Technical Memorandum
Strategies & Tools for Water Supply Issues
Final

WRIA 35 – Middle Snake River Basin

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Introduction

Key planning issues for WRIA 35 have been identified in Sections 5 and 6 (WRIA 35 Watershed Plan) in the areas of water supply, instream flow, water quality, and aquatic habitat. General strategies or "tool sets" that can be used to address the key planning issues are discussed below, and specific tools (e.g. programs, projects, BMPs, regulations, etc) are described in detail in tables B-1 through B–8. The strategies and tools include measures that can be implemented by the Planning Unit, federal, state, and local agencies, tribes, conservation districts, individual landowners, and other stakeholders and water users in addressing key planning issues. The inclusion of a specific strategy or tool herein is not intended as a recommendation for its use within WRIA 35, rather, it is provided here as a menu of some of the possible actions or strategies that are available to address key planning issues within the watershed. This listing of possible tools, while extensive, is by no means exhaustive, and the Planning Unit and other stakeholders may identify and select other means to address the key planning issues discussed within this Plan.

A listing of the tools is provided in the following tables, presented in eight broad categories:

- Water conservation
- Water storage
- Regulatory / administrative
- Water quality
- Groundwater management
- Groundwater quality
- Habitat Enhancement
- Monitoring

Tools within each of these categories may apply to one or more of the key planning issues; many tools can affect multiple planning issues. Each table provides a description of the tool, the potential benefits normally expected with implementation of the tool, potential parties responsible for implementation, and other issues (e.g., social, legal, technical) that could be a factor when considering undertaking any of the listed strategies.

This report is designed to be used as a general reference for the Planning Unit and other stakeholders and individuals involved in watershed planning activities. The lists are not intended to be exhaustive, but rather to provide a range of options available when considering activities in each Implementation Area. As such, these strategies and tools are not specific to any of the Implementation Areas per se; the discussion of recommended strategies per Implementation Area is provided in Section 6 of the WRIA 35 Watershed Plan.

Strategies & Tools for Water Supply Issues

Water supply issues arise when there is increased competition for water and a limited supply of the resource. Competition for water is increasing throughout Washington State as population and economic growth occurs and as regions prepare for anticipated future growth. Multiple demands include needs for municipal water, agricultural uses (e.g. irrigation and stock watering), recreation, and commercial/industrial use, as well as federal and state requirements for salmon protection and recovery and instream flows. Water supply tools are primarily intended to address the demand for water for human-related uses, such as municipal and irrigation use, but may also benefit instream flow. Tools identified under Instream Flow Strategies and Aquatic Habitat Strategies are primarily designed to benefit fish and natural habitats.

When addressing water quantity issues in a WRIA planning process, a number of strategies must be considered, including water conservation, water reuse, water reclamation and reuse, voluntary water transfers, aquifer recharge, additional water allocations, or additional water storage enhancements (Chapter 90.82 RCW).

An index to the strategies and tools that can be used to address water supply issues is provided in Table 4-1 of the Watershed Plan. These strategies and tools are described in detail with information on benefits, implementing party, and related social and technical issues in Tables B-1 through B-3.

Strategies and Tools for Instream Flow Issues

The term "*instream flow*" is used to identify a specific stream flow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the stream flow needed to protect and preserve instream resources and values, such as fish, wildlife and recreation.

An index to the strategies and tools that can be used to address instream flow issues is provided in Table 4-2 of the WRIA 35 Watershed Plan. These strategies and tools are described in detail with information on benefits, implementing party, and related social and technical issues in Tables B-1 through B-3.

Table B-1

CONSERVATION TOOLS

Description of Tool	Potential Benefits	Potential Issues (Legal, Technical, Social, Institutional)	Party Responsible for Implementation
Municipal – Consumer Demand Management Program for Residential, Business, and Public Properties (schools, parks, government facilities, etc) • Education – The consumer is provided information in various forums, such as with their monthly billing statements, public service announcements, newspaper articles, etc, on water conservation measures. • Positive Incentives – The consumer is offered low cost rebates, tax credits, loans, grants, and/or technical assistance in repairing leaking or upgrading to new flow faucet aerators, high efficiency showerheads, leak detection toilets, and replacement valves, etc. • Negative Incentives – The consumer is discouraged from excessive water use through increase rates (pay per use); Outdoor watering schedules are imposed (e.g., specific days of the week; early morning and late evening hours only); • Landscaping - Local governments adopt landscaping ordinances that require and/or encourage efficient, low flow watering systems; use of treated wastewater (grey water); increased use of trees/shrubs and native grasses; education on water needs for shrubs, trees, grass; mulching; weed control; use of recycled water in ornamental fountains, etc. See EPA's website (www.epa.gov/owm/water-efficiency for detailed tips on water efficiency for municipal, residential, business and landscaping.	Cost savings Generates revenue Protects drinking water resources Increases reliability of municipal supply Minimizes water pollution and health risks Reduces demand from stream sources Maintains the health of aquatic environments Reduces temperatures of surface waters with increased instream flow Less reliance on groundwater (if used for municipal supply) Saves energy used to pump, heat and treat water	*Second Engrossed Substitute House Bill 1338 – An Act Related to Municipal Water Rights (enacted in 2003)* mandates water conservation for all municipal suppliers; requires the WDOH to adopt comprehensive rules by 12/05. To fund the development and implementation of the conservation program, the bill allows WDOH to collect additional operating permit fees equivalent to 25 cents per residential service connection per year through June 2007. Consumer demand management success may depend on community's reaction to an incentive-based vs. penalty-based program.	Water Management Agency City Government

Table B-1 CONSERVATION TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Municipal – Operational Efficiency Management Program for Water Systems • Administration / Management - Designate a water efficiency coordinator; develop a water efficiency plan (see www.epa.gov/owm/water-efficiency/inter2.htm for guidelines on developing a plan); educate and involve employees and residents in water efficiency efforts; develop and implement a voluntary Environmental Management System (EMS) to ensure compliance with environmental regulations (for more information see www.epa.gov/owm/iso14001/wm046200.) • System Maintenance - Minimize losses of water during routine flushing of mains; install leak detection equipment to find and repair leaks as soon as possible; implement a meter testing schedule to detect and repair meter failure. • System Improvements – Implement a water-loss management program (e.g. repair leaks). The water industry goal for unaccounted-for-water is 10%. Implement metering throughout your service area. Consider a reclaimed wastewater distribution system for non-potable uses. Ensure that fire hydrants are tamper proof. • Equipment Changes – Set the example in your own facility by Installing ultra-low flow toilets and urinals in municipal buildings, or by installing dams on existing toilets. Retrofit water-saving devices in flushometer valves. Install faucet aerators and low flow shower heads in municipal buildings. As municipal appliances or equipment wear out, replace them with water-saving models. Minimize the water used in cooling equipment in accordance with manufacturer's recommendations. Shut off cooling units when not needed.	Same as above plus Improves environmental performance Reduces liability Improves compliance Improves customer relations		Water Management Agencies City Government

Table B-1 CONSERVATION TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Eliminate "once-through" cooling of equipment with municipal water by recycling water flow to cooling tower or replacing with air-cooled equipment. Consider installing new water-saving pool filters.			
Agricultural water conservation and irrigation efficiency strategies. • Evaluate crops based on market demand, water use, and methods (e.g., organic farming uses less energy overall than conventional farming) • Implement irrigation scheduling to maximize water efficiency and reduce crop stress • Replace open laterals and trenches with closed pipe systems • Replace non-pressurized irrigation systems with pressurized sprinkler systems (with flow control and pressure regulators) or drip irrigation systems • Determine distribution uniformity for irrigation and consider field leveling to maximize water efficiency • Use soil moisture sensors to prevent over-watering • Construct on-farm ponds to capture and reuse tailwater • Implement management measures listed under regional water conservation above	Saves energy used to pump water Saves water users money by reducing their energy costs Increases water availability for instream uses Reduces concentration of water pollutants Minimizes water pollution and health risks Reduces demand from stream sources Maintains the health of aquatic environments		Individual land owner
Industrial Conservation Measures Administration/Management: Appoint a water efficiency coordinator. Educate and involve employees in water efficiency efforts. Develop and implement a voluntary Environmental Management System (EMS) to ensure compliance with	Cost savings Generates revenue Protects drinking water		Industrial company

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CONSERVATION TOOLS

Description of Tool	Potential Benefits	Potential Issues (Legal, Technical, Social, Institutional)	Party Responsible for Implementation
environmental regulations (for more information see www.epa.gov/owm/iso14001/wm046200.) Equipment Use/Maintenance: • Install high-pressure, low-volume nozzles on spray washers. • Install in-line strainers on all spray headers; inspect nozzles regularly for clogging. • Replace high-volume hoses with high-pressure, low-volume cleaning systems. • As equipment wears out, replace with water-saving models. • Equip hoses with spring loaded shutoff nozzles. • Install ultra-low flow toilets, or adjust flush valves or install dams on existing toilets. System Practices: • Detect and repair all leaks. • Identify discharges that may be re-used and implement re-use practices. Some discharges with potential for re-use are: o final rinses from tank cleaning, keg washers, fermenters o bottle and can soak and rinse water o cooler flush water, filter backwash o pasteurizer and sterilizer water o final rinses in wash cycles o boiler makeup o refrigeration equipment defrost o equipment cleaning o floor and gutter wash o Use fogging nozzles to cool products o Handle waste materials in a dry mode where possible	resources Increases reliability of municipal supply Minimizes water pollution and health risks Reduces demand from stream sources Maintains the health of aquatic environments Reduces temperatures of surface waters with increased instream flow Less reliance on groundwater (if used for municipal supply) Saves energy used to pump, heat and treat water Improves environmental performance Reduces liability		

Table B-1 CONSERVATION TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
○ Adjust overflows from recirculation systems by controlling the rate at which make-up water is added: install float-controlled valve on the make-up line, close filling line during operation, provide surge tanks for each system to avoid overflow. ○ Turn off all flows during shutdowns. Use solenoid valves to stop the flow of water when production stops. ○ Adjust flow in sprays and other lines to meet minimum requirements. ○ Wash vehicles less often, or use a commercial car wash that recycles water. ○ Discontinue using water to clean sidewalks, driveways, loading docks, and parking lots.	Improves compliance Improves customer relations		
Water reuse facilities by wastewater utilities Recycling and reusing treated water, primarily from wastewater treatment plants. Secondary treatment of wastewater (through disinfection and biological oxidation) sample uses: • Surface irrigation of orchards and vineyards • Non-food crop irrigation • Restricted landscape impoundments • Groundwater recharge of non-potable aquifer • Wetlands, wildlife habitat, stream augmentation (with concurrence with state, federal water quality and fish and wildlife agencies) • Industrial cooling processes Tertiary/Advanced treatment of wastewater (through chemical coagulation, filtration and disinfection) sample uses: • Landscape and golf course irrigation	With appropriate treatment, can satisfy most water demands Provides a dependable, locally-controlled water supply Decreases the diversion of water from sensitive ecosystems Decreases wastewater discharges, especially to sensitive water bodies Reduces and prevents	The US Environmental Protection Agency regulates many aspects of wastewater treatment and drinking water quality, and the majority of states in the US have established criteria or guidelines for the beneficial use of recycled water. In addition, in 2004, EPA developed a technical document entitled "Guidelines for Water Reuse," which contains such information as a	Wastewater Facility / City government

Table B-1 CONSERVATION TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
• Toilet flushing • Vehicle washing • Food crop irrigation • Unrestricted recreational impoundment • Indirect potable reuse (groundwater recharge of potable aquifer and surface water reservoir augmentation)	pollution Can create or enhance wetlands and riparian habitats	summary of state requirements, and guidelines for the treatment and uses of recycled water. References: *Guidelines for Water Reuse* US EPA Office of Technology Transfer and Regulatory Support. EPA/625/R-92/004 September 1992 *Municipal Wastewater Reuse: Selected Readings on Water Reuse.* Office of Water (WH-595) EPA 430/09-91-002 September, 1991	
On-site greywater segregation and use Greywater is wastewater from domestic bathtubs, showers, bathroom sinks, washing machines, dishwashers and kitchen sinks, any source in your home other than toilets**.** Greywater can be used in place of fresh water to irrigate (below ground) the roots of trees, shrubs, and flowers. Greywater systems must	Greywater systems, used in conjunction with other conservation strategies, such as waterless toilets and subsurface drip systems for irrigation	*It's important to understand that greywater can contain harmful bacteria, viruses, and chemicals that pose a risk to*	Homeowner Facility Owner

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Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
irrigate below the ground surface by using a drainfield or a suitable drip irrigation system* to reduce health risks. Treatment of greywater, in accordance with Department of Health standards, is achieved through the installation and operation of a specialized on-site sewage system. Disposal of blackwater (e.g., water from toilets) must be accomplished through use of composting or incinerating toilets, an on-site sewage system, or discharge to a central sewage system. *Greywater systems are different than subsurface drip systems (SDS) (see http://www.doh.wa.gov/ehp/ts/WW/Subsurface-Drip-2002.pdf for more information on SDS guidelines.	result in a lower demand for water Increases instream flows due to decreased demand for surface water diversion or groundwater resources Saves consumers money with less costs for water	*public health and the environment if mishandled.* Some chemicals in greywater can be harmful to plants. For example, liquid detergents generally have less sodium than powdered detergents and are recommended when irrigating with greywater. With a reduction in withdrawals, a corresponding reduction in return flows would also be expected. Changes in the timing of local recharge may result.	

Table Appendix B-2 WATER STORAGE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Construct and operate new on-channel storage facilities A water storage facility would be created by impounding flows from a river or stream. On-channel storage facilities could include large reservoirs on the mainstem of major rivers as well as small reservoirs on tributary streams. Construction would likely involve creation of an earthen and/or concrete dam. A water accounting system for allocating storage to each water right account can provide information to users regarding the risk of future water shortages. Individual water users can manage their available supply in accordance with their perception of the risk and consequences of possible water shortages. Water districts, cities, and other public entities may take appropriate action in anticipation of impending shortages. Water rights marketing and implementation of water conservation measures may be triggered by low levels of storage.	Provides reliability of water supply Increases supply to multiple users Flood control Increases groundwater recharge in vicinity of storage area Well-controlled rate of release of water Grade control could slow the flow of water from upstream to downstream so that water remains in the stream for a longer period of time and low flow periods can be delayed	On-channel storage impoundments can be controversial, particularly when done on a large scale. Impoundments can significantly alter the existing hydrograph and habitat. The permits required in general for on-channel storage could include: (1) a license from FERC (if the facility will also generate electricity); (2) an environmental impact statement under the State Environmental Policy Act (SEPA) and/or NEPA (if federal funding is involved); (3) a Water Quality Certification under Section 401 of the Federal Clean Water Act; (4) a dredge and fill permit under Section 404 of the Federal Clean Water Act (this permit provides veto authority to the USEPA); (5) approval under the Shoreline process by the county of jurisdiction (DOE has veto authority over this process approval); (6) a hydraulic project approval under Chapter 75.20 RCW from the Washington State Department of Fish and Wildlife; (7) a National Pollutant Discharge Elimination System (NPDES) permit under Section 402 of the Federal Clean Water Act; (8) a water permit under RCW 90.03.250	Local government / Utility

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Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
		through RCW 90.03.320 obtained from the Department of Ecology; and, (9) a water reservoir permit under RCW 90.03.370 was also obtained from the Department of Ecology.	
Raise and operate existing on-channel storage facilities The capacity of an existing on-channel reservoir could be increased by raising or enlarging the impoundment structure.	Provides reliability of water supply Increases supply to multiple uses and users Flood control Increases groundwater recharge in vicinity of storage area Well-controlled rate of release of water	Existing permits would need to be modified and or re-issued to accommodate a larger structure and/or larger surface area impact. Modifications to existing dam structures must be also be authorized by the Dam Safety Office and must conform to the provisions and guidelines for structure modification outlined in WAC-173-175.	Local government / Utility
Construct and operate new off-channel storage facilities There is a large quantity of water stored naturally as snow pack each year that melts and flows to the state's rivers in the late spring and early summer. An impoundment structure, either earthen or concrete, would be created in an upland location to capture these flows. Alternatively, water would be diverted, or more likely pumped depending on topography, from a river during high flow periods to an off-channel	Enhances low stream flows. Provides reliability of water supply Increases groundwater recharge in vicinity of storage area Flood control Increases wetland function	Regulatory constraints of off-stream storage impoundments are much less problematic than for in-stream projects. Some constraints arise in the regulations regarding placement of dams. Other regulatory concerns would be introduced through SEPA and local land use regulations. Off-stream storage reservoirs are, however, generally subject to less complex regulatory processing.	Local government

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Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
location for storage. Off-channel facilities could have a wide range of capacities.	Enhances wildlife habitat values Creates watered riparian areas Well-controlled rate of release of water		
Raise and operate existing off-channel storage facilities The capacity of an existing off-channel reservoir could be increased by raising or enlarging the impoundment structure.	Provides reliability of water supply Increases supply to multiple uses and users Flood control Increases groundwater recharge in vicinity of storage Increases wetland function Enhances wildlife habitat values Creates watered riparian areas Well-controlled rate of release of water	Existing permits would need to be modified and or re-issued to accommodate a larger structure and/or larger surface area impact. Modifications to existing dam structures may be also be authorized by the Dam Safety Office and must conform to the provisions and guidelines for structure modification outlined in WAC-173-175.	Local government / Utility

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Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Use existing storage facilities for additional beneficial uses Operation of a storage facility constructed to provide water for one specific beneficial use or group of uses could be modified to provide for additional beneficial uses. For example, use of a storage facility originally constructed for municipal water supply could be expanded to supply water for irrigation or to provide additional flows for fish during critical life stages.	Enhances reliability of water supply Increases supply to multiple uses and users Controlled rate of release of water can be used to enhance downstream water supply, habitat, and water quality	Existing permits would need to be modified and or re-issued to accommodate a larger structure and/or larger surface area impact. Modifications to existing dam structures may be also be authorized by the Dam Safety Office and must conform to the provisions and guidelines for structure modification outlined in WAC-173-175. Multiple uses may come into conflict, particularly during periods of low flow. For example, withdrawing water to meet irrigation needs in late summer could conflict with habitat and/or recreation use of a reservoir.	Local government / Utility
Construct and operate artificial recharge/ aquifer storage projects Aquifer storage and recovery involves introducing water, usually surface water diverted during high flows into an aquifer through injection wells or through surface spreading and infiltration. Water is diverted from the stream, conveyed to an infiltration pond and allowed to infiltrate into the alluvial aquifer. The water may be stored in the aquifer for some time before it flows back to the stream or until needed and withdrawn from the aquifer through wells for beneficial use. The aquifer	Enhances reliability of water supply Increases supply to multiple uses and users Increase instream flows as demand for surface flows is met through other sources	Water to be stored in an aquifer must meet the state's groundwater quality standards, Chapter 173-200 WAC. The injected water must meet: a) the quality of the receiving aquifer; b) drinking water standards; or, c) the required quality characteristics of the highest use made of the water from the receiving aquifer, which ever is the highest quality. Issues regarding the water rights of artificially stored ground water can	Local government / Utility

Table Appendix B-2 WATER STORAGE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
serves as an underground reservoir that provides baseflow to streams. Per RCW 90.03.370, aquifer storage and recovery does not refer to operational losses of water during irrigation of land; to water artificially stored due to construction, operation or maintenance of an irrigation system; or to projects involving recharge of reclaimed water. Aquifer storage options may include enhanced infiltration or direct recharge of aquifers from recharge ponds or wells, although the technical issues and permitting requirements are more substantial for the latter option. It also may be possible to enhance infiltration to aquifers from alternative land-use practices. Enhanced infiltration could include employing no-till farming techniques to decrease runoff and increase infiltration or using other methods to reduce runoff.		become very complex, with the level of complexity dependent on the specific site and situation. See Chapter 90.44.130, and Chapter 90.03 RCW related to reservoir permits. There are SEPA issues for these projects, which must be addressed.	
New riparian storage or farm field flooding storage Store surface water close to the river within the riparian zone. Water could be diverted during peak flow periods and stored in a location close to the stream. The stored water may be released later in the year to supplement low flow and provide improved habitat for fish and other water users. Options under this category could include modifying existing levees and flooding	Supplements instream flows, especially during high use and low precipitation periods Improves aquatic habitat Improves riparian areas Provides reliability of water	Does not provide option of storing water through the summer. Unless properly designed and maintained, erosion could occur. Feasibility assessment should include careful study of potential water quality impacts, including ground water quality from mineral/salt deposition, nutrient	Local government / land management agency / fish and wildlife agency

Table Appendix B-2 WATER STORAGE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
fields. Farm fields located near a stream may provide possible sites for water storage/spreading techniques. Water could be delivered to agricultural land during high flow spring runoff. Existing levees could be modified with a weir or other type of release structure. Water from the stream could potentially overflow onto the farm fields during peak flow periods and infiltrate into the ground. This water could drain through the soil and slowly seep into the stream.	supply Increases supply to multiple uses and users	leaching, etc.	
New or modified riparian wetlands Expand existing wetlands or construct new wetlands in the riparian zone. Riparian wetlands could be expanded to increase the potential water storage volume or a new wetland could be constructed as an additional storage site. Water that is released or overflows into a wetland during peak flow periods may remain for some time, although the amount of water stored and the rate of release would be dependent on the ability to capture and store water while minimizing seepage losses. Infiltration of water from the wetland may increase aquifer storage, providing more summer baseflow. Diverting streamflow to wetlands may require a diversion structure, modification of existing wetlands or alteration of existing levees.	Reduces flood peaks Improves water quality Increases aquatic habitat Enhances reliability of water source Newly created wetlands can be a source of mitigation for other projects that impact wetlands. The developed wetland credits can be "sold" to other parties, or held as a "wetland bank" against future need.	Although wetlands provide many benefits, the storage capacity is not as great as a reservoir of the same area and there is less control over the rate of release of water back into the stream. Rate of release is difficult to control Creation of a wetland will require permits from state and federal authorities, including CWA Section 404 permits from the Corps.	Local government / land management agency / fish and wildlife agency
Modification of existing sediment basins	Improves water quality by	Control of flow release may be difficult	Local government /

Table Appendix B-2 WATER STORAGE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Sediment basins are used to trap sediment entering a stream from uplands or tributary valleys and, as a secondary result, can slow water flow though the basin into the stream. Sediment basins are typically designed to hold water only long enough for sediment to filter out and would need to be modified to serve as storage facilities. Sediment basins could be improved, expanded or constructed in new areas to store water. Other modifications may increase the sediment filtration efficiency and/or decrease the rate of water released such that stored water could provide supplemental flows into the low-flow period.	reducing sediment load to receiving streams Augments low flows for a longer period of time through the year	with this type of secondary storage. Sediment basins require periodic maintenance to maintain capacity.	land management agency / fish and wildlife agency / Landowners
Alternative source for irrigation Basalt aquifers could potentially be used as an irrigation source in place of surface water, although the depth to water and pumping costs are unknown. If artesian conditions are present, this could eliminate the need for pumping.	Reduces demand for surface flows Improves aquatic habitat Improves water quality Increase reliability of water supply	Requires development of new source of water, may require new water right. Aquifer use may not be sustainable. Basalt aquifers are complex, and determining connectivity, recharge, and sustainable yields can be difficult and expensive.	Irrigation Districts / Landowners
Direct stream augmentation Water could be pumped from the basalt aquifer to the stream.	Supplements streamflow during periods of low flow. Decreases stream temperatures during summer months	Requires development of new source of water, may require new water right. Aquifer use may not be sustainable. Basalt aquifers are complex, and determining connectivity, recharge, and	Local government / water utility

Table Appendix B-2 WATER STORAGE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
		sustainable yields can be difficult and expensive.	
New water supply A regional groundwater study could provide information on new water supply possibilities for municipal or agricultural purposes. The regional ground water study would provide information on locations and aquifer target depths, water quality, water temperature, production rates. Test wells could be installed which could be used to supplement supply or streamflow for one of the above options.	Provides reliability of water supply Increases supply to multiple uses and users Increase instream flows as demand for surface flows is met through other sources	Requires development of new source of water, may require new water right. Aquifer use may not be sustainable. Basalt aquifers are complex, and determining connectivity, recharge, and sustainable yields can be difficult and expensive.	Local government / regional government entity / water utility

Table B-3 REGULATORY / ADMINISTRATIVE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Transfer existing water rights for out-of-stream uses to other out-of-stream beneficial uses Water rights change or transfer through Ecology or local county conservancy board to change place of use, point of diversion, time of water use and/or type of use consistent with goals and objectives of the watershed plan.	Beneficial out-of-stream uses, identified by the watershed planning group, could be fulfilled	Potential for third party impairment of existing water right holders	DOE Water Right Holder Conservancy Board
Transfer existing water rights for out-of-stream uses to instream beneficial uses through the Trust Water Rights Program Trust water rights may be held by Ecology or "authorized for use for instream flows, irrigation, municipal or other beneficial uses consistent with applicable regional plans for pilot planning areas, or to resolve critical water supply problems" (RCW 90.42.040). Trust water rights can derive generally from two sources: • Water saved through state or federally funded conservation and available to other uses without impact on existing rights, "net saved water", can be acquired by the state from the conserver through a voluntary agreement; and • Voluntary transfer to the state of an existing water right (or portion thereof), through lease, donation, or purchase, but not by condemnation.	Beneficial instream uses, identified by the watershed planning group, could be fulfilled Reduces demand from stream sources Increased streamflows can enhance the health of aquatic environments Increased streamflows can reduce temperature of surface waters	Trust water rights maintain the priority date of the original water right, unless the water right is split between the original user and the state, in which case the trust water right is inferior in priority. Trust water rights can redirect the use of conserved water. The amount of water which was previously beneficially used as part of the water right forms the basis for transfer to a trust water right. Water which has been beneficially used and then transferred to the trust program is not subject to relinquishment.	DOE Water Right Holder Conservancy Board

Table B-3 REGULATORY / ADMINISTRATIVE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Transfer water through interties of public water systems or irrigation systems Interties are interconnections between two or more water systems that allow the exchange or delivery of water between systems. Interties are typically used between adjacent public water systems. Transfers of public water through such interties are managed by a joint board of control, established pursuant to Chapter 87.80 RCW.	Increases water system reliability Benefits to public health and resource management objectives Enhances the manageability of the water system Provides opportunities for conjunctive use Delays or avoids the need to develop new water sources	Existing water users may object over transfer of water that may impact junior water users or in condemnation cases	Water Management Agencies/ City Government
Short-term or long-term allocation Allocate additional ground or surface water on a short-term or long-term basis from a specific source (surface water body or aquifer) for a specific beneficial use. Specific beneficial uses could include municipal supply or multiple beneficial uses.	Beneficial use could be fulfilled	Potential legal and/or social implications from existing water users relying on water allocated to beneficial uses.	DOE
Complete or partial closure of a basin or subbasin from appropriations The Water Resources Act of 1971 (Chapter 90.54 RCW) provides authority for Ecology to withdraw waters in a basin or subbasin from further appropriation based on a determination that insufficient information and data are available to support sound resource allocation decisions or that water resources have been over-appropriated. The rule can close areas during certain periods, creates reservations for domestic and stock	Beneficial instream uses could be fulfilled Reduces demand from stream sources Maintains the health of aquatic environments Reduces temperatures of surface waters with increased instream	Prior to initiating such rule making, Ecology is required to consult with the standing committees of the State Senate and House of Representatives with jurisdiction over water resources. Potential legal and/or social implications of cutting off access to water source by	DOE

Table B-3 REGULATORY / ADMINISTRATIVE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
watering uses and clarifies the requirements for out of stream uses.	flow	potential water users. Future, permitted, year around, consumptive uses, which are not eligible for the reservation, may obtain water through mitigation and transfers during the closure periods.	
Adjudication of water rights One or more persons claiming a right to divert water, or the Department of Ecology, can petition to conduct an adjudication of the water source. An adjudication would codify valid water rights for the water source. Under the adjudication process, Ecology must file with the Superior Court a report containing the names of all those claiming a right to use water, a description of the claim, and a brief statement of facts relating to each claim and water use. Those claiming a right to use water are defendants in the adjudication and bear the burden of proving their claimed right. At the end of the adjudication, the court issues a decree confirming water rights and describing the nature of those rights. Ecology then issues water right certificates that incorporate the court's findings. Water rights that are not confirmed by the court are lost or extinguished.	Determines the existence, amount and priorities of existing water rights, if such issues are in question for a water source		DOE
Assignment of a watermaster Water users in a basin, subbasin or other geographical area may request that Ecology assign a watermaster, who would be appointed,	Provides regulatory enforcement to ensure water rights are fulfilled appropriately with sufficient supply	In an adjudicated basin or subbasin, Ecology may appoint a 'stream patrolman' to regulate water use. A stream patrolman	DOE

Table B-3 REGULATORY / ADMINISTRATIVE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
compensated and supervised by Ecology. A watermaster controls the use of water in a designated water district by regulating headgates and reservoirs to prevent the use of water in excess of the amount to which water right holders are entitled.	Reduces loss to legitimate water right holders by illegal diversions	has the same powers as a water master, but the stream patrolman's jurisdiction is limited to the adjudicated stream.	
Increase enforcement against illegal water use within a basin or subbasin. Ecology would assign staff to focus on enforcement activities within a basin or subbasin identified by a watershed plan.	Provides regulatory enforcement to ensure water rights are fulfilled appropriately with sufficient supply Reduces loss to legitimate water right holders by illegal diversions	Potential legal and social ramifications of increased regulation on water users.	DOE
Evaluate existing water rights within a basin or subbasin (without an adjudication) Ecology would assign staff to determine if quantities of water allocated through water rights are being put to a beneficial use and over what time period; what rights have been partially or totally abandoned; and what rights have not been put to a beneficial use for a period of at least five consecutive years without sufficient cause. The information would be used to determine whether additional water resources would be available or not in the basin or subbasin, and if rights were eligible for relinquishment.	Accurate accounting of water may allow for future allocations for beneficial out-of-stream or instream uses Increases surface and ground water levels provided unused rights are relinquished	Potential legal and social ramifications of increased regulation on existing water right permittees	DOE
Evaluate tribal water rights claims within a basin or subbasin Indian tribes with treaties that reserved water rights in perpetuity may claim water rights within	Provides information necessary to settle tribal water rights claims Provides certainty for future water	Settlement of tribal water rights claims are often lengthy and costly and can become divisive.	Federal and Tribal governments

Table B-3 REGULATORY / ADMINISTRATIVE TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
a basin or subbasin. Tribal water right claims are usually asserted to protect tribal fishing rights and fish resources.	use if claims are settled Supports the protection and restoration of fish species		
Adopt rules and/or regulations regarding wells Chapter 90.44 RCW establishes an exemption from water right permitting requirements for ground water for: "stock watering purposes, for the watering of a lawn, of a noncommercial garden not exceeding one-half acre in area, for single, group domestic uses in an amount not exceeding 5000 gallons per day, or for an industrial purpose in an amount not exceeding 5000 gallons per day." Minimize the use of exempt wells; restrictions on the siting of wells in proximity to streams and/or restriction of the finished depth of new wells to the second aquifer unit or lower; restrictions on new exempt wells when water from a public water system is reasonably available to serve an affected property.	Reduces potential impairment to existing water rights Reduces impact of shallow groundwater withdrawals on surface water flows Increases documentation which would provide more information to assess current and future impacts on senior water rights	A person with an exempt well may apply for a water right permit. Ecology must review applications for water right permits, even exempt uses of water. The following criteria used in water right decisions are defined in *RCW 90.03.290*: *"…if it shall find that there is water available for appropriation for a beneficial use, and the appropriation thereof as proposed in the application will not impair existing rights or be detrimental to the public welfare…"*	Local governments / DOE
Extend public water system services into areas served by exempt wells Where adequate public water supplies are available, extend public water system services into areas served by exempt wells and require new developments to connect to the public water system.	Reduces impact to groundwater Reduces impact of shallow groundwater withdrawals on surface water flows	Landowners with existing exempt wells could be encouraged, but not required to connect to the public water system, unless the property owner chose to develop a new exempt well.	Local government/water management agency

Strategies and Tools for Surface Water Quality Issues

The state's surface water quality standards set limits on pollution in lakes, rivers and marine waters in order to protect water quality. Standards are designed to prevent pollution from chemicals, bacteria, toxics and other sources, as well as protect fish species that are sensitive to factors such as water temperature. The federal Clean Water Act (CWA) requires that the water quality standards protect beneficial uses, such as swimming, fishing, aquatic life habitat, and agricultural and drinking water supplies.

Pollution in a watershed can come from point and nonpoint sources. Point sources, such as direct discharges from wastewater treatment plants, irrigation return ditches, or industrial discharges, are regulated by discharge permits specific to the individual discharge. The discharge permits, regulated under the National Pollutant Discharge Elimination System (NPDES), set limits on the pollutant concentrations allowed in the discharge. Water quality issues attributable to direct discharges are generally addressed by the regulatory agency and the permit holder.

Nonpoint sources of pollution include run-off from land activities such as logging, urbanization, roads and agriculture. Nonpoint sources of pollution are difficult to identify and control since they are generated by a wide variety of sources, mostly individual actions. There are a variety of federal, state and local tools to assist in implementing projects that will improve nonpoint sources of pollution in a watershed, from changing agricultural, logging, and landscaping practices to collecting and treating runoff.

An index to the strategies and tools that can be used to address water quality issues is provided in Table 4-3 of the WRIA 35 Watershed Plan. These strategies and tools are described in detail with information on benefits, implementing party, and related social and technical issues in Table B-4.

Table B-4 WATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Develop a Total Maximum Daily Load (TMDL) Water Cleanup Plan A TMDL includes a technical study (assessment), an analysis of the data, an implementation plan, and a monitoring plan. The assessment of a water body is conducted to determine the amount of pollutant that the water body may accept and still meet water quality standards. The data analysis allows Ecology to determine how much reduction of a pollutant will be required to meet State standards. The implementation plan is a strategy used to manage the pollutant at its source. Finally, a monitoring plan is put in place to determine the efficacy of implementing the plan	Achieves compliance with State criteria for surface water quality	The entire process is estimated to take approximately five years from start to finish. A flexible schedule is allowed for TMDL compliance because non-point source implementation is not an exact science. Interim targets are compared to monitoring data at regular intervals, as the targets and data are compared, the progress toward improved water quality conditions is assessed, and adjustments or changes in the TMDL strategy are publicly discussed	DOE
Develop a Soil Water Assessment Tool (SWAT). Develop a model to analyze the erosion and sediment loading characteristics of the Basin as impacted by historical and current (or projected) agricultural practices.	Assesses positive impacts of implementing alternative agricultural management practices		Planning Unit, Conservation Districts

Table B-4 WATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Implement Irrigation Water Management by iImplementing delivery system improvements, irrigation scheduling and management, on-farm irrigation system upgrades/ conversions, constructing on-farm and off-farm sediment ponds	Reduces non-point source impacts		Landowners, Conservation Districts, NRCS
Implement cropland management activities such as implementing in-furrow residue placement, row crop erosion control and tillage management	Reduces non-point source impacts		Landowners, Conservation Districts, NRCS
Implement Agricultural Chemical Practices such as: Split Fertilizer Applications, Soil Fertility Testing, Pesticide Application Training, Pesticide Licensing Programs, Row Crop Soil Erosion Controls, Irrigation Water Management, Deep Percolation Evaluations, Wind Criteria for Pesticide Application	Reduces non-point source impacts		Landowners, Conservation Districts, NRCS, DOH
Implement Livestock Management Practices such as: providing technical/financial support to confined animal feeding operations (CAFO); NPDES Permitting of CAFOs; Dairy Permit Programs; voluntary fencing of streams And buffer strips near streams; participating in small landowner assistance programs; applying public land grazing programs; manure management; supporting conservation district efforts regarding dairies	Reduces non-point source impacts		Landowners, Conservation Districts, NRCS

Table B-4 WATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Implement Other Agricultural Controls/Practices such as conducting aquatic weed control evaluations, removing silt from canals/laterals, controlling canal weeds, conducing pesticide residue monitoring on aquatic life; conducting soil monitoring for pesticides	Reduces non-point source impacts		Landowners, Conservation Districts, NRCS
Implement BMPS on State, County, and City Roads Implement BMPs for road maintenance, grading and new construction; control chemical applications such as roadside spraying for weed control, de-icing to minimize water quality impacts	Reduces overall pollutant load from roads on water resources		State, County and City road departments
Plan/Implement Municipal Stormwater Runoff Control Develop municipal stormwater ordinances, regional stormwater runoff control guidelines, municipal stormwater control plans, regional stormwater impact assessments, urban/suburban land use awareness programs, transportation/deicing guidelines, hazardous household waste disposal sites and/or pickup programs	Reduces overall pollutant load on water resources		State, County and City governments
Plan/Implement Industrial Stormwater Runoff Control Develop industrial stormwater ordinances, regional industrial stormwater guidelines, industrial stormwater control plans, regional stormwater impact assessments	Reduces overall pollutant load on water resources		Applicable industries
Manage Urban Landscaping by developing ordinances, educational awareness programs, demonstration projects to encourage	Reduces runoff and overall pollutant load on water resources		Municipal governments, parks and recreation departments,

Table B-4 WATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
			water and wastewater utilities
Implement a pollution trading (credit) system for water to facilitate compliance with a Total Maximum Daily Load (TMDL). Under a pollution trading system, proponents of a new or expanding contaminant generating land or water use could receive a number of pollution "credits" by reducing a specific amount of existing contaminant loading to surface or ground water. The reduction in contamination load could be accomplished by modifying facilities owned by the proponent, by paying owners or operators of other contaminant generating facilities to make operational changes, or by purchasing and retiring contaminant generating facilities. The proponent can then redeem the "credits" for approval of the new or expanding contaminant generating land or water use, provide appropriate pollution controls were applied.	Provides additional flexibility in management of facilities	The transaction would need to result in a net reduction in contaminant loading within the area addressed by the trading system (more contaminant loading would be eliminated in obtaining credits than would be created by the new or expanding land or water use).	Washington Department of Ecology
Incorporate requirements for improving the quality of discharges from existing industries when issued State Waste Discharge Permits or National Pollutant Discharge Elimination System Permits (NPDES). Ecology would need to evaluate State Waste Discharge Permits and NPDES permits on a case-by-case basis to ensure that such requirements represent or incorporate all known, available, and reasonable methods of prevention, control and treatment. Should it be determined that additional increments of	Improves water quality		Washington Department of Ecology

Table B-4 WATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
prevention, treatment and control could reasonably be attained, permit requirements would be modified to help ensure that such incremental improvements would be achieved.			
Increase the level of inspection of commercial dairy operations and enforcement of water quality as appropriate. Ecology's Water Quality Program currently maintains a dairy inspection program to administer the provisions of the state's Dairy Nutrient Management Act (Chapter 90.64 RCW) and the wastewater discharge general permit for dairy farms issued under requirements of the Clean Water Act. The primary purpose of the inspection program is to prevent entry of wastes into waters of the state.	Improves water quality		Washington Department of Ecology

Strategies and Tools for Groundwater Management Issues

Management of groundwater as a resource is an important component of a watershed planning effort because it is heavily used as a source of water supply and can also affect stream flow where surface water is hydraulically connected to groundwater.

Groundwater management can have a significant effect on management of stream flows. Where groundwater is hydraulically connected with surface water, pumping of wells can reduce baseflows in nearby streams by reducing the water table gradient in the shallow aquifer. This is due to capture of groundwater that otherwise would have discharged to surface water. These types of effects are complex and vary according to many factors including the nature of the local hydrogeology and topography.

Most of the existing programs utilized for groundwater management are based on State and federal legislation designed to provide water quantity and/or quality protection. Regulatory programs such as Sole Source Aquifer Program (SSA), Aquifer Protection Areas (APA), and Growth Management Act Critical Areas, focus primarily on water quality issues and management.

An index to the strategies and tools that can be used to address water quality issues is provided in Table 4-4 of the WRIA 35 Watershed Plan. These strategies and tools are described in detail with information on benefits, implementing party, and related social and technical issues in Table B-5.

Table B-5 GROUNDWATER MANAGEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Develop a Groundwater Management Program (GWMP). RCW 90.44.00 through 90.44.440 enacted in 1985 provides the statutory mechanism for local agencies and groundwater user groups to initiate and develop Groundwater Management Programs (GWMP). The purpose of the law is to identify groundwater management procedures that are consistent with both local and State water resource policies and management objectives, including protection of water quality, assurance of quantity and efficient management of water resources to meet future needs.	Allows a better understanding of an area's groundwater system identifies existing and potential problems develop the management program to address the problems	Ecology considers several criteria to evaluate whether GWMA designation is to be granted. These criteria include: (1) Areas where groundwater quality is susceptible to contamination; (2) aquifers that are declining due to limited recharge or over-utilization; (3) aquifers that have been over-appropriated; (4) aquifers designated as "sole source aquifers" by EPA; (5) aquifers designated as the primary source of a public water supply; and (6) aquifer for which an approved Coordinated Water System Plan has identified a need for a groundwater management program.	Planning Unit, local governments, Conservation Districts, Washington Department of Ecology
Implement water demand reduction strategies (see specific recommendations under Table X-1, Water Conservation Tools) Water conservation refers to the beneficial reduction of water use, loss, or waste. Conservation measures can be implemented within the municipal, industrial, and agricultural sectors. Water reclamation and reuse refers to the capture, treatment, and reuse of water typically for	Benefits both surface and groundwater management by reducing demand on groundwater resources Reduces pumping rates Delays or eliminates needs to expand or develop new sources of supply to meet demand	The Washington State Department of Health (DOH) requires a water conservation plan from public water systems as a condition for approval of water system plans and issuance of new water rights permits..	Landowners, agricultural producers, irrigation districts, industry, municipal water users, governments

Table B-5 GROUNDWATER MANAGEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
non-potable purposes.			
Implement recharge enhancement with shallow aquifer recharge (SAR) projects Shallow Aquifer Recharge (SAR) assumes that the capture of winter-spring peak flows can be used to successfully recharge a portion of the depleted shallow aquifer system and at least locally provide benefit to the interconnected groundwater and surface water system. The concept of SAR essentially attempts to mimic the natural water cycle as it existed historically in the Basin prior to river channelization, implementation of irrigation efficiency projects (e.g.,, ditch lining and piping that reduce groundwater recharge), and the advent of significant groundwater and surface water use.	potentially recharges shallow groundwater potentially reverses trends seen in declining spring creek flows increases stream baseflows decreases water temperatures	The State of Washington Growth Management Act (GMA) requires each county in the state of Washington to designate critical areas and to prepare critical areas ordinances (CAO). CAOs regulate activities in critical areas including, among other things, areas with a critical recharging effect on aquifers used for potable water, otherwise known as Critical Aquifer Recharge Areas (CARA). CARAs are required to be classified, designated, and regulated when a municipality (e.g., a city, a county, a water district) has aquifer recharge areas within its boundaries (RCW 36.70A).	
Implement recharge enhancement with aquifer storage and recovery (ASR) In areas where water availability is limited on a seasonal basis, excess water can be injected or infiltrated into groundwater aquifers during wet periods and then withdrawn during dry periods to aid in meeting water demands.	Reduces and/or potentially reverses rate of water level declines in aquifer Optimizes use of existing water resources		
Implement Water Rights Transfers (see specific recommendations under Table X-3, Regulatory/Administrative Tools)	Redirects water use from less valued applications to more valued ones		

Table B-5 GROUNDWATER MANAGEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Identify opportunities for groundwater rights transfers/purchase/lease and streamlining the process. This strategy involves changing an existing water right to meet needs associated with a different use or a different location than originally defined in the water right. Transfers (also known as water right changes) do not increase the overall amount of water being used in a basin; rather, they can modify where, how, and when the water is used.	accommodates future supply needs without a net increase in consumptive appropriations		

Table B-5 GROUNDWATER MANAGEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Pursue regional coordination Develop regional coordination of groundwater use and development. The coordination effort should identify actions, strategies, roles and responsibilities for improving surface and groundwater monitoring, management and conservation, conjunctive use strategies and updating regional coordination efforts. The focus of regional coordination should be on developing a well-managed supply diversion program.	optimizes the use and development of the groundwater resource and integrate the supply plans (including water conservation) of major purveyors with other users (e.g., smaller communities, large industries, and developments).	Coordination efforts should encourage new urban or suburban developments or industrial facilities that require new or expanded water supplies obtain water from existing municipal or other water suppliers rather than developing separate sources of supply	
Conduct groundwater monitoring program, including development of a groundwater model A groundwater model should be developed which effectively simulates the gravel and basalt aquifer systems. Potential components of a groundwater model would include to: (1) estimate of the amount of water available from the aquifer supporting well sources; (2) evaluation of the recharge capacity of the aquifer; (3) identification of recharge rates and operational scenarios to maximize aquifer storage capacity; and (4) recommendations for use of the model as a basis for future groundwater management evaluation The information generated from the monitoring program can be used to refine the model and the input data. An adaptive management program should be developed to integrate information collected under monitoring network and modeling efforts into the comprehensive management strategy.	Develops a better understanding of surface / groundwater interactions Can be used to simulate the long-term impacts of aquifer storage recharge projects and the response of the aquifer to continued long-term withdrawals Can be used to evaluate impacts of different water use scenarios or trends Can be used to establish water budget for demands from groundwater system	A large network of wells for water level monitoring would be needed throughout the basin for both the gravel and basalt aquifers. As part of this effort, well discharges should also be monitored.	

Table B-5 GROUNDWATER MANAGEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Conduct a hydrogeologic study. Develop a better understanding of surface /groundwater interaction by conducting a hydrogeologic study. A study should focus on characterizing hydraulic continuity in the basin. As part of this effort, stream flows should continue to be monitored to assess surface water and groundwater relationships.			

Strategies & Tools for Groundwater Quality Issues

A number of federal environmental laws are directly or indirectly designed to protect groundwater from contamination. Examples of these laws include the Safe Drinking Water Act (SDWA); Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and Toxic Substances Control Act (TSCA). In most cases, state agencies are responsible for promulgating regulations in the state of Washington in accordance with these federal laws. Examples of state agencies with regulatory authority to protect groundwater quality under the aforementioned federal laws include the Washington State Department of Health (DOH), Ecology, and Washington State Department of Agriculture (WSDA).

Ecology has several programs related to groundwater quality protection. Examples include the Aquifer Vulnerability Project under the Water Quality Program and the Underground Injection Control Program (UIC). The purpose of the Aquifer Vulnerability Project is to develop a method for identifying areas of the state that are vulnerable to groundwater contamination and assess areas of the state that are relatively more vulnerable to groundwater contamination from pesticides to support the proposed State Pesticide Management Plan. The UIC program protects groundwater quality by regulating the disposal of fluids into the subsurface. Most UIC wells or injection wells are simple devices that allow fluids into the shallow subsurface under the force of gravity.

The potential for groundwater contamination from UIC wells can occur and is dependent on the well construction and location, the volume and quality of the fluids injected and the hydrogeologic setting.

WSDA is currently developing a statewide pesticide management plan to address the potential for pesticide occurrences in groundwater. Development of this plan is being driven by several state and federal initiatives designed to protect groundwater quality from the unintended movement of pesticides resulting from labeled agricultural and urban use.

Existing statewide regulations have limitations, which occasionally fail to protect groundwater from contamination. Local government agencies often need to develop and implement a groundwater management program to address the limitations of the regulations.

An index to the strategies and tools that can be used to address water quality issues is provided in Table 4-5. These strategies and tools are described in detail with information on benefits, costs, implementing party, and related social and technical issues in Appendix B.

Table B-6 GROUNDWATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Conduct "level 1" risk assessment. Develop land use and hydrogeologic screening criteria. Evaluate existing databases and develop GIS database in coordination with Ecology, DOH, and county governments. Produce regional maps showing results of risk assessment.	Assesses susceptibility of groundwater supplies to contamination on a regional basis		Planning Unit, local governments
Identify land use activities and contaminants to be addressed with technical management strategies Land use activities and contaminants of concern will depend on region specific groundwater quality results obtained from the assessment and monitoring actions.	Assesses susceptibility of groundwater supplies to contamination on a regional basis		Planning Unit, local governments
Enforce Wellhead Protection Program requirements for all Group A Public Water Systems (PWS)	Provides protection for groundwater sources for public health and safety		Washington Department of Health
Encourage Group B Public Water Systems to voluntarily establish a wellhead protection program Group B PWSs are not required to conduct wellhead protection under current regulations. Encourage entities to prepare a simplified wellhead protection plan.	Provides protection for groundwater sources for public health and safety		Washington Department of Health
Select and implement technical management strategies based on assessment findings	Minimizes impacts of land use activities on groundwater supplies		Landowners, local governments, conservation districts

Table B-6 GROUNDWATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
For example, strategies could include implementation of BMPs for fertilizer and pesticide application, irrigation management practices, and manure handling, establishment of guidelines to limit septic system densities in new developments; extension of sewer lines to areas with septic systems; establishment of more stringent guidelines for land application of wastewater and on-site disposal of non-domestic wastewater from industrial facilities.			
Evaluate the need for greater involvement of stakeholders in cleanup actions at Ecology-regulated facilities and sites Work with Ecology to ensure that remediation actions are sufficient to protect existing and future groundwater supplies. Ecology should notify implementing agency where proposed remediation actions may not restore groundwater to concentrations below MCLs (maximum concentration levels).	Assists with cleanup of sources of groundwater contamination		Washington Department of Ecology, Planning Unit, local governments, landowners, conservation districts
Evaluate the need for independent cleanup actions Investigate potential for providing technical /financial assistance to remove source of contamination associated with Ecology cleanup programs, e.g., septic systems, agricultural operations, etc.	Assists with cleanup of sources of groundwater contamination		Planning Unit, local governments
Provide oversight for well decommissions to ensure decommissions consistent with safe practices	Provides protection for groundwater sources for public health and safety		Washington Department of Ecology
Assess drinking water supplies that are	Provides protection for		Planning Unit,

Table B-6 GROUNDWATER QUALITY TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
unprotected and "at risk" of becoming impacted in the future Further assessment should focus on those areas in which development has occurred or is likely to occur within the Planning Unit's 20 year planning horizon. Since future wellhead placement may not occur near or within existing developed land or on land proposed for future development, the assessment focus should be on the protection of currently undeveloped areas slated for future groundwater production.	groundwater sources for public health and safety		Washington Department of Health
Develop and implement management protocols of unprotected groundwater sources located outside the service areas of large and medium water purveyors Technical and/or financial assistance should be provided to these small systems to complete formal or informal wellhead protection activities. Assistance should be concentrated in areas with groundwater supplies that are already impacted or "at risk" of becoming impacted in the future.	Provides protection for groundwater sources for public health and safety		Planning Unit, Washington Department of Health

Strategies and Tools for Aquatic Habitat Issues

If initiating governments choose to include a habitat component in their watershed plan, the plan must be coordinated or developed in a manner that serves to protect or enhance fish habitat in the WRIA. Planning activities under Chapter 90.82 RCW must also be integrated with strategies developed as part of other processes undertaken in response to potential or actual listing of salmon and other fish species as being threatened or endangered under the federal Endangered Species Act. In WRIAs where habitat restoration activities are being developed and implemented under the Salmon Recovery Act (Chapter 77.85 RCW), such activities must be relied upon as the primary nonregulatory habitat component for fish habitat in the watershed plan.

An index to the strategies and tools that can be used to address aquatic habitat issues is provided in Table 4-6 of the WRIA 35 Watershed Plan. These strategies and tools are described in detail in Table B-???.

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Encourage landowner participation in the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. The program is a partnership among producers; tribal, state, and federal governments; and, in some cases, private groups. CREP addresses high-priority conservation issues of both local and national significance, such as impacts to water supplies, loss of critical habitat for threatened and endangered wildlife species, soil erosion, and reduced habitat for fish populations such as salmon. CREP is a community-based, results-oriented effort centered on local participation and leadership.	Supplements farm income for participants. CREP provides payments to participants who offer eligible land. A federal annual rental rate, including an FSA state committee-determined maintenance incentive payment, is offered, plus cost-share of up to 50 percent of the eligible costs to install the practice. Further, the program generally offers a sign-up incentive for participants to install specific practices. Enrollment can be on a continuous basis, allowing landowners to join the program at any time rather than waiting for specific sign-up periods Supports increased conservation practices Protects streams, lakes, and rivers from sedimentation and agricultural runoff Helps landowners develop and restore wetlands through the planting of appropriate	CREP: Enrollment in a state is limited to specific geographic areas and practices. Land must be owned or leased for at least one year prior to enrollment to be eligible, and must be physically and legally capable of being cropped in a normal manner. Land must also meet cropping history and other eligibility requirements CREP contracts require a 10- to 15-year commitment to keep lands out of agricultural production.	USDA Farm Service Agency (FSA); private landowners.

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
	groundcover Annual monitoring measures progress		
Encourage landowner participation in the Environmental Quality Incentives Program (EQIP). EQIP was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. EQIP may provide cost-sharing of up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource	Supplements farm income for participating landowners Reduces non-point source pollution, such as nutrients, sediment, pesticides, or excess salinity in impaired watersheds, consistent with Total Maximum Daily Loads (TMDLs) Reduces groundwater contamination Conserves ground and surface water resources Reduces emissions, such as particulate matter, nitrogen oxides (NOx), volatile organic compounds, and ozone precursors and depleters that contribute to air quality impairment violations of National Ambient Air Quality Standards	Contracts are a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.	USDA Natural Resource Conservation Service (NRCS); private landowners

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance.	Reduces soil erosion and sedimentation on agricultural land Promotes habitat conservation for at-risk species		
Encourage landowner participation in the Wetlands Reserve Program (WRP). The Wetlands Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Landowners are provided technical and financial support for their wetland restoration efforts in exchange for retiring marginal land from agricultural production. The goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. The program offers three enrollment options: *Permanent Easement*. This is a conservation easement in perpetuity. Easement payments for this option equal the lowest of three amounts: the agricultural value of the land, an established payment cap, or an amount offered by the landowner. In addition to paying for the easement, USDA pays 100 percent of the costs of restoring the wetland. *30-Year Easement*. Easement payments through this option are 75 percent of what would be paid for a permanent easement.	Supplements farm income for participating landowners Improves wetland functions Improves fish and wildlife habitat Improves water quality by filtering chemicals and sediment Reduces downstream flooding Increases groundwater recharge Protects biological diversity Establishes long-term conservation and wildlife practices and protection on private lands	To offer a conservation easement, the landowner must have owned the land for at least 12 months prior to enrolling it in the program, unless the land was inherited, the landowner exercised the landowner's right of redemption after foreclosure, or the landowner can prove the land was not obtained for the purpose of enrolling it in the program. To participate in a restoration cost-share agreement, the landowner must show evidence of ownership. To be eligible for WRP, land must be restorable and be suitable for wildlife benefits. This includes: Wetlands farmed under natural conditions; farmed wetlands; prior converted cropland;	USDA Natural Resource Conservation Service (NRCS); private landowners

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
USDA also pays up to 75 percent of restoration costs. For both permanent and 30-year easements, USDA pays all costs associated with recording the easement in the local land records office, including recording fees, charges for abstracts, survey and appraisal fees, and title insurance. *Restoration Cost-Share Agreement*. This is an agreement (generally for a minimum of 10 years) to re-establish degraded or lost wetland habitat. USDA pays up to 75 percent of the cost of the restoration activity. This enrollment option does not place an easement on the property. Other agencies, conservation districts, and private conservation organizations may provide additional incentive payments as a way to reduce the landowner's share of the costs. Such special partnership efforts are encouraged.		farmed wetland pasture; farmland that has become a wetland as a result of flooding; range land, pasture, or production forest land where the hydrology has been significantly degraded and can be restored; riparian areas which link protected wetlands; lands adjacent to protected wetlands that contribute significantly to wetland functions and values; and previously restored wetlands that need long-term protection. *Ineligible Land*. Ineligible land includes wetlands converted after December 23, 1985; lands with timber stands established under a Conservation Reserve Program contract; Federal lands; and lands where conditions make restoration impossible. The Adjusted Gross Income provision of the 2002 Farm Bill impacts eligibility for WRP and several other 2002 Farm Bill	

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		programs. Individuals or entities that have an average adjusted gross income exceeding $2.5 million for the three tax years immediately preceding the year the contract is approved are not eligible to receive program benefits or payments. However, an exemption is provided for cases where 75 % of the adjusted gross income is derived from farming, ranching, or forestry operations. Compatible uses are allowed if they are fully consistent with the protection and enhancement of the wetland.	
Implement fish habitat improvement projects involving construction or placement of structures within the waterway, such as cross vanes, vortex weirs, large woody debris, fish screens, or side-channels. Fish habitat enhancement projects are defined as projects that accomplish one or more of the following tasks: (i) Elimination of human-made fish passage barriers, including culvert repair and replacement; (ii) Restoration of an eroded or	Improves quality and quantity of aquatic habitat May reconnect hydrology of floodplain with side channels and off-channel habitats	Chapter 77.55 RCW requires that any person or agency proposing to conduct construction activities or perform any other work that will use, divert, obstruct, or change the flow or bed of waters of the state must obtain a Hydraulic Project Approval (HPA) from the Washington Department of Fish and	Conservation Districts, landowners state and federal land management agencies, fish and wildlife agencies, Indian tribes

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
unstable stream bank employing the principle of bioengineering, including limited use of rock as a stabilization only at the toe of the bank, and with primary emphasis on using native vegetation to control the erosive forces of flowing water; or (iii) Placement of woody debris or other instream structures that benefit naturally reproducing fish stocks (RCW 70.55.290). Chapter 77.55 RCW establishes a streamlined permitting process for fish habitat enhancement projects that exempts such projects from environmental review requirements of the State Environmental Policy Act (Chapter 43.21C RCW) and that precludes local governments from requiring permits or charging fees. If WDFW determines that a project meets the criteria for a fish habitat enhancement project, local governments are provided with a 15-day comment period within which to provide input to the Department of Fish & Wildlife (RCW 77.55.290). A special addition to the Joint Aquatic Permits Application (JARPA) form has been developed for use in the streamlined process for fish habitat enhancement projects.		Wildlife. Special provisions are contained in Chapter 77.55 RCW for approval of fish habitat enhancement projects. Approval of such projects can be accomplished though a number of means including, but not limited to: By WDFW under provisions of the Salmon Enhancement Program (Chapter 77.95 RCW) or the Volunteer Fish and Wildlife Enhancement Program (Chapter 77.100 RCW); by WDFW as a department-sponsored fish habitat enhancement of restoration project; by the sponsor of a Watershed Restoration Plan developed pursuant to Chapter 89.08 RCW; through the review and approval process for the Jobs for the Environment Program; through the review and approval process for conservation district-sponsored projects, where the project complies with	

Table B-7 HABITAT ENHANCEMENT TOOLS			
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		design standards established by the state Conservation Commission through interagency agreement with the USFWS and NRCS (Chapter 77.55.290); or through a formal grant program established by the legislature or by the Department of Fish and Wildlife for fish habitat enhancement or restoration (RCW 77.55.290).	
Construct pool and riffle habitat using in-stream modifications. Where opportunities exist, work on public, federal, state, tribal and private lands can be conducted to increase the quantity of pools and gravel dominated riffles (as opposed to cobble). Pools can be constructed by direct intervention, often concurrently with work to restore channel form and function, and the quantity of gravel dominated riffles can be improved by decreasing channel slope, reducing entrenchment and confinement, and restoring pool/riffle sequencing.	Corrects past straightening or entrenchment activities, and improves complexity of aquatic habitat conditions Increases aquatic habitat Increases pools and riffle habitat.		Conservation Districts, state and federal land management agencies, fish and wildlife agencies, Indian tribes
Implement habitat improvement projects involving out-of-stream riparian restoration or enhancement, such as replanting or bank stabilization projects. Bioengineering methodologies can be incorporated into bank stabilization projects.	Reduces bank erosion and sediment loading Increases cover and shading of aquatic habitat	If project is implemented on private lands, cooperation with the landowner is crucial to the implementation and long-term success of the project.	Conservation Districts, state and federal land management agencies, fish and wildlife agencies, Indian tribes

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Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Projects can include planting of various native grass, shrub, and tree species, and may also involve bioengineering techniques, such as the use of willow bundles.	Improves recruitment of large woody debris		
Implement habitat improvement projects intended to "daylight" streams currently contained within enclosed channels. Some stream reaches have been placed in enclosed channels or piping systems. Such actions have been undertaken for various reasons, usually associated with land development activities. As a result of these types of actions, portions of the streams' aquatic and riparian habitats have been destroyed and, in some cases, fish migration has been impaired. 'Daylighting' describes projects that deliberately expose some or all of the flow of a previously covered river, creek, or stormwater drainage. Daylighting projects liberate waterways that were buried in culverts or pipes, covered by decks, or otherwise removed from view. Daylighting reestablishes a waterway in its old channel where feasible. Some daylighting projects re-create wetlands, ponds, or estuaries.	Restores aquatic and riparian habitat to reestablish natural function	If project is implemented on private lands, cooperation with the landowner is crucial to the success of the project	Conservation Districts, state and federal land management agencies, fish and wildlife agencies, Indian tribes
Restore natural floodplain function in channelized stream reaches. Excavate a channel with natural alignment and geometry and revegetate riparian buffers.	Reestablishes stream and riparian habitat characteristics Reintroduces meander and flow	If project is implemented on private lands, cooperation with the landowner is crucial to the success of the project	Conservation Districts, state and federal land management agencies, fish and wildlife agencies, Indian tribes
Move river dikes back from existing river channels to allow for floodplain restoration and channel maintenance.	Reconnects the channel to the floodplain, side channels and/or off-channel habitats	If project is implemented on private lands, cooperation with the landowner is crucial to the	Conservation Districts, state and federal land management agencies,

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Diking can disconnect the channel from its floodplain, side-channels, and off-channel habitats may adversely affect fish habitat. Through removal of existing dikes and their relocation further landward, a river or stream can be allowed to reestablish more natural and proper floodplain function within the dikes.	Restores/Improves fish habitat within the dikes Reestablishes floodplain function within the dikes	success of the project. Benefits are limited to the area within the dikes, which may (or may not) encompass all of the original floodplain.	fish and wildlife agencies, Indian tribes
Plant native vegetation in riparian areas; plant native conifers and other large woody trees in the riparian area to establish shade, erosion control and provide future woody debris recruitment.	Enhances riparian function, including erosion control Establishes a source of natural woody debris for future recruitment Reestablishes native vegetation and riparian habitat		Conservation Districts, landowners, WDFW, Indian tribes
Fence riparian areas to keep cattle away from stream channel.	Reduces erosion of stream banks into streams Reduces pollutant loading into streams Protects riparian vegetation	Conservation districts can assist landowners with development of alternative water sources	Conservation Districts, landowners, Indian tribes
Manage grazing in riparian areas following grazing plans designed to improve riparian condition; could include exclusion, partial season use, development of off-site water, herding, salting, rest-rotation, etc. Develop alternative water sources for livestock.	Reduces pressure on streams for water		Conservation Districts, federal land management agencies, landowners, Indian tribes
Remove or replace bridges, culverts, roadways, and other infrastructure as	Reduces sediment loading into streams from road runoff		Local governments, transportation agencies,

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
necessary to eliminate or reduce their impacts as fish passage obstructions and/or channel constrictions.	Improves aquatic habitat Improves fish passage		federal land management areas, Indian tribes
Construct fish passage facilities where such facilities do not currently exist.	Improves successful fish passage Allows fish access to additional potential habitat		State and federal land management agecies, WDFW, Indian tribes
Relocate campgrounds further from stream edges where assessments show potential for erosion and other adverse effects.	Reduces sediment loading into streams from recreation activities Protects riparian vegetation and habitat Reduces fecal input from campground waste facilities into streams	Availability of suitable campsites can restrict relocation opportunities. Frequent campground visitors may not support changes to location.	State and federal recreation management agencies.
Implement integrated noxious weed management program including survey, prevention practices, education, treatment and revegetation. Conduct weed control in riparian areas	Improves native vegetation communities		Counties, state, federal transportation managers
Update Wildlife Area Management Plans to support riparian enhancement priorities.	Improves riparian function		Fish and wildlife management agencies, land management agencies.

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Implement BMP's to protect and enhance watersheds with ESA listed steelhead and chinook.	Improves habitat conditions for ESA listed fish species Cost-share can be utilized from federal and state agencies as a match to BPA Funds to implement riparian buffers		Conservation District
Acquire conservation easements to protect and restore fish bearing streams and/or spring fed tributaries.	Improves aquatic habitat for area protected by easement	Both federal, state, local, and tribal government as well as private organization can acquire lands through purchase, donation, or other means for protection of fish and wildlife habitat. This includes lands along rivers, lakes, or estuaries or lands containing valuable wetland complexes. Conservation easements can be a less expensive option to outright purchase. Under conservation easements, property owners retain rights to use portions of their property, but set aside critical habitat areas, such as shoreline areas or buffers, for non-use and retention of their natural state. Unless conducted on a broad stream or watershed scale, protection may be piecemeal	Conservation districts, fish and wildlife agencies, Indian tribes, private entities

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
		and ineffective.	
Amend or modify plans/ordinances to protect habitat or control floodplain development to protect habitat and control floodplain development.	Protects existing habitat Protects existing floodplain capacity to provide flood control	Provides protection against some types of future development, but does not address past activities or existing development.	Local governments
Continue Operation and Maintenance (O&M) activities associated with past habitat improvement projects. Includes maintenance of stream improvement and water control structures.	Provides information to assist future habitat improvement projects and revise adaptive management of past projects		Initiating party of original project; conservation districts, land management agencies; fish and wildlife agencies
Replace open ditch conveyance systems for irrigation with lined ditches or piping.	Reducing the quantity of irrigation water lost in conveyance can result in more water left in streams and rivers, improving adult and juvenile passage for ESA-listed species, lowering water temperatures, and increasing instream flow	The purpose of the project must be clearly defined, as Increasing the efficiency of the conveyance system could be used to make additional water available for irrigation rather than instream flow.	Irrigation districts, fish and wildlife agencies
Improve irrigation diversions to enhance fish passage and provide more effective fish screening	Improves adult and juvenile passage and reduces juvenile irrigation entrainment mortality for ESA listed species		Irrigation districts, fish and wildlife agencies
Install a screened lift pump system at irrigation diversions. Replace gravel push up dams with a lift pump system which incorporates a compliant fish screen.	Improves adult and juvenile passage and reduces juvenile irrigation entrainment mortality for ESA listed species		Irrigation districts, fish and wildlife agencies

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Plant native grasses and shrubs along rural roads.	Reduces erosion from cutbanks Increases stream shade within riparian areas		Federal and state land management agencies, counties
Plant native grasses and shrubs within timber sale boundaries and roads.	Reduces erosion Increases stream shade within riparian areas		Federal land management agencies
Develop a Habitat Conservation Plan (HCP) prepared under provisions of Section 10 (16 U.S.C. 1539) of the Endangered Species Act. Nonfederal entities such as private landowners or state and local governments can prepare Habitat Conservation Plans to address an otherwise lawful project or land or water use activity (for example, agriculture or forestry) that might result in the unintentional take of a listed species. A plan must describe the anticipated impact of a proposed taking on the affected species, how the take will be minimized and mitigated, and how mitigation measures will be funded.	Provides an Incidental Take Permit for landowners (e.g. protection against liability for "taking" listed species within the activities approved in the plan) Provides assurances that mitigation measures to protect/enhance the listed species will be conducted over a specified period of time Reduces uncertainty in impacts to endangered species	A Habitat Conservation Plan must gain approval of the Fish and Wildlife Service or NOAA Fisheries, as applicable. Based on the approved Habitat Conservation Plan, the private landowner or government is authorized to incidentally take listed species through any activity that is undertaken in a manner consistent with the plan. This authorization is authorized through an Incidental Take Permit. A Habitat Conservation Plan applicant can also negotiate for long term regulatory assurances that no additional mitigation measures will be required over the life of the project or activity, provided the plan is properly	State government, local government, landowners, conservation districts, irrigation districts.

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
		implemented.	
Develop a Habitat Incentives Program under Chapter 77.55 RCW. The program allows a private landowner to enter into an agreement with either or both the Washington Department of Fish and Wildlife and Washington State Department of Natural Resources to enhance fish or wildlife habitat on private land in exchange for regulatory certainty with regard to future applications for an HPA or Forest Practices Permits on the property covered by the agreement.	Provides increased operational certainty for landowners Improves habitat conditions for fish and wildlife	A single agreement can encompass up to 1,000 acres. A private landowner can enter into multiple agreements provided the total acreage covered under the agreements does not exceed 10,000 acres (RCW 77.55.280).	State fish and wildlife agency, state department of natural resources
Develop local government regulations or programs to control sources of sediment that are not addressed through critical areas ordinances or other existing regulations and programs. This alternative may involve amending existing critical areas ordinances or grading and filling ordinances, creation of new ordinances, or development of educational programs to provide control over erosion and sedimentation sources that are not currently addressed.	Increases control over erosion and sediment sources Increases conservation of critical areas		Local governments
Integrate habitat improvement planning into flood hazard reduction plans. Concepts such as restoration of floodplain function, preservation or reestablishment of natural riparian habitat, and preservation of riparian wetland functions could be integrated into flood hazard reduction planning to improve riparian and aquatic habitat within the floodplain.	Restores floodplain function Improves riparian habitat		Local governments
Support implementation of the	Provides compliance with the	Most of the findings of the	State and federal forest

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
recommendations of Washington's Forest and Fish Report. Provide assistance in gaining public and landowner support for implementation of the Forest and Fish Report recommendations through outreach activities and other appropriate measures. The Report is a compilation of biologically sound and economically practical solutions that will improve and protect riparian habitat on non-federal forest lands in the State of Washington. Among the provisions of the Forest Practices Act (Chapter 76.09 RCW) are requirements for improved road culverts to facilitate fish passage, enhanced road construction practices to reduce erosion and sedimentation, and enlarged stream buffers to provide better shading (Washington Forest Protection Association 2002).	Endangered Species Act for aquatic and riparian-dependent species on non-federal forest lands Restores and maintains riparian habitat on non-federal forest lands Meets the requirements of the Clean Water Act for water quality on non-federal forest lands	Forest and Fish Report have been codified as part of the state's Forest Practices Act (Chapter 76.09 RCW), administered by the Department of Natural Resources. Recognizing that implementation of the Forests and Fish Law provisions may be burdensome to small family-owned forest operations, the legislature authorized establishment of a Small Forest Landowner Office within DNR. This was accomplished through amendment of a code related to the Forest Practices Act (Chapter 76.13 RCW, Stewardship of Non- industrial Forests and Woodlands). The Small Forest Landowners Office provides technical assistance to small forestland holders in developing management and harvest plans. The office also promotes, implements, and manages the *Forestry Riparian Easement*	management agencies, Forestry Industry, landowners, Indian tribes, Planning Unit

Table B-7 HABITAT ENHANCEMENT TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
		Program (Chapter 76.13.120). The Forestry Riparian Easement Program partially compensates eligible small forest landowners in exchange for a 50- year easement for timber left unharvested near a river, lake, or wetland.	
Re-establish historic wet meadow complexes where feasible.	Restores or enhances wetlands Improves fish and wildlife habitat		Conservation districts, NRCS, private landowners

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Surface and Groundwater Quality Monitoring			
Conduct water quality monitoring programs, including installation and maintenance of monitoring devices, to measure the extent of non-point source pollution and/or measure the effectiveness of non-point source pollution control measures.	Understand water quality condition of critical water bodies Assist land and water managers with setting management protocols and goals Measures progress of watershed restoration activities	N/A	Federal, State, Local Governments, Conservation Districts, Water Purveyors, Watershed Councils
Evaluate TMDL implementation. Once a TMDL has been completed and has begun being implemented, a regular evaluation can be made to determine if voluntary measure to implement controls on non-point sources of pollution are being done, as stated. Also, the study would monitor if the measures were effective in reducing load on the water body.	Assists land and water managers with setting management protocols and goals Measures progress of watershed restoration activities	Implementation activities recommended under TMDLs are voluntary for control of non-point source pollution. There may be constraints to implementation due to cost and/or impacts to landowners.	State and Local governments, Conservation Districts, Watershed Councils

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Monitor impacts to groundwater supplies Groundwater monitoring would be based on a multi-faceted approach. 1. Evaluate availability and usefulness of existing groundwater quality monitoring data. Include a review of whether new monitoring programs need to be established and integrate any data collected from Ecology-regulated sites and facilities. 2. Establish short-term monitoring approach to determine baseline conditions. Implement a one-time monitoring event with a large number of monitoring locations including household wells and verify well-completion details at monitoring locations. 3. Establish long-term monitoring approach to detect impacted groundwater supplies. Develop periodic monitoring events at a reduced number of locations used in the baseline assessment (2); and target "at-risk" sites from the assessment in (1). 4. Establish a long-term monitoring approach to evaluate performance of implemented management strategies. All implemented management strategies should include long-term monitoring to conduct performance evaluations.	Understand water quality condition of ground water resources Assist land and water managers with setting management protocols and goals Measures progress of watershed restoration activities	Utilize technical expertise from Ecology, DOH, and USGS.	Federal, State, Local Governments, Conservation Districts, Water Purveyors, Watershed Councils
Water Quantity Monitoring			
Analyze baseline water conditions in the watershed. Included in the baseline would be a water budget for applicable water bodies, which would include an inventory of all water sources, such as springs, wells, and surface flows. Also included would be all pertinent information	Assists land and water managers with setting management protocols and goals	This information would be most useful if stored, maintained and updated by one entity to ensure quality control of the data.	Federal, State, Local Governments, Conservation Districts, Water Purveyors, Watershed Councils

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
regarding surface water, groundwater and biological communities. Other information would include water used for temporary (drought) emergencies, exempt wells, tribal trust purposes, wildlife refuges, storage projects, supplementation and substitution.			
Monitor current water permitting system for the watershed. Once priorities for instream flow and water use have been established in the watershed, an evaluation can be made to determine if permitting actions are meeting established targets.	Assist in understanding of impacts of individual permits and at programmatic level on instream flows, tribal rights and fishery habitat	Agencies such as U.S. Fish and Wildlife Service, NOAA Fisheries, and affected Indian tribes will likely request consultation on new applications for permit, which may impact surface flows and focal fish species.	State governments
Monitor stored water levels. Monitor storage right to store water in those months that water is available based on an exceedence analysis.	Assists in providing consistency of flows for focal fish species	Requires coordination and cooperation from water storage principals.	Federal and state governments, conservation districts
Monitor groundwater use. Use U.S. Geologic Survey regional numerical flow model to develop a plan to monitor well drawdowns and surface water interference and for recovery of groundwater resources, if applicable. Monitor any new permits that would exceed limits reached, and whether recovery goals have been met. Prior to implementation of this monitoring tool, as assessment of groundwater resources and connectivity between surface and groundwater would be made to understand overall contribution of groundwater to surface flows. The assessment	Assist in understanding of impacts to surface water from well drawdowns	In Washington state, a hydraulic connection between ground water and surface water is presumed as a matter of course. Thus when the state closes surface waters in a watershed to further appropriation, it closes the groundwater at the same time.	Federal, state, local governments, conservation districts.

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
would also include an evaluation of aquifer capacity, depletion rates, and recharge.			
Monitor water meters. Meters measure the rate and duty of water at the point of diversion. An evaluation of meters would be valuable in providing information for a baseline inventory of water uses, losses and the efficacy of watershed projects designed to recover flows.	Assists in the development of water use inventory and water budget Assists water managers with setting management protocols and goals		State governments (watermaster), landowners
Monitor existing water rights. An ongoing monitoring program of all water rights (including municipal) and inchoate (allocated but not yet put to use) water rights would assess whether rights are not in use, real v. paper water, availability of surface flows for instream/beneficial purposes, determine season of use trends, and potential eligibility of water available for instream flow dedication as trust water.	Assists in the development of water use inventory and water budget Assists water managers with setting management protocols and goals	The evaluation of water rights may be of concern to local water rights holders.	State governments (watermaster), landowners
Analyze outstanding water rights applications on file with state water agency. An analysis of outstanding water right applications on file with state water agencies can assess whether the applicants are still interested in pursuing their projects. There are applications submitted over time but not finalized or used and thus may not accurately reflect the current demand for water. The analysis can be organized by geographic area, proposed types and seasons of use, quantities requested, quantities likely to be awarded, etc.	Assists in the development of water use inventory and water budget Assists water managers with setting management protocols and goals based on actual demand	Landowners may not be willing to withdraw outstanding applications.	State governments (watermaster)

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
Water Conservation Monitoring			
Monitor conservation programs implemented by municipal, industrial, commercial and other water users to determine water savings. Determine efficacy of program(s) in terms of water saved, costs, and viability for long-term success.	Assists water managers with setting management protocols and making changes if necessary to meet water savings goals		Implementing party of conservation program
Monitor irrigation efficiency projects. Irrigation efficiency projects are designed to save water by changing and/or modifying equipment, scheduling, crop management, etc. An evaluation of efficiency would provide information on the effectiveness of new equipment or management regimes to meet conservation goals.	Assists landowners and water managers with setting management protocols and goals Provides credit to landowners and conservation districts for meeting instream flow goals	In October 2005, DOE approved the program guidance for Determining Irrigation Efficiency and Consumptive Use. According to the state DOE "staff will follow the guidance when issuing new water rights for irrigation purposes, when conducting tentative determinations of existing irrigation water rights, when evaluating trust water right applications, and in other situations when determining irrigation efficiency and the consumptive use associated with irrigation is necessary.	Landowners, conservation districts
Evaluate impacts of drought emergency relief efforts that provide access to temporary water for water right holders. Evaluation would include data on how much water was used, program costs, compliance with metering, cost-benefit to the state on the program.	Assists water managers in planning for drought and other emergencies Assists water managers with setting management protocols and		State government

Table B-8 MONITORING TOOLS			
Description of Tool	**Potential Benefits**	**Potential Issues (Legal, Technical, Social, Institutional)**	**Party Responsible for Implementation**
	goals		
Monitor utility rates for pumping costs. Pumping costs are indirectly related to the amount of water versus conservation of water used by individual permits.	Assists water managers in setting rates appropriate to conserve water for meeting consumer demand and reduce impacts to watershed	Consumer laws may require that utility rates be sufficiently high to avoid subsidies provided by non-irrigator customers.	Utility Companies, Public Utility Commission