the case, it may not be advisable to install any kind of a structure as the change in the course of the stream or river could provide additional habitat or reconnect the floodplain. This natural action should not be altered if the additional habitat and floodplain reconnectivity fits the area (e.g. it would cause no damage to homes, roads, or agricultural lands, etc.). Conversely, in the managed waterways of lower Kittitas County, where floodplains are occupied by homes, roads, agricultural lands, etc., serious consideration must be given the long-term effects of the in-stream structures. They may end up causing more harm than good, if they reduce erosion in one location only to increase it in another. In some cases, it may even be advisable to remove woody material, especially in the managed streams of the Valley, in order to prevent severe erosion in high flow situations. It's not an action generally promoted by resource agencies, but we need to make sure this document reflects the real world and in the real world, the removal of debris jams in the managed creeks is often necessary to prevent damage to the stream banks, as well as the surrounding homes, roads, and agricultural lands. We need an acknowledgement of this in the DIP. In short, the current language in the DIP is much too simplistic to represent the actual situations and needed actions.

Again, advising landowners to pursue in-stream structures without the assistance of a trained professional is not acceptable. Those structures have appropriate times and places and inappropriate times and places, a fact that needs to be repeatedly acknowledged.

[The activities] section should acknowledge the complexity of these activities and that various permits (HPA, grading) and expertise (consultation, contracting) may be required to complete them.

Ecology agrees wholeheartedly that landowners should not attempt to install bank stabilization structures without first seeking professional advice from one of the resource advisory agencies (NRCS, KCCD, WSU Extension or others). The DIP document has been modified to ensure that this point is clearly made.

<u>4. Other comments</u>

a. ***In Appendix C, "Schedules and Tracking" there are year by year measurements for each of the other contaminants but nothing pertaining to bioaccumulative organochlorines in fish or water. [Also,] I only find references to "periodic monitoring". What exactly does that mean? In another reference I find reporting dates of these substances to be in 2006 and 2011 only. On that basis how will we know if we are steadily progressing toward "a significant decrease in agricultural return flows"? (Meaning insecticides applied to crops)***

"Periodic monitoring" means that Ecology will be monitoring area waterways for these pesticides as part of their effectiveness monitoring program, which will occur in

conjunction with the TMDL target dates of 2006 and 2011, and with additional monitoring to occur every 5 to 10 years after that until these pesticides meet state water quality standards.

The commenter also mentions that he is curious how we will know if we are "steadily progressing toward 'a significant decrease in agricultural return flows' (Meaning insecticides applied to crops)." The commenter may have meant a "significant decrease in contaminant levels in agricultural return flows" since that more closely quotes the document. Ecology is confident that the effectiveness monitoring program described above will allow us to determine whether or not these contaminant levels are decreasing as expected.

Further, the organochlorine pesticides (DDT and dieldrin) that are a focus of this TMDL have both been banned for almost 30 years. Therefore, except for very rare isolated circumstances, these insecticides have not been freshly applied to crops for several decades. Because these pesticides are very persistent in the environment, and have a strong affinity for sediment particles, reduction of suspended sediment levels in valley waterways is expected to also help reduce the pesticide levels in the valley waterways.

b. The Kittitas County Water Purveyors have participated in the development of the Upper Yakima River TMDL and will continue to participate in its implementation. The emphasis on voluntary actions by each purveyor and individual landowners is appropriate and should produce improvements in water quality. Local coordination and cooperation has grown with the support of the KCWP, Kittitas County Conservation District and community leaders. The KCWP remains committed to maintaining local involvement in water quality issues and working with Ecology on this and future TMDLs.

Ecology has very much appreciated the cooperation and support of the KCWP during the development of this TMDL, and looks forward to an excellent working relationship with the KCWP in the future.

c. Re road improvements: Perhaps a more realistic goal would be 40-50% improvement on existing roads and 90-100% built to guidelines for new, non-emergency, roads.

Since, as the commenter noted, this is a goal for road improvements, Ecology prefers to stay with the more optimistic goals as stated in the document. Again, compliance with this TMDL is voluntary, and optimistic goals may help secure more funding to assist landowners with road improvements.

d. I'm not sure how we would educate the public on the importance of not disturbing bottom sediments in contaminated waterways. I don't think there is any way to stop high flow events, which is what this table says causes re-suspension.

Public education does not have to be formal training or publications – it can be limited to discussions with landowners or other individuals performing in-water work, as situations

arise. Additionally, Ecology agrees that it is not possible to stop most high flow events. Table 3 has been modified to reflect that disturbance of bottom sediments can also cause re-suspension of bottom sediments.

e. [The Washington State Department of Transportation (WSDOT)] reviewed the draft Upper Yakima River Basin Suspended Sediment, Turbidity and Organochlorine Pesticide Total Maximum Daily Load Detailed Implementation Plan. It appears that this plan should not impose any major commitments or changes in the ability of WSDOT to operate, construct or maintain the state transportation facilities within this basin and study area. Page 5 and 6 contain the only reference to WSDOT and it basically indicates that WSDOT is responsible for and to continue to maintain its roads and ditches within our jurisdiction and prevent the entry of sediment into area waterways. The WSDOT as a state agency has the responsibility for operating and improving the state transportation system in an environmentally responsible way.

Ecology appreciates the WSDOT's willingness to work toward the goal of cleaner water in the Upper Yakima River basin.

f. From a perusal of state laws … one sees that Washington promotes a healthful environment yet recognizes that man interacts with the environment for beneficial activities such as recreation, food production, transportation and housing which may affect water systems.

[These laws include:

> ***RCW 34.05.328 (Administrative Procedures Act), includes "Despite its importance, Washington's regulatory system must not impose excessive, unreasonable, or unnecessary obligation… and detrimentally affects the economy of the state and well-being of our citizens." And further finds that "In order to achieve greater compliance with administrative rules at less cost, that a cooperative partnership exist between agencies and regulated parties that emphasized education and assistance before the imposition of penalties…"***
>
> ***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.***
>
> ***Legislative finding, intent -- 1981 c 297: "The legislature finds that agricultural land is essential to providing citizens with food and fiber and to insuring aesthetic values through the preservation of open spaces in our state. The legislature further finds that government regulations can cause agricultural land to be converted to nonagricultural uses. The legislature intends that agricultural activity consistent with good practices be protected from government over-regulation." (applicable to RCW 90.48)***
>
> ***ESSB 5028 amends RCW 90.48 to the effect that "When a water quality standard cannot be reasonable met …the department may use voluntary, incentive-based methods including funding of water conservation projects… development of new storage, or habitat restoration projects in an attempt to meet water quality standards." (Bill 5028 signed by the Governor on June 20, 2003; effective date September 9, 2003.)***

The laws [noted above] also express an appreciation for the value of agricultural lands and contain a requirement for consideration to be given to any enforcement action that might contribute to the conversion of agricultural land to nonagricultural uses and to minimize the possibility of such conversion.

The legislature also finds that agricultural land is essential and intends that agricultural activity that is consistent with good practices be protected from government over-regulation and the use of voluntary, incentive-based methods to meet water quality standards are encouraged. Also, to achieve greater compliance levels a cooperative partnership should exist between agencies and regulated parties that emphasized education and assistance before the imposition of penalties. We appreciate that Ecology is moving in this direction.

As you have seen by field observations, the management of ditches and riparian areas is a dynamic and iterative process. One can identify overarching goals for water quality, habitat and irrigation with supporting objectives, but actual management must be flexible, adaptive and allowed time to work. For example, implementing actions to reduce water velocity and thereby decrease bank erosion may take different forms (tree plantings, animal impact, rip rap), take many years to see outcomes and have varied results (temporary bank erosion as new course is established, changes in flood risk, increased bank stability) and require investment (cash, labor, equipment and time) to install and maintain. Landowners work in an environment of flux, between periodic disturbance and periods of stability.

On-farm irrigation improvements will help to meet TMDL goals by minimizing the volume of irrigation return flow and/or to reduce its sediment load. However, conversion from gravity irrigation techniques to sprinklers may be impractical (rocky or hilly ground, pasture, junior rights, remoteness from power, cost). In addition, the presence of effective lower cost, more flexible alternatives should be given considerable weight, including gated pipe, PAM and other rotation-compatible efforts. Individual, independent choices will likely be key to meeting TMDL targets.

Also, the relationship between return flow and fecal coliform bacteria should be explored to better understand the circumstances under which return flows may or may not contribute to fecal coliform numbers in surface waters …. Recommendations between TMDLs should be compatible rather than work at cross purposes.

Locally, the KCWP, Kittitas County Conservation District, Kittitas County Cattlemen's Association, and various grower groups are working toward improving environmental conditions while maintaining economic viability. This energy should be supported and relied upon in working toward broad objectives in support of water quality, not only for this TMDL, but for bacteria and temperature TMDLs to follow. The laws cited [above] should further encourage Ecology to advance its proactive, adaptive approach to the TMDL process and focus on strategies that are financially feasible and technically sound …

Ecology appreciates the above sentiments, and the willingness of interested citizens to strive to improve this TMDL process while ensuring that the best interests of the local agriculture community are protected. Ecology agrees that it is very important that there be harmony, and certainly no conflicts, between recommended implementation actions for the various Kittitas Valley TMDLs. Ecology also intends to work with the citizens of Kittitas County to develop solutions to water pollutions problems that will also enhance viability of the area's agriculturalists.