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ECOLOGY
State of Washington

Columbia River Basin Water Supply Inventory Report

(Expanded CD Version)

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Columbia River Basin Water Supply Inventory Report

(Expanded CD Version)

by the Office of Columbia River

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Office of Columbia River

In 2006, the Legislature passed ESSHB 2860, An Act Relating to water resource management in the Columbia River Basin (codified as Chapter 90.90 RCW, Columbia River Basin Water Supply). The Legislature recognized that the development of new water supplies is key to successful water resource management in the Columbia River Basin. The goal of the act is to meet the economic and community development needs of people and the instream flow needs of fish. Ecology intends this report to provide program transparency to the public and to aid communication and coordination with other agencies and stakeholders.

RCW 90.90 establishes the basis for the Columbia River Basin Water Management Program. The act directs the Department of Ecology (Ecology) to aggressively pursue development of water supplies to benefit both instream and out-of-stream uses. Ecology reorganized the Columbia River Basin Water Management Program into the Office of Columbia River (OCR) to carry out this program.

The Program's water supply mandate is broad. The Legislature charges Ecology to consider new storage, modification of existing storage, conservation, acquisition, and any other actions designed to provide access to new water supplies.

The act also creates a Columbia River Basin Water Supply Development Account (Account). Funding for this Account can come from legislative appropriations, funds earned through implementing Program components, and other sources. The Legislature provided $200 million in general obligation bonds to fund water supply projects. Ecology's use of this funding requires that those water supplies that are developed be managed by the State in proportion to the Columbia River funding.

With the significant state investment in the Program comes routine reporting to the Legislature on the progress Ecology is making to meet the act's objectives. RCW 90.90.040 directs Ecology to publish a water supply inventory annually and a long-term water supply and demand forecast every five years:

> RCW 90.90.040
> **Columbia river water supply inventory — Long-term water supply and demand forecast.**
>
> (1) To support the development of new water supplies in the Columbia river and to protect instream flow, the department of ecology shall work with all interested parties, including interested county legislative authorities and watershed planning groups, adjacent to the Columbia river, and affected tribal governments, to develop a Columbia river water supply inventory and a long-term water supply and demand forecast. The inventory must include:
>
> (a) A list of conservation projects that have been implemented under this chapter and the amount of water conservation they have achieved; and
>
> (b) A list of potential water supply and storage projects in the Columbia river basin, including estimates of:
>
> (i) Cost per acre-foot;
>
> (ii) Benefit to fish and other instream needs;
>
> (iii) Benefit to out-of-stream needs; and
>
> (iv) Environmental and cultural impacts.
>
> (2) The department of ecology shall complete the first Columbia river water supply inventory by November 15, 2006, and shall update the inventory annually thereafter.
>
> (3) The department of ecology shall complete the first Columbia river long-term water supply and demand forecast by November 15, 2006, and shall update the report every five years thereafter.

This 2008 Columbia River Water Supply Inventory Report is designed to provide information and updates on our work regarding:

- Water that is now available from the Program.
- Projects currently funding by Ecology to develop water supply.
- A comprehensive inventory of all conservation and storage opportunities Ecology is tracking.
- A "sneak peak" at efforts Ecology is undertaking to forecast demand in preparation for the 2011 Legislative Demand Forecast Report.

Ecology intends for this report to provide program transparency to the public and to aid communication and coordination with other agencies and stakeholders. Additionally, this report meets the requirement in RCW 90.90.040 which directs Ecology to publish a water supply inventory annually and a long-term water supply and demand forecast every five years.

Implementation Issues

The Office of Columbia River's 2006 Legislative Report contained a new section, called Implementation Issues. Ecology provided this section to keep the Legislature and external stakeholders informed about the issues Ecology is facing as it works to aggressively pursue new water supply development. Solutions to these issues could come in the form of outreach and coordination, policy decisions, funding, rulemaking or proposed legislation. In 2006, Ecology identified two issues:

1. **Water for Columbia River or Water for Tributaries.** OCR continues to work with watershed planning units and other stakeholders to find balance between a tributary focus and mainstem focus in administering the Columbia River Program. While some elements of the legislation focus on the one-mile corridor of the Columbia River, others reference the Columbia River basin at large. Ecology's granting of $46.4 million for projects this year will provide an opportunity for on-the-ground implementation of this issue. Ecology is recommending continued outreach to seek effective strategies for coordinating and where appropriate, integrating Columbia River Program activities with watershed planning efforts.

2. **Allocating Water Savings.** The tension created by the backlog of pending water right applications continues. Proponents want both money for projects and water for new permits, whereas the OCR typically spends money on a project at the request of one party, it gives the water saved or stored from that project to someone else (who may have been waiting for up to 20 years). While there are potential legislative fixes to this problem, it can also be solved by eliminating the backlog. New water supplies are coming on-line in 2009 that will enable Ecology to start issuing new permits. For now, Ecology is recommending an emphasis on permit processing to resolve this issue.

Ecology has identified three additional implementation issues that merit discussion this year:

1. **Columbia River Program Reorganization.** The Columbia River Basin Water Management Program has been reorganized under a new director. Ecology Director Jay Manning announced in September that Derek Sandison will lead the department's new "Office of Columbia River" to be headquartered in Wenatchee. Sandison will report directly to Manning under the new organizational structure, while maintaining a side-by-side relationship with the agency's water resources program. The new organizational structure is more streamlined, geographically located in Wenatchee, which is closer to the center of the Columbia River constituency, and provides prominence to the water supply development focus of the program which is responsive to external stakeholder comments. Ecology will continue to monitor ways to improve the efficiency of the program.

2. **Implementing the Storage Goals of the Program.** Ecology is funding many studies for new storage projects—large and small, surface and underground. There are some aquifer storage and recovery (ASR) and small surface storage proposals that appear promising. Ensuring that these projects can be permitted if they prove feasible is an important goal of the program. Feasible projects would likely be those that take water surplus to fish needs (for example, in the winter) and re-time it to benefit both instream and out-of-stream uses (for example, in the spring/summer).

   Under the water code, up to 3 separate permits may be needed for a new storage facility: a right to divert water, a right to store water, and a secondary use permit to release water from storage and put it to beneficial use. Given the backlog of applications, new storage cannot be easily permitted without finding a way to priority process applications for permits. Two of the three permits (storage and secondary use) can be moved to the front of the line under RCW 90.03.380. Ecology has adopted rules for priority processing of other water rights (WAC 173-152) based on the Supreme Court ruling in Hillis v. Ecology[1]. Ecology is considering amending WAC 173-152 to address this processing issue.

3. **Office of Columbia River Needs.** Ecology is evaluating how best to meet the Columbia River water supply development mandate in the legislation with its current work force. The fiscal note for the Columbia River program allocated 4 FTE's for permitting work and assumed 15 permits per FTE per year, or 60 permits each year. Based on the development of the 132,500 acre-feet of supply from the Lake Roosevelt Incremental Releases project alone, over 500 permits are projected to be issued for instream and out-of-stream uses. At 60 permits per year, it would take approximately 9 years to permit all the water. Ecology is evaluating ways to streamline this process to shorten permitting time during the current budget shortfall, particularly among the drought permits which are the bulk of the 500 permits, and will report on its progress in the next legislative report. In the meantime, additional supplies are also being developed (see "We Are Getting Water" section of this report), which will create additional permitting work. Permitting all of these newly available water supplies in a timely manner will remain a significant challenge.

We Have Water

Lake Roosevelt Incremental Storage Releases

On March 20, 2008, Governor Chris Gregoire signed legislation that will provide for the release the largest delivery (132,500 acre-feet) of new water to towns and farms in the Columbia Basin, and for endangered salmon, in three decades. New withdrawals from Lake Roosevelt, behind Grand Coulee Dam, are expected to begin in 2009.

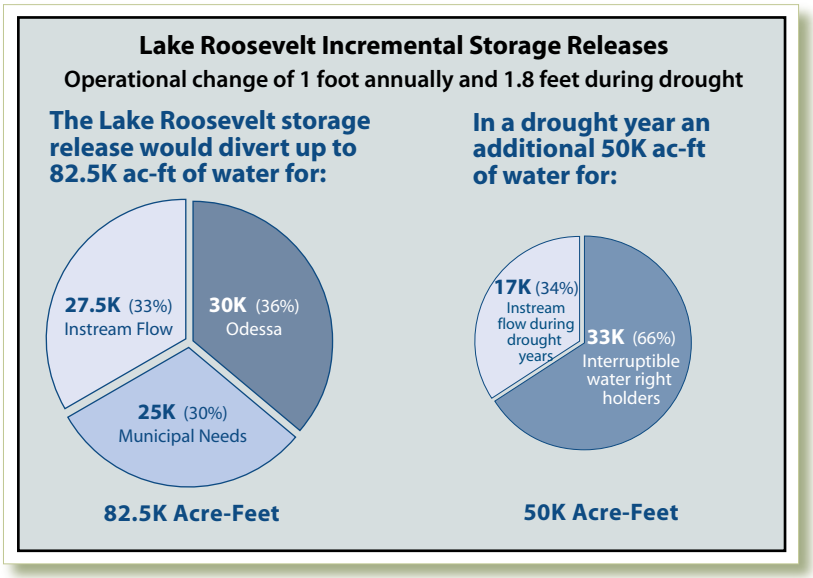
A historic partnership agreement with the Confederated Tribes of the Colville Indian Reservation and the Spokane Tribe was the final key piece of negotiation that included the Bureau of Reclamation (Reclamation), the Columbia Basin irrigation districts, the Department of Fish & Wildlife, local government, and other key stakeholders. Under the agreement, the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians will receive an annual payment of approximately $3.75 million and $2.25 million respectively, adjusted for inflation[2]. The funding is being provided to enhance fisheries, protect the environment, to preserve cultural resources, and other activities. Local governments around Lake Roosevelt will receive $2 million to address impacts from the release of the new water.

1 Hillis resulted in requirements for prioritizing the order in which water rights are processed.
2 A one-time fisheries, cultural resources, and parks mitigation payment of $1.35M is also incorporated in the state's agreement with the Colville Tribes.

The Lake Roosevelt Incremental Storage Releases Project involves withdrawing additional water from Lake Roosevelt to provide water for drought relief, municipal and industrial supply, replacement of groundwater use in the Odessa Subarea, and enhanced stream flows for fish. Annually, 82,500 acre-feet will be released to supply municipal and industrial uses, provide increased stream flows, and offset some groundwater use in the Odessa Subarea. In drought years, a total of 132,500 acre-feet would be released with an additional 50,000 acre-feet of water for stream flows and to supply interruptible water rights. Water would be released from Lake Roosevelt according to an adaptive management strategy that will maximize fish benefits. In general, releases occur from April to August with lake levels returning to normal by the end of September.

The storage releases would be diverted from Reclamation's existing 6.4 million acre-foot storage right for water behind Grand Coulee Dam. The storage releases would result in additional one foot of drawdown of the lake level during the spring and summer months (1.8 feet during drought years). This additional drawdown is small compared to the normal operating range of Lake Roosevelt, which can fluctuate up to 80 feet a year and up to 2.5 feet a day. Ecology will issue secondary permits to Reclamation for release of water stored in Lake Roosevelt under Reclamation's 1938 storage right. Based on these incremental releases, Ecology will:

- Issue new water rights for municipal and industrial uses.
- Issue standby-reserve permits for interruptible water rights holders.
- Issue new instream flow trust water rights.
- Modify existing Odessa groundwater certificates to standby-reserve status.



This new water will create significant public benefits. The Lake Roosevelt releases, will:

- Supply additional surface water to irrigators of 10,000 acres of land east of Moses Lake (Odessa). This will reduce impacts on farmland affected by the dwindling Odessa aquifer, which threatens the loss to the region of $600 million a year in revenue and the elimination of 7,500 jobs.
- Offer more certainty to those who have interruptible water rights in times of drought.
- Provide new water supplies to municipalities with pending water right applications.
- Bolster the State's economy through new industrial development.
- Help ensure the survival of salmon by increasing stream flow in the river in the spring and summer, when fish need it most.

Odessa

During July and August of each year, 30,000 acre-feet are scheduled to be released to the Odessa Subarea. Water released to Odessa will be diverted to Banks Lake and will not be available for downstream uses. Reclamation will enter into a contract for water distribution with the East Columbia Basin Irrigation District (ECBID). The ECBID will in turn issue contracts to irrigators for the water released to meet irrigation needs in the Odessa Subarea. It is not known at this time which irrigators would receive the water.

Interruptibles

Once Lake Roosevelt water is available, Ecology will run a voluntary enrollment cycle for the Drought Insurance

Program. All eligible interruptible water right holders will be notified of the program requirements and may choose to enroll if the program meets their needs.

Ecology will develop guidelines for its Drought Insurance Program so enrollees understand the criteria. Elements of the Program will include:

1. An equal percentage of the 33,000 acre-feet of water from Lake Roosevelt would be allocated to all holders of interruptible water rights. If every interruptible water right holder enrolled in the program, each water right holder would receive an additional 10.7 percent of supply during drought years (e.g., 33,000 acre-feet / 309,159 acre-feet). For example, a water right holder with 100 acre-feet of interruptible supply would receive a standby/reserve permit for 10.7 acre-feet to use when the interruptible right is curtailed. Water uses would not be prioritized or distributed to achieve regional equity. However, significant geographic diversity already exists in the location of interruptible water rights.
2. Water users who receive a distribution of water would be allowed to assign their water to other users in a drought year. Ecology would develop and manage its permit system to accommodate and reflect the redistribution of the initial allocation through the secondary market-based reallocation.
3. The Program will include mandatory conservation or use restrictions. Ecology may apply the same criteria used in 2001. These included requirements for best management practices, limits on expansion of permitted acreage during droughts, caps on water duties or other elements.
4. Reimbursement of Ecology's costs to make the water available and to manage it will be required. Any funds received will be placed in the Columbia River Basin Water Supply Development Account to be used for other water management projects in the Columbia River Basin (RCW 90.90.010).

Each standby/reserve permit would issue for the same quantities as the interruptible water right because of the inherent uncertainty about the level of drought to plan for. Ecology's only "on-the-ground" drought experience was in 2001 when instream flows were not met. In 2001, there were 16 weeks of interruption (11 with the critical flow adjustment taken in 2001 by the Ecology Director). Climate change, changes in river operations and other factors may lead to greater drought management needs in the future.

Although the standby/reserve permit would issue for the full interruptible quantity, each right would be provisioned to the water available in the Drought Insurance Program at the time of the next drought. Although initially the 33,000 acre-feet of Lake Roosevelt releases is the only volume of drought water available, in the future Ecology plans to have a portfolio of drought supplies including Trust Water holdings from conservation, storage releases, dry-year lease acquisitions, and others. Ecology will use the Columbia River Webmap to display how much drought supply it has available for each interruptible water right holder.

Municipalities

Based on further analysis and comments received on the Draft Supplemental EIS, Ecology selected the following two alternatives as the Preferred Alternatives for the allocation to municipal and industrial users. The two alternatives are variations of the alternatives that were considered in the Draft Supplemental EIS. The first covers the geographic extent of applicants who can receive mitigation water and the second covers the order in which they will be processed.

Ecology will consider the use of Lake Roosevelt incremental flow releases to supply for municipal and industrial users who:

1. Can physically capture the released water at their point of diversion or withdrawal, and
2. Cannot physically capture the water from the river, but whose proposed water use would impact Columbia River stream flows within the same season or year without requiring mitigation of impacts in subsequent seasons or years.

Municipal and industrial users whose impacts can be mitigated by Lake Roosevelt releases include:

A. Surface water diverters on the Columbia River in Lake Roosevelt or downstream of Grand Coulee Dam.

B. Surface water diverters on the Snake River in the McNary Pool and Ice Harbor Pool.

C. Surface water diverters from tributaries to the Columbia River, where water is available in the tributary, and if the impacts of those upstream diversions are mitigated by Lake Roosevelt releases within the same year or season. The objective is to prevent carry-over of impacts to subsequent seasons or years.

D. Groundwater diverters tributary to the Columbia River, where local availability is not limiting, and whose groundwater sources are in bank storage. The objective is to prevent carry-over of impacts to subsequent seasons or years. Wells located in bank storage have a near-immediate effect on the Columbia River.

Ecology will use the one-mile corridor as the surrogate for groundwater users in bank storage. Groundwater users outside the one-mile corridor could petition for inclusion where hydrogeologic evidence supports it.

Ecology will also apportion mitigation water to pending municipal and industrial applicants to achieve regional equity in Columbia River counties. Ecology will convene an annual meeting of municipal and industrial stakeholders and describe its permitting progress each year. Although there is diversity in the location of pending applicants up and down the Columbia River, until a case-by-case evaluation is made of the 20-year old applications, it is difficult to conclude whether allocation based on first-in-time, first-in-right will result in regional equity. Ecology will use this annual review process (which could also be described in each year's legislative report and associated public review) to determine whether its regional equity goals are succeeding. It is anticipated that it will take several years to permit all of the municipal/industrial water. If Ecology determines that regional equity is not occurring, it could amend WAC 173-563 to reserve the remaining water for a specific geographic location. As an initial screen, Ecology will track permits issued by WRIA, and those issued upstream and downstream of Priest Rapids Dam.

Ecology intends to process applications in the order they were received with two exceptions based on priority needs. The two exceptions are:

1. Applicants that meet the criteria for expedited processing under WAC 173-152.
2. Water required to meet existing settlement agreements or contractual obligations.

Quantities of water allocated to these priority needs will be made with public input and will be summarized in each year's annual legislative report.

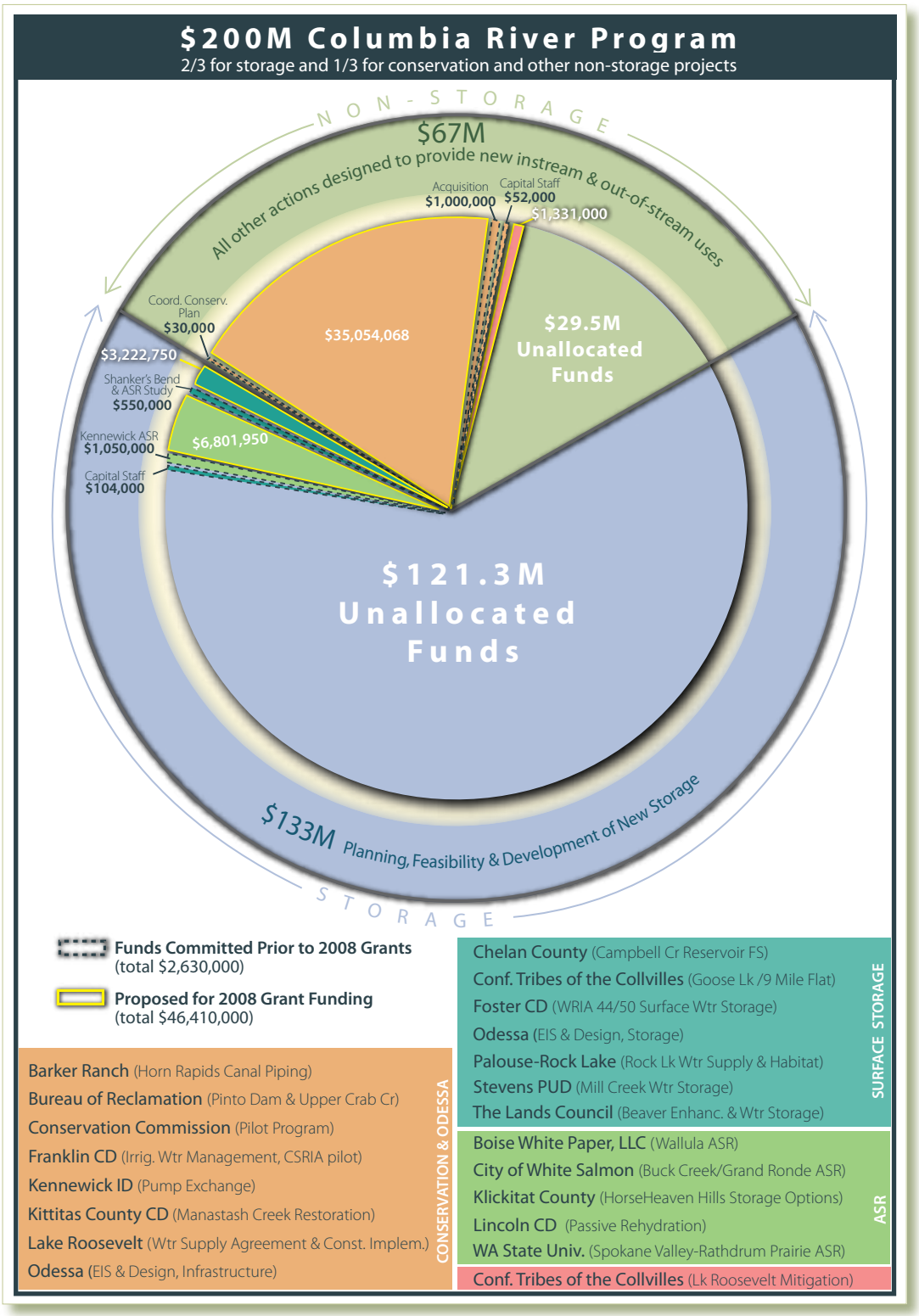
All applicants will be expected to meet conservation criteria as part of the public interest test for issuing new water rights. Ecology will meet with the Department of Health and external stakeholders to determine how best to integrate its own statutory conservation mandates with those adopted in rule by the Department of Health and voluntary measures adopted by individual communities through water system planning.

Instream Flow Benefits

The specific amount of flow released each month would be determined by a panel of fisheries and water managers from Ecology, Reclamation, tribes, the Columbia River Intertribal Fish Commission (CRITFC), WDFW, NOAA Fisheries, and the U.S. Fish and Wildlife Service. The panel would determine specific releases each year based on the March 1 forecast for April through September runoff at The Dalles Dam with the goal of scheduling releases to maximize fish benefits under the specific conditions in any year. The panel would also consider anticipated river conditions and the status of fish runs and outmigration. Ecology is negotiating an MOA with Reclamation to incorporate the adaptive management strategy for the Preferred Alternatives into river operations.

We Are Getting Water

Ecology is continuously working toward acquiring water for instream and out-of-stream use. In doing so, the Columbia River Program ran the first competitive grant funding cycle to solicit projects to help achieve the Program's goals. In addition, Ecology has continued to work on projects that it invested in prior to the 2008 grant funding cycle. This section discusses Ecology's on-going efforts to aggressively pursue the development of new water supplies for instream and out-of-stream needs. A summary of the funding Ecology is currently providing for projects from the Columbia River Account is shown on the pie chart below.



This section provides a summary of our grant program and then is organized in a way to reflect our current priorities on water supply project development:

- Modification of existing storage. This offers an opportunity for increasing supply capacity with current infrastructure at a reduced environmental footprint.
- Conservation and pump exchanges. Controlling demand (through decreased diversions or transferring demand from smaller, more vulnerable water sources to larger ones) is another way to develop supply.
- Aquifer storage. Utilizing underground reservoirs allows for retiming stream flows in a way that minimizes environmental impacts.
- Small surface storage. Creating small surface storage opportunities in areas close to the demand it will serve allows incremental progress on capturing and using surplus water in the winter and spring.
- Large surface storage. Understanding whether large surface storage is necessary in light of forecasted demand, and which site is most competitive at the appraisal stage, is Ecology's current focus.

This section concludes with an update on other projects that are called for in the legislation, but not identified specifically as "new" water supply projects. These include replacement of declining groundwater with surface water supplies for the Odessa Subarea, an update on Voluntary Regional Agreements, supplemental feed routes for Potholes Reservoir, Ecology's Drought Insurance Program and others.

Columbia River Grant Funding Program

In October 2007, Ecology began accepting pre-applications for the first annual Columbia River Basin Water Management Grant Program. A formal grant process was designed so that project applications could be analyzed in the context of the balanced goals of the statute (benefit to both instream and out-of-stream uses) and for cost and technical feasibility.

The grant program utilizes a team of Ecology, Department of Fish & Wildlife and Conservation Commission staff familiar with other funding programs in Washington. This team participated in an application submittal and review process, with pre-applications being accepted from October 1 through November 30, 2007. Successful pre-applicants were invited to submit applications in March 2008.

Application Process

Pre-applications were accepted from October 1 through November 30, 2007. The Department of Ecology evaluated the pre-applications to ensure they meet eligibility criteria including:

- A valid water right must exist if construction funding is requested (a water right is not required for feasibility studies).
- The water right must be "trustable" for conservation projects.
- The project must be consistent with adopted watershed plans.
- Storage projects made possible with funds from the Columbia River Account must be managed 2/3 for out-of-stream and 1/3 for instream in proportion to Columbia River funding.

Forty-two pre-applicants were received during the pre-application stage of the Grant Program. Successful pre-applicants were invited to submit applications in March 2008. Seventeen proponents who had participated with pre-applications in the Fall submitted applications to the Grant Program.

Proposed conservation, small storage, aquifer storage, and operation and maintenance projects were subjected to technical analysis and scoring by the Technical Advisory Group (TAG)[3]. The TAG a committee composed of

3 The objective of the TAG is to aid the department in funding sound conservation projects that will advance the goals of the program. The role of the TAG will be to review and evaluate conservation project applications using criteria set by the EIS and the Policy Advisory Group (PAG), in order to provide Ecology with funding recommendations.

water resource experts from state, tribal, and local government, conservation districts, and the Salmon Recovery Board. The goals of the scoring process were to:

- Analyze the technical merit of each project.
- Bring in as wide a range of projects as possible.
- Gather information about the projects.
- Allow for a fair and unbiased ranking of the projects.

The raw score (0-50) was converted into a weighted score (0-100) based on the following criteria in Table 1.

Table 1: TAG Scoring

Categories	Maximum Possible Unweighted Score	Total Unweighted Score	Weighting Factor	Maximum Possible Weighted Score	Weighted Score
1. Project Costs	10		2	20	
2. Net Water Savings	10		3.3	33	
3. Project Support	10		1.5	15	
4. Fish/Water Quality Benefits	10		2.2	22	
5. Long Term Resources	10		1	10	
Total Score for All Categories	50		10	100	

Funded Projects

Once the projects were evaluated and scored, Ecology submitted a list of recommended projects for discussion by the Policy Advisory Group (PAG)[4]. The PAG is a committee composed of representatives from federal, state, tribal, and local government and agricultural, business, and environmental stakeholder groups. Selected projects were then submitted to the Governor and the Legislature for funding. The following 18 projects were selected for funding:

Table 2: Projects for Proposed Funding

Applicant	Project Title	Project Type
The Barker Ranch	Horn Rapids Canal Piping	C
Lincoln County CD	Lincoln County Passive Rehydration	FS
Foster Creek CD	WRIA 44/50 Surface Water Storage	FS
Stevens PUD	Mill Creek Water Storage Project	FS
Palouse-Rock Lake CD	Rock Lake Water Supply & Habitat Enhancement Study	FS
Kittitas County CD	Manastash Creek Restoration Project	C
Boise White Paper, LLC	Boise White Paper, LLC, Wallula ASR	S
The Lands Council	Beaver Population Enhancement & Water Storage	FS
City of White Salmon	Buck Creek to Grand Ronde ASR	S
Chelan County	Campbell Creek Reservoir FS	FS
Franklin CD	Irrigation Water Management	FS
Klickitat County	Horse Heaven Hills Surface Storage & Conveyance	FS
WSU	Spokane Valley – Rathdrum Prairie ASR	FS
BOR	Pinto Dam & Upper Crab Creek	C

4 The objective of the PAG is to assist Ecology in identifying policy issues associated with implementing a new water resource management program for the Columbia River. The PAG provides Ecology with a full range of perspectives on policy choices and priorities and assists Ecology in setting criteria for funding of storage and conservation projects.

Applicant	Project Title	Project Type
Confederated Tribes of the Colvilles	Goose Lake & 9 Mile Flat	FS
KID	KID Pump Exchange	C
Confederated Tribes of the Colvilles	Mitigation Projects related to the Colville Tribes Agreement	C
Yakama Nation	Yakama Funding List	*
C= Conservation FS=Feasibility Study S=Storage		

Grants contracts for the 2007 funding cycle will be awarded Fall 2008. The timeline for processing applications for the 2009 funding cycle are being developed by Ecology.

Modification to Existing Storage

Ecology is partnering with Reclamation and other federal, state, local, and tribal governments to consider how existing storage facilities can be managed to add to water supplies for instream and out-of-stream uses in the Columbia River Basin. Modifications could include raising the height of existing impoundments (on-channel or off-channel), raising operating pool heights, lowering drawdown depths, or otherwise altering operations at existing facilities. The advantages of modifying existing storage, over new construction, are that both the cost and the environmental and cultural impacts are likely much lower.

Wanapum Pool Raise

Ecology is currently partnering with Public Utilities District No.2 of Grant County to evaluate the possibility of a pool raise at Wanapum Dam of the Priest Rapids Project. Increasing the normal maximum operating elevation 3.5 ft at Wanapum Dam could provide approximately 70,000 acre-feet of incremental Columbia River storage. Currently, expected cost of this project is on the order of $33 million[5] (Draft Wanapum Pool Raise Effects Evaluation Study 2008). Since early 2008, a working group consisting of federal, state and tribal fisheries interests, Ecology, BPA and others have been working with Grant County PUD on this project.

Reoperation of Banks Lake (Drawdown and Raise)

Ecology continues to partner with Reclamation on the Odessa Subarea Special Study, whose goal is to investigate the feasibility of replacing irrigated lands currently served by declining groundwater levels with surface water from the Columbia River. The project requires both storage (because water is available from the Columbia River in the winter/spring) and transmission infrastructure.

Reclamation is assessing several options to provide replacement water including operation changes at Banks Lake. Reclamation estimates that 50,000 acre-feet of storage is available from Banks Lake for every two-foot rise or drawdown. The project requires both storage (for water available from the Columbia River in the winter/spring) and transmission infrastructure.

Reclamation is preparing an EIS in cooperation with Ecology to comply with the National Environmental Policy Act (NEPA) and the State Environmental Policy Act (SEPA). Scoping for the EIS occurred in September 2008 and we expect to issue the draft in 2010.

Conservation and Pump Exchanges

Barker Ranch Canal Piping

It will result in the conversion of the Horn Rapids Canal from an open ditch system to a closed pipe system and conservation of water in the lower Yakima and Columbia rivers by saving conveyance losses. Less water will be diverted to the Canal during low flow times resulting in water saved during the months of June through October. This project scored high for instream benefits and will also result in permittable out-of-stream water.

5 This cost includes projected expenses for fish bypass gates, fish bypass gate guides, attraction flow prototype structure (structure designed to shape stream flow in a way that attracts migrating fish), electrical cable gallery, spillway gates, and a trash sluice gate (for removing debris).

Kittitas Conservation District (CD) Manastash Ditch Piping

The project will result in piping the Manastash Water Ditch Association's earthen unlined ditch from the Kittitas Reclamation District's south branch to Hanson Road. Approximately 4,440 feet of canal / ditch would be piped. This project possesses good instream benefits.

Franklin Conservation District Irrigation Water Management Feasibility Study

This project was proposed by Franklin Conservation District. This feasibility study will document and develop a program to capture the conserved water that could be gained by implementing Irrigation Water Management (IWM). This study is a CSRIA VRA pilot project and will be used as an opportunity to explore significant amount of conservation potential. Deliverables for this study include:

1. Measurement of on-farm water conservation.
2. Technical evaluation of fate of non-consumptive water saved.
3. Proposed use of saved water through seasonal transfers.
4. Evaluation of institutional barriers to water saved by IWM in the Columbia Basin Project.

Conservation Commission Pilot Conservation Proposal

The Washington Conservation Commission will pilot project to indentify, evaluate and fund water conservation projects using a $1 million dollar grant from the Columbia River Program. The pilot will evaluate the efficacy of employing conservation districts to assist Ecology in meeting the dual goals of the bill; instream flow benefit and out-of-stream permits. The pilot will begin in 2009.

Coordinated Conservation Plan (Columbia Basin Irrigation Districts)

Ecology has provided $30,000 to the Columbia Basin Project Irrigation Districts to develop a Coordinated Conservation Plan. This plan will include a water conservation strategy that matches and maximizes conservation opportunities in each district. Net water savings from paired conservation projects will be used to develop water supplies for the Odessa Subarea and protect Columbia River stream flows.

Kennewick Irrigation District Pump Exchange

KID proposes to forgo a portion of their 782 cfs water right at Prosser Dam and Chandler Powerhouse on the Yakima River and divert less water downstream (45 cfs at Kiona) on the Yakima River and (195 cfs at Edison St.) from the Columbia River. Under this proposal, the flow in a critical reach of the lower Yakima River would double and KID would develop additional acres on Red Mountain. Ecology has provided a $95,000 grant to evaluate piping alignments to reduce the cost and improve the operational efficiency of the project. Ecology has also reserved $15 million towards construction of the project.

Wymer Pump Exchange

The Wymer pump exchange is part of a range of proposals being jointly considered by Ecology and Reclamation in the Yakima River Basin Water Storage Feasibility Study Supplemental Draft Environmental Impact Statement. A draft of this SEIS is expected by January 2009. The Wymer pump exchange includes options for both storage and pumping water from the Columbia River into the Yakima Basin. Up to 174,000 acre-feet of storage and a pump exchange of up to 1,200 cfs are being considered. The total cost of the Wymer reservoir and Yakima pump exchange is approximately $380 million, of which about $200 million is for the pump exchange.

Walla Walla Pump Exchange

Ecology has allocated $400,000 to the Confederated Tribes of the Umatilla Indian Reservation for a cooperative study in the Walla Walla River Basin. The four-year study will be completed in 2009 and will determine the feasibility of restoring stream flows through several options, including acquisition, conservation, groundwater recharge, and replacement of Walla Walla River irrigation water with Columbia River water.

Aquifer Storage and Recovery (ASR) and Rehydration

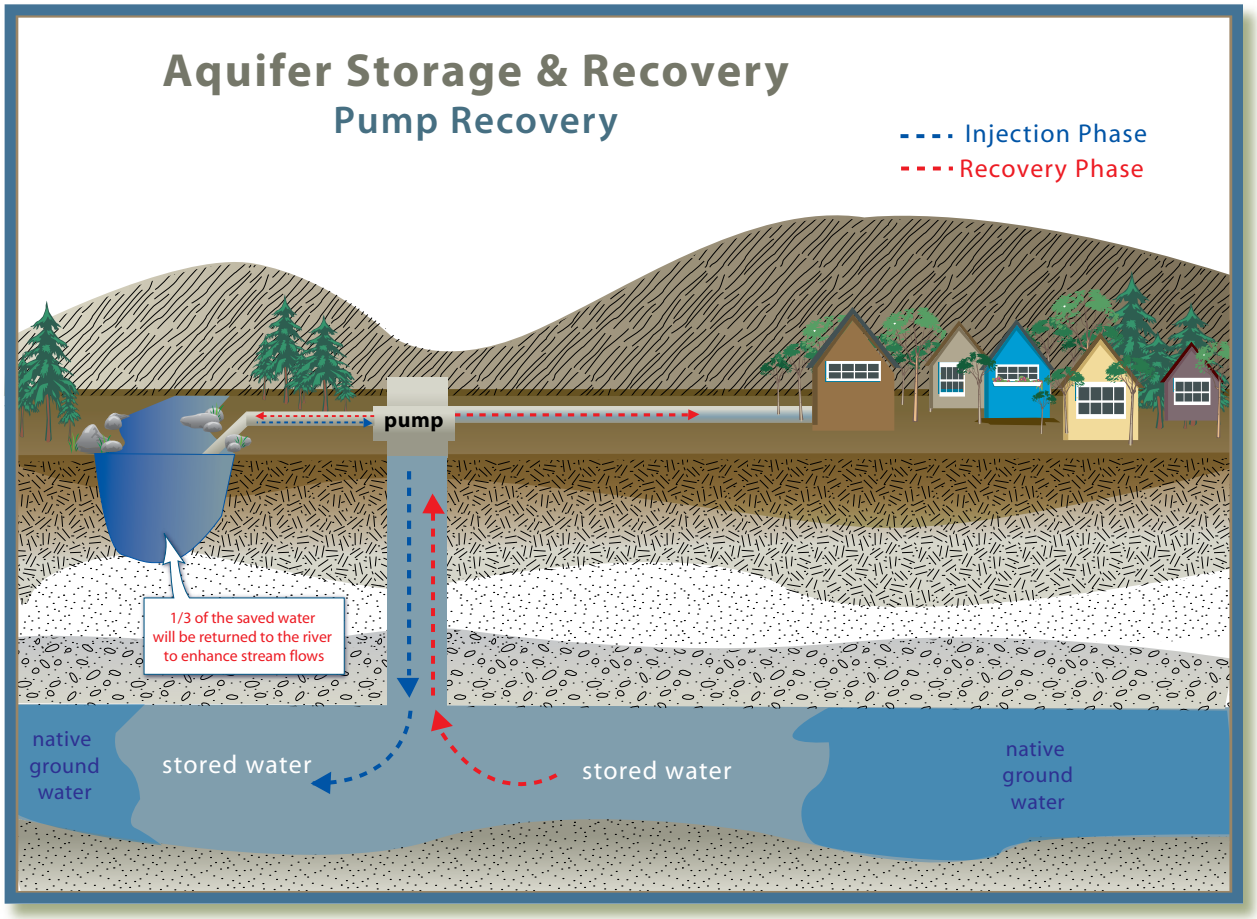
Kennewick ASR

The City of Kennewick currently treats water from the Columbia River to supply its residents with drinking water. In response to increasing regulatory pressures under the Surface Water Treatment Rule and increasing summer water demands, Kennewick funded an Aquifer Storage and Recovery (ASR) feasibility report in October 2005. The goal of the study was to determine the feasibility of aquifer storage to provide source redundancy and reduce summer demands on the water treatment plant.

The report identified that injection of water into a basalt aquifer at the south end of the city had the potential to hold approximately 318 acre-feet of water with less than ten percent leakage back to the river. The capacity of the ASR system is not known at this time, but could be in the range of 300-400 acre feet or more. How much of this stored water is retrievable is open to question, since many of the physical characteristics of the aquifer used to model system recoveries were assumed. A planned pilot test of the ASR system will answer most of these questions.

Kennewick would divert and treat water in winter months, when water is most available and the city's treatment plant has the greatest surplus capacity, then pump the water to two injection wells and store it for later use in the aquifer. The city would pump the water into the distribution system in the summer for municipal supply, while an equal amount of water would remain in the Columbia River.

In 2008 Ecology allocated $1.05 million to fund a pilot for the Kennewick ASR project. The pilot will be funded and conducted in several phases. In the first phase, Ecology will spend $200,000 on testing to determine if the aquifer is capable of meeting or exceeding its projected capacity and whether water quality standards can be met. If the project passes that test, the remaining $800,000 will be used to fund construction and testing of the injection well. This phase will also include an appraisal-level facility design, and provide approximate cost estimates for



facility construction and operation. In exchange for funding and following successful construction and operation of the facility, Ecology will manage the water stored (proportionate to funding under the Program) according to the statutory formula of two-thirds for out-of-stream uses and one-third for instream uses. The figure at left shows an example of how water is injected underground, stored and recovered.

Lincoln County Passive Rehydration Study

This feasibility study will examine rehydration of the basalt aquifers in Lincoln and Adams County (Odessa sub aquifer) thorough passive infiltration into the basalt aquifers by diversion of water from the Columbia River. This is a diverse project in good location to potentially serve the Odessa.

Boise Wallula ASR

This project will result in the installation of an aquifer storage system that will provide cold water during the summer and will reduce the overall water used by the facility. Cold water will be pumped into the aquifer during the winter months and withdrawn during the summer months. Return flow to the Columbia will be cleaner and cooler. This project has good fish benefit (temperature) and possesses good potential for new out-of-stream permits.

City of White Salmon ASR

This project will evaluate whether the City's proposed filter plant, equalization reservoirs (reservoirs that manage the water supply to make the system work efficiently), and pipeline can be used to inject surplus capacity water during winter months into wells for storage in the City's aquifer. The water would be withdrawn during the summer months to meet City municipal needs and enhance stream flows in the Columbia River. Due to a declining aquifer, the City of White Salmon is undergoing a serious water shortage. A surface water source is needed immediately for the city to meet its most basic water needs and an accompanying aquifer storage project will increase the reliability of the City's supply.

Washington State University Spokane Valley-Rathdrum Prairie ASR Feasibility Study

This study will examine the viability of aquifer storage and recovery in the Spokane Valley-Rathdrum Prairie (SVRP) aquifer. Water would be diverted from the Spokane River and Lake Pend Oreille during high flow periods, injected into the SVRP aquifer and gravity would drain the water back to the Columbia River. This project was removed from the TAG process because it involves cross-border issues with Idaho and can be handled more effectively by local staff working in the region.

Regional ASR Study

Ecology is currently evaluating the merits in funding a Columbia River Basin ASR Appraisal Study in 2009. The potential opportunities for artificial groundwater storage in the Columbia Basin to are perceived as being significant. The hydrology of the basin suggests that significant quantities of water are available during periods of low demand and high availability (runoff). The geology of the basin suggests that suitable underground storage sites may be available. At a minimum the ASR study will include the following areas of interest:

- A description of the optimum geologic characteristics for artificial groundwater storage and where such conditions exist in the Basin.
- Documentation of potential recharge sources, considering both physical and legal availability.
- An estimate of the volume of water available for storage including timing and frequency of availability.
- Assessment of availability of infrastructure required to deliver water to ASR site.
- A clear description of the risks and benefits of potential groundwater storage projects including estimated benefits to stream flow.
- A summary of available water quality information for both potential source water and aquifers identified as potential storage sites.

An estimate of the cost per acre foot of water injected or proposed for recovery.

A ranking of potential sites numerically by criteria (The best sites have ideal geologic conditions and available storage, a reliable source of water, infrastructure to deliver it to the injection/dispersal location, are close to the area of use).

Small Storage

Foster Creek CD WRIA 44/50 Surface Water Storage Feasibility Study

During the implementation of the Watershed Management Plan, the Watershed Planning Association identified two potential small water storage sites located in WRIA 50 at the Foster Coulee and in WRIA 44 at Rock Island Creek. This project possesses a high potential for new out-of-stream permits and is close to Columbia Basin Project infrastructure. The feasibility study will examine the two potential small storage sites.

Table 3: Potential Surface Water Storage Sites

		Acre-feet	Estimated Cost	Cost per Acre-feet
Rock Island Creek (WRIA 44)		60,000 AF	$204 M	$3,397
Foster Coulee* (WRIA 50)	2 Low	126,000	$223-251 M	$1,772-1,994
	2 High	96,250	$266-299 M	$2,768-3,114
	2 High, 1 Low	194,700	$399-449 M	$2,051-2,308

*Three different dam heights and configurations will be evaluated.

Stevens PUD Mill Creek Water Storage Feasibility Study

The feasibility study will examine the possibility of a small surface storage facility on Mill Creek. If the project proves feasible, it will provide additional storage capacity for instream and out-of-stream uses that would benefit tributaries in the Northeast region of the state. Three potential dam heights would determine the acre-feet of water stored:

- 100 feet = 2,050 AF
- 150 feet = 5,400 AF
- 200 feet = 10,700 AF

Palouse-Rock Lake CD Water Supply and Habitat Enhancement Feasibility Study

The feasibility study with examine the potential to construct a small storage facility on Rock Lake that will provide cool water storage for use. This project would provide good instream benefits and has a high potential for new out-of-stream permits. In addition, the project could produce a small amount of hydroelectric power. Phase one of the study will address whether or not there is sufficient water available from the catchment basin to warrant a storage facility. Phase two will address the potential constraints on the water.

Chelan County Natural Resources Department Campbell Creek Reservoir Feasibility Study

This feasibility study will examine the possibility of constructing an off-stream reservoir that will store water and release it to the Peshastin Irrigation District to supplant Peshastin Creek diversions. Releases from the storage facility would occur in July through September. This project is in a good location, has good instream benefits, and will result in new out-of-stream permits.

Lands Council Beaver Population Enhancement and Water Storage Feasibility Study

This project is a study of natural ecosystem small storage potential by the re-introduction of beaver to the upper Columbia basin and tributaries. Wetlands created by the beavers would capture peak spring runoff and allow that water to be released during the rest of the year.

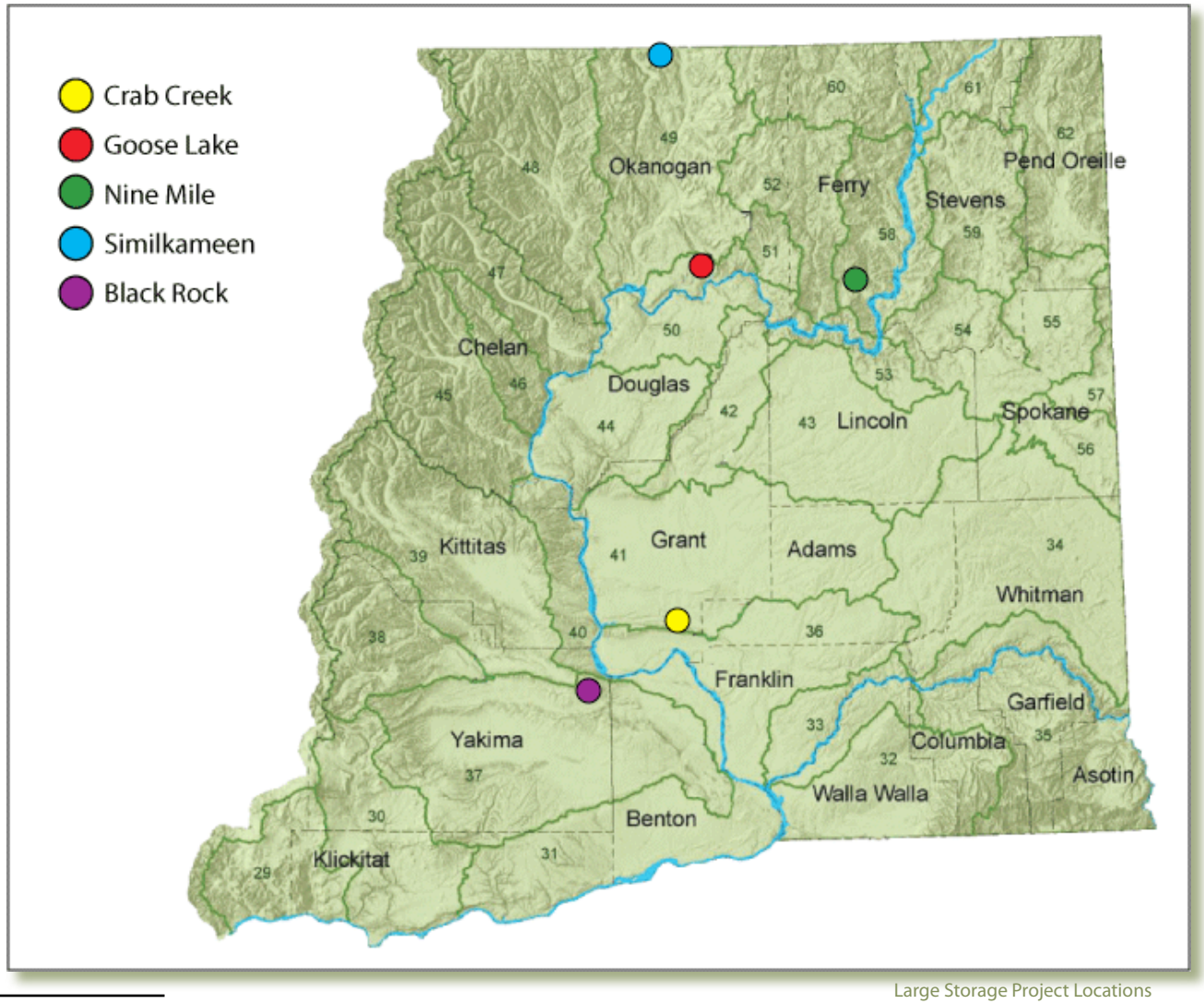
Klickitat County Horse Heaven Hills Surface Storage & Conveyance Feasibility Study

This study involves an examination of the possibility for diverting water from the John Day-McNary Pool during the winter and spring months to a new surface storage site in the Glade-Fourmile Sub-basin in WRIA 31 and creating a new conveyance system.

Large Storage (Crab Creek, Goose Lake, Nine Mile, Similkameen, Black Rock)

Ecology's investigation of opportunities for large storage (more than 1 million acre-feet) predates the Columbia River Program in 2006. Chapter 90.90 RCW added focus to Ecology's efforts by requiring that two-thirds of all money in the account be spent on storage. It also directed that Ecology manage water generated from Program-funded storage projects as two-thirds for out-of-stream uses and one-third for instream uses.

Currently, Ecology is considering five potential large storage options. One of these of these,Crab Creek,[6] rose to the top of a list of 21 different sites considered in Ecology's Off-Channel Mainstem Appraisal Report. Two others (Goose Lake and Nine Mile[7]) are sites on the Colville Reservation that are only at the pre-appraisal stage. Black Rock[8] is part of the EIS and Feasibility Study Reclamation is working on in the Yakima Basin. Shanker's Bend[9] (on the Similkameen River in Okanogan County) is also at the Pre-Appraisal stage of an evaluation by Okanogan County PUD.



Large Storage Project Locations

6 http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/appraisal_rpt/VolumeI.pdf
7 http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/crssr_final_12062005.pdf
8 http://www.usbr.gov/pn/programs/storage_study/reports/ts-yss-07/index.html
9 http://www.ecy.wa.gov/programs/wr/cwp/cr_shankers_storage.html

Ecology plans to bring all these sites up to the Appraisal stage to resolve which site might best meet the needs of the greater Columbia River Basin. At the same time, Ecology is working to forecast future demand to determine how much new storage is needed.

Crab Creek

Crab Creek

The Crab Creek site is located in western Grant County on a tributary to Priest Rapids Lake. This potential large storage site is estimated to be capable of providing approximately 2,300,000 acre-feet of active storage. The pre-appraisal cost estimate is $1,703 million. The estimated cost per acre-foot is $740.

Water stored in the Crab Creek Reservoir could be used to supplement Columbia River instream flows for anadromous fish and could be released during April through August when 2000 BiOp target flows are not met at McNary Dam.

Out-of-stream benefits include agricultural water use within an estimated 50 miles of the storage facility. Beyond this distance, conveyance costs would make agricultural use uneconomical. Most of Grant and parts of Douglas, Kittitas, Yakima, Benton, Adams, and Franklin counties lie within the 50-mile range for irrigation water. The Crab Creek site could be a significant resource for agricultural irrigation in these areas.

In addition, there could be future potential benefits from using Crab Creek storage water for an M&I water supply. The Quad-Cities area and the City of Yakima and the smaller communities of Moses Lake could potentially be served by water stored at the Crab Creek facility. Local water supplies are expected to be sufficient to continue meeting near-term M&I water supply needs, but the Crab Creek Dam and Reservoir could meet long-term water needs for future growth of those communities.

Environmental concerns include potentially habitat loss due to inundation, anadromous fish passage issues, and potentially high water temperatures due to reservoir depth.

Goose Lake

The Goose Lake site lies in a basin north of the Columbia River, between Rufus Woods Lake (Chief Joseph Reservoir) and Omak Lake. The site is located completely within the boundaries of the Colville Indian Reservation. The total storage volume is estimated to be approximately 3,350,000 acre-feet. The pre-appraisal cost estimate is $3 – 3.4 billion. The estimated cost per acre-foot is $997.

Water stored in the Goose Lake Reservoir could be used to supplement Columbia River instream flows for anadromous fish and could be released during April through August when 2000 BiOp target flows are not met at McNary Dam. The Goose Lake Reservoir would store enough water to meet a range of 36 to 111 percent of the 2000 BiOp target flows at McNary Dam during a one-month period from April through August based on monthly average flows at Grand Coulee, Priest Rapids and Bonneville dams.

Proposed Goose Lake site

Of the counties surrounding the potential Goose Lake dam and reservoir site, only Grant County has significant irrigated agriculture. The north half of Grant County lies within 50 miles of the site for agricultural water use and could benefit from irrigation water conveyed from the Goose Lake site.

There would be minimal benefits from using Goose Lake storage water for a municipal and industrial (M&I) water supply. Nearby cities and towns include Omak, Okanogan, Coulee Dam and Nespelem, each with populations under 5,000, and local water supplies are expected to be sufficient to continue meeting future M&I water supply needs.

Construction and operation of a dam and reservoir at the Goose Lake site would potentially impact approximately 382 acres of NWI wetlands. The site is located within the boundaries of the Colville Indian Reservation and the Colville Confederated Tribes would have to be consulted concerning potentially sensitive sites with respect to natural resources, cultural resources and other trust resources within the potential project boundary. Additionally, potential impacts on Indian Trust Assets would need to be evaluated, analyzed and mitigated.

Proposed Nine Mile site

Nine Mile

The Nine Mile Flat site is located west of the Columbia River, approximately 55 river miles upstream from Grand Coulee Dam. The proposed site is located entirely within the Colville Indian Reservation boundary. The reservoir site is estimated to potentially store 930,000 acre-feet of active storage. The pre-appraisal cost estimate is $1.5 billion. The estimated cost per acre-foot is $1,564.

Water stored in the Nine Mile Flat Reservoir could be used to supplement Columbia River instream flows for anadromous fish and could be released during April through August when 2000 BiOp target flows are not met at McNary Dam. The Nine Mile Flat Reservoir would store enough water to meet a range of 10 to 30 percent of the 2000 BiOp target flows at McNary Dam during a one-month period from April through August based on monthly average flows at Grand Coulee, Priest Rapids and Bonneville dams.

Existing Columbia Basin Project irrigation infrastructure has the potential to convey irrigation water from a potential off-stream surface storage site to agricultural land in Grant, Adams and Franklin counties. Water from the Nine Mile Flat reservoir could be conveyed by existing Columbia Basin Project facilities to over 300,000 acres in Grant, Adams and Franklin Counties. Additionally, parts of Douglas and Lincoln Counties lie within 50 miles from the potential reservoir. The Nine Mile Flat site could be a resource for significant agricultural irrigation in these areas.

There could be potential future benefits from using Nine Mile Flat storage water for an M&I water supply. The City of Spokaneis located within 50 miles of the Nine Mile Flat site. Local water supplies are expected to be sufficient to continue meeting near term M&I water supply needs, but the Nine Mile Flat Reservoir could be a resource to meet M&I water supplies for expected community growth.

Construction and operation of a dam and reservoir at the Goose Lake site would potentially impact approximately 326 acres of NWI wetlands. The site is located within the boundaries of the Colville Indian Reservation and the Colville Confederated Tribes would have to be consulted concerning potentially sensitive sites with respect to natural resources, cultural resources and other trust resources within the potential project boundary. Additionally, potential impacts on Indian Trust Assets would need to be evaluated, analyzed and mitigated.

Shanker's Bend (Similkameen River)

The Similkameen River is an international watershed, with 80% of the basin in Canada. In June 2007, Ecology met with tribes, state and local government leaders, and members of a watershed planning group to discuss future water use for the Similkameen River watershed. This planning group, the Similkameen Watershed Interim Steering Committee, had recently formed with the purpose of locating new water storage sites in the Similkameen

basin. The Committee's two component national interest groups are investigating Canadian and American sites. The Canadian effort is supported by FortisBC, a local power utility, and spearheaded by the Similkameen River Planning Society. The US support consists of irrigators, utilities, and Okanogan County, and is led by Okanogan Co. Public Utility District (PUD).

Similkameen River

The Similkameen Watershed Interim Steering Committee awarded a contract to Hatch Energy in January 2008. The contract was for a study to assist the Similkameen River Planning Society in making decisions with respect to the potential development of the Similkameen Watershed in Canada. The group's overall goal is to have both Canadian and US members investigate potential storage sites and merge the two studies into the Hatch study at a later date. Okanogan PUD initiated the US process in Dec 2007 and recently hired a consultant team to perform detailed regional storage site assessments. Completion of the Okanogan PUD study is estimated for December 2008.

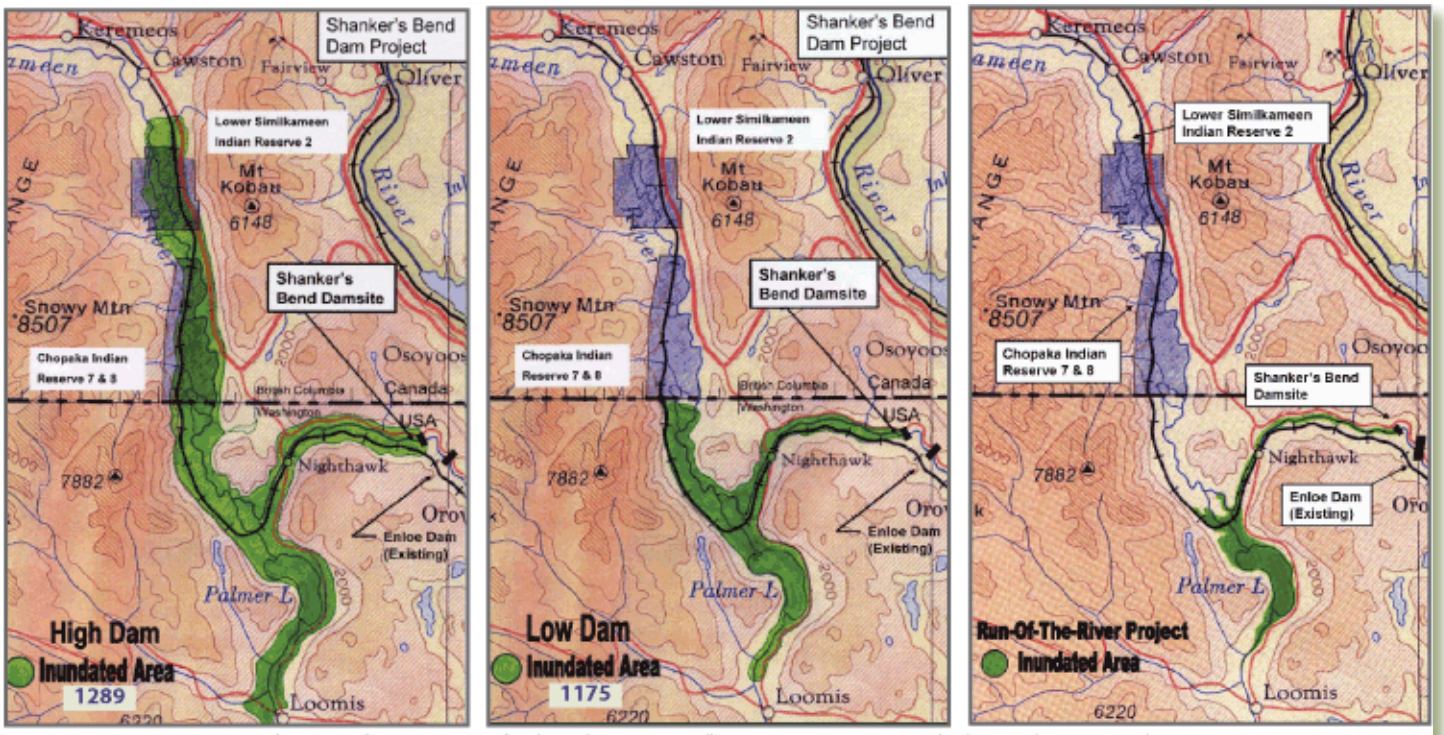
Canadian Storage Investigations

Hatch Energy recently released a report that recommended a new water storage project located south of Princeton B.C. The project would include construction of a 600 foot concrete dam capable of storing 164,000 acre-feet of water. The cost of the proposed project is between $297 million to $321 million, depending on features to be evaluated later. In addition, a project power plant could produce up to 60 MW of new power generation.

The proposed storage project might provide some potential benefits to US water users downstream, as well as pose some potential problems.

Possible Benefits to US include:

- Increases river flow later in the year in the Similkameen-Okanogan-Columbia system, when power-to-sell brings higher prices.



Project Inundation Maps from Department of Ecology White Paper – Similkameen River Storage Project (Shanker's Bend) 5/17/07 David Cummings

- Possibly will increase river flows after August and later in the Similkameen-Okanogan system, aiding migration of some fish species.

Possible Problems to US include:

- Since Okanogan PUD (Enloe Dam) and Columbia River dam owners benefit as described above, BC dam developers might seek US funding for construction or operation of the project.
- Downstream power revenue credits could accrue to whoever owns the storage project closest upstream of the Okanogan PUD and Columbia River dams, so this project and the Shanker's Bend project could be viewed as competitors.
- The project might decrease water flows during June-July in the Similkameen-Okanogan Rivers, possibly impacting migration of other fish species.

US Storage Investigations

The Okanogan PUD is studying the potential for a storage facility/dam at Shanker's Bend on the Similkameen River, a site that has been considered for construction of a dam since the 1940s. The proposed site is located a short distance upstream from the existing Enloe Dam. The Shanker's Bend project is viewed as having at least three possible configurations. These configurations are detailed in the images on the previous page.

Black Rock

The Black Rock project involves a proposal to construct an 800,000 to 1,300,000 acre- foot storage reservoir in eastern Yakima County. The proposed reservoir would be filled with water pumped from the Priest Rapids Dam pool of the Columbia River, when such water is available in excess of current instream flow targets. Water from the reservoir would be used by participating irrigation entities within portions of the lower Yakima Basin in exchange for water currently diverted by those entities from the Yakima River under existing water rights. Black Rock reservoir is currently undergoing analysis by Reclamation as an alternative in the Yakima River Basin Water Storage Feasibility Study. The study was initiated in May of 2003 and a draft EIS is expected in January 2009. The estimated cost for the Black Rock facility is $6.7 billion.

Proposed Black Rock site

Other Columbia River Program Goals

Odessa

RCW 90.90.020 directs Ecology to focus its water supply development efforts on alternatives to groundwater for agricultural users in the Odessa subarea aquifer. The Odessa Subarea Special Study is an investigation by Reclamation of continued phased development of the Columbia Basin Project to replace current groundwater irrigation occurring in the Odessa Subarea with surface water. An estimated 170,000 acres within the Odessa Subarea are now being irrigated with groundwater; an estimated 140,000 of these acres are eligible to receive Columbia Basin Project surface water. Ecology is participating in the Study to provide support for state and local agency permit decisions that may be necessary to implement a selected alternative.

On April 1, 2008, Reclamation released an appraisal-level engineering investigation of four water delivery alternatives and six water supply options. The four water delivery alternatives proposed possible infrastructure (canals, pumping plants and laterals) and configurations to deliver replacement surface water to existing

groundwater irrigated lands in the Study area[10]. Reclamation selected Alternative B for further study. Alternative B would involve construction of a new East High Canal system north of I-90 and enlargement of the capacity of the existing East Low Canal south of I-90 with a 2.3 mile extension. This alternative is estimated to cost $1,944 – $ 4,391 million[11]. The study also includes storage options, such as reoperation of Banks Lake and construction of Rocky Coulee Dam. Reclamation began scoping for an EIS in September 2008 and plans to issue a Draft EIS in 2010.

Alternative B includes the construct a new East High Canal system north of Interstate 90; enlarge the capacity of the existing East Low Canal south of Interstate 90 and construct a 2.3 mile extension. This alternative would allow for the conversion of 127,300 acres from groundwater to surface water irrigation; equal to 91 percent of the total need for the Odessa. The estimated cost range is $1,944,000,000 to $3,848,000,000.

Increased diversions will be required from the Columbia River above current Columbia Basin Project diversions to provide the replacement water supply. Alternative B would require an additional 453,200 acre-feet of Columbia River diversion. Reclamation examined water supply options that would not affect Columbia River flow objectives identified for fish listed under the Endangered Species Act (ESA). These water supply options included:

- Modifying operations at existing Columbia Basin Project storage facilities
  - Banks Lake Drawdown: Draw down Banks Lake to elevations ranging from 4 to 16 feet lower than current operations.
  - Banks Lake Operational Raise: Raise reservoir water surface elevation 2 feet.
  - Potholes Reservoir Reoperation: Adjust water storage timing in the reservoir.
- Constructing new storage facilities that would be filled in September and October to provide water to Odessa Subarea lands in March through August. Three sites were examined: Dry Coulee, Rocky Coulee and Lower Crab Creek.

After examining these options, Reclamation decided to continue to study operational modifications at Banks Lake and Potholes Reservoir and the possible construction of Rocky Coulee Dam and reservoir as potential options to provide the replacement water supply.

Table 2. Water Supply Options Summary

Water Supply Option	Active Storage *(acre-feet)*	Groundwater Acres Served		Estimated Construction Cost Range
		acres	*percent*	
Banks Lake Drawdown	715,000*	Up to 140,000	100	n/a
Banks Lake Raise	50,000	16,700	12	$ 18,600,000 - 130,000,000
Potholes Reservoir Re-op	50,000	16,700	12	$ 1,920,000 - 62,400,000
Dry Coulee	481,000	140,000	100	$ 1,020,000,000 - 1,950,000,000
Rocky Coulee	126,000	46,900	34	$ 234,000,000 - 416,000,000
Lower Crab Creek	200,000	60,000	43	$ 252,000,000 - 494,000,000
	472,000	140,000	100	$ 348,000,000 - 676,000,000

* Currently 125,000 acre-feet of this is used to assist with Columbia River fish flow objectives.

http://www.usbr.gov/pn/programs/ucao_misc/odessa/update-feb2008.pdf

The study was submitted to the public for comment in October 2007. Reclamation received 81 written comments from State agencies, environmental, conservation and non-governmental organizations, State residents, and representatives for agriculture and recreation interests.

10 The study will focus on lands currently irrigated with groundwater in Adams and Grant Counties and a small portion of Franklin County. The study area is within the Columbia Basin Project boundary and is generally defined by the area bounded on the west by the Project's East Low Canal, on the east by the City of Lind and extending north to Wilson Creek and south to the Connell area. Previous Reclamation studies have determined these lands to have irrigation development potential. They are also located within the Odessa groundwater subarea as designated by the Washington Department of Ecology.

11 These are appraisal-level cost estimates that are considered preliminary and not suitable for determining actual construction costs or requesting construction fund appropriations from the Congress.

Potholes Reservoir - Supplemental Feed Route

Since 2005, Ecology has invested $2.1 million in partnering with Reclamation to study the need for a supplemental feed route to provide water to the South Columbia Basin Irrigation District. The Legislature authorized additional funds in HB 2860, the authorizing legislation for RCW 90.90. In August 2007, Reclamation issued a final Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Potholes Reservoir Supplemental Feed Route.

Reclamation identified Crab Creek and Frenchman Hills Wasteway as the preferred alternative for the Potholes Supplemental Feed Route. This alternative would release feed water from Billy Clapp Reservoir through the four-by-four-foot outlet into Brook Lake, a natural water body within the Crab Creek channel. Crab Creek would then convey the water into Moses Lake and Potholes Reservoir. Water would also be released from Billy Clapp Reservoir via the Main Canal and West Canal, into the Frenchman Hills Wasteway, and then into Potholes Reservoir (Bureau, 2007 EA).

Aerial view of Potholes Reservoir

On January 17, 2008, Ecology issued an MDNS determination under the State Environmental Policy Act (SEPA) for Phase 1 /7(Frenchman Hills Wasteway) of the Potholes Supplemental Feed Route project. After studying potential impacts to the environment, Ecology determined that with appropriate mitigation, there will be no probable significant adverse environmental impacts. Construction of Frenchman Hills Wasteway was concluded in March 2008. SEPA compliance and permitting for Phase 2 (Crab Creek) was initiated in August 2008. $10 million dollars from the 2008 Grant Funding Cycle has been awarded for construction activities associated with Crab Creek.

Trust Water Brochure (http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/tw_brochure.pdf)

Acquisitions and the Drought Insurance Program

Acquisition is one of the water supply development tools that the Legislature directed Ecology to use in RCW 90.90.010. Ecology set aside $1 million to begin to meet this goal. Ecology has contracted $50,000 with Washington Water Trust (WWT) and Washington Rivers Conservancy (WRC) to develop a pilot program to identify and acquire water supplies for implementation of the Columbia River Program. The pilot project is focused on developing drought supplies to augment Ecology's Drought Insurance Program[12] to benefit interruptible water right holders. Additional tools, such as permanent acquisition and term leases of at least five years are being explored and tested.

The Trust Water Rights Program gives Ecology the ability to reallocate water for new permits and enhance stream flows for healthier fish habitat by providing conservation for fisheries and economic stability via drought permits for local needs.

Ecology acquires trust water by purchasing or leasing water rights from willing

12 The Drought Insurance Program will include a portfolio of trust water and storage supplies for us in drought. Currently, the 33,000 acre-feet of supply from Lake Roosevelt Incremental Storage Releases is the only drought water available.

water right holders who may choose to temporarily or permanently donate all or a portion of their water right. Trust water may also come from water conservation resulting from on-farm irrigation improvements. By participating, water right holders keep their water right in good standing without losing it via relinquishment.

The Trust Water Rights Program operates in collaboration with:

- Water Resource Inventory Areas (WRIA)
- local governments
- fisheries experts and wildlife biologists
- non-profit environmental organizations
- community & private citizen groups

2008 Telephone Survey

In June 2008, Ecology commissioned a telephone survey of water right holders in the Columbia Basin to gain a better understanding of how to more effectively acquire water for the Trust Program. The survey found that over half of the respondents had heard of the acquisition program and 33% of them are interested in participating. Their desire to participate varied according to how the sale would be conducted:

- 40% preferred direct negotiations.
- 12% liked an open format
- 6% wanted an auction.
- Only 1% preferred a reverse auction (the method employed by Ecology in the last acquisition attempt.)

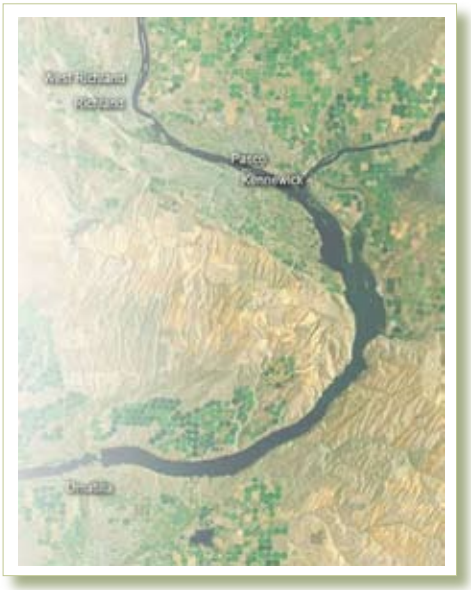
The report's executive summary is available for viewing or download at the Office of Columbia River web site; http://www.ecy.wa.gov/programs/wr/cwp/crwmp.html.

Voluntary Regional Agreements

A voluntary regional agreement (VRA) is a legal agreement between the State and one or more Columbia River water users "for the purpose of providing new water for out-of-stream use, streamlining the application process, and protecting instream flow." (RCW 90.90.030). Once adopted by the Department of Ecology, a VRA serves as the framework for issuing new water rights to that individual or group of water users.

Columbia-Snake River Irrigators Association (CSRIA)

Ecology and the Columbia-Snake River Irrigators Association (CSRIA) entered into the first Voluntary Regional Agreement (VRA) as provided for in RCW 90.90.030 on July 18, 2008. The purpose of this VRA is to provide new water for the issuance of drought permits to existing interruptible water rights holders and new water rights on the Columbia and Snake Rivers. This VRA provides that the issuance of these new water rights cannot reduce or negatively impact stream flows in the months of July and August (April through August for the Snake River). To meet this standard of protection, Ecology and CSRIA will pursue conservation, storage, acquisition and other opportunities to provide new water to offset new withdrawals during the summer months. Ecology completed an interim legislative report (required in RCW 90.90.030) on VRA's in December 2008 with additional detail on VRA implementation[13].



CSRIA area

Cultural Resource Management Plan

Ecology is preparing to fund the development of a Cultural Resource

13 http://www.ecy.wa.gov/programs/wr/cwp/cr_vra.html

Management Plan (CRMP) for the Columbia River Program. The CRMP will be a set of guidelines for the treatment and management of cultural resources as applicable to project aimed at acquiring water for instream and out-of-stream needs. The CRMP will be consistent with the cultural resource laws and national policies of environmental stewardship and fulfill the requirements of Washington state Executive Order 05-05. The CRMP will respond to and support the Program's mission, to "aggressively pursue development of water supplies to benefit both instream and out-of-stream water uses" (90.90.005 RCW).

Spokane tribal archaeology crew conducting test excavations at Lake Roosevelt (photo: J.J. Sijohnz)

Supply Inventory

The statute directs Ecology to develop water supplies that meet both instream flow needs and the following specific out-of-stream needs (90.90.020(3)):

- Alternatives to groundwater for agricultural users in the Odessa subarea aquifer.
- Sources of water supply for pending water right applications.
- A new uninterruptible supply of water for the holders of interruptible water rights on the Columbia River mainstem that are subject to instream flows or other mitigation conditions to protect stream flows.
- New municipal, domestic, industrial, and irrigation water needs within the Columbia River Basin.

Each of the water supply needs above can be met by different water supply sources. Some require permanent, ongoing supplies. Others can be met by short-term water supply projects. Some require offsetting consumptive use reductions to ensure there is no impact to the river and downstream water right holders. Others may be met by projects that reduce withdrawals through return flow savings in particular river reaches or through source substitution projects.

The inventory of water supply projects offers a toolbox of options Ecology can use to meet existing and future demands for water within the Columbia River Basin. One of the most significant efforts Ecology undertook in this legislative report is to identify which water supply opportunities benefit stream flows and the environment and which water supplies could be allocated for new out-of-stream uses (new permits). This distinction is required in RCW 90.90.040(1) so that Ecology can meet the balanced objectives in the statute.

Table 4: Summary of Water Supply Inventory Table for 2007 and 2008

Type of Project	Number of Projects Listed		Projects with Water Savings (Projects with Cost Data)		Projects with Water Savings & Cost Data	
	2007	2008	2007	2008	2007	2008
New Large Storage (>1,000,000 acre-feet)	5	5	5(5)	5(5)	5	5
New Small Storage (<1,000,000 acre-feet)	104	112	89(49)	91(55)	43	45
Aquifer Storage and Recovery	31	37	6(10)	8(14)	2	4
Modification to Existing Storage	5	7	4(0)	6(1)	0	1
Lining/Piping	165	173	109(124)	113(128)	107	111
On-farm Efficiency	5,587	5,589	5,402(5,410)	5,404(5,412)	5,399	5,401
Irrigation Water Management^	33	34	1(1)	2(1)	1	1
Automation & System Control	46	46	21(40)	21(40)	21	21
General Water Conservation*	88	89	5(9)	5(9)	4	4
Tail Water Reuse	4	4	4(4)	4(4)	4	4
Surface to Groundwater Conversion	1	1	1(1)	1(1)	1	1
Reclaimed Water	0	1	0(0)	0(0)	0	0
Municipal Conservation	0	0	0(0)	0(0)	0	0
Partial Season Acquisitions/Leases^	9	10	5(3)	5(3)	3	3
Fallowed Corners/Land Retirement	45	45	31(31)	31(31)	31	31
Crop Water Duty Reductions	15	15	0(0)	0(0)	0	0
Land Conservation Programs	0	0	0(0)	0(0)	0	0
Crop Change	0	0	0(0)	0(0)	0	0
Total (all)	6,138	6,168	5,683 (5,687)	5,696(5,704)	5,621	5,632
Total (conservation & acquis. only)	5,993	6,007	5,579 (5,623)	5,586 (5,629)	5,571	5,577

2008 numbers reflect 2007 data with added and updated data from 2008.

* General Water Conservation projects include public education, planning, researching and developing innovative irrigation implementation.

^ Annual cost per-acre feet

	Estimated Water savings acre-ft/year		Estimated Cost		Estimated Cost per acre-feet	
	2007	2008	2007	2008	2007	2008
	6,000,000	9,580,000	$10,392,000,000	$13,457,886,563	$1,732	$1,405
	251,240	269,740	$727,952,510	$762,832,510	$2,897	$2,828
	343	2,581	$3,400,000	$8,857,000	$9,913	$3,432
	unknown	70,000	unknown	$33,000,000	unknown	$471
	451,310	478,030	$505,691,321	$540,667,321	$1,120	$1,131
	259,952	263,143	$338,459,565	$343,079,425	$1,302	$1,304
	243,503	243,503	$9,167,184	$9,167,184	$38^	$38
	26,307	26,307	$9,757,000	$9,757,000	$371	$371
	12,914	12,914	$7,196,300	$7,196,300	$557	$557
	5,800	5,800	$1,040,000	$1,040,000	$179	$179
	360	360	$200,000	$200,000	$556	$556
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	80,360	80,360	$6,700,000	$6,700,000	$83^	$83
	392	392	$392,100	$392,100	$1,000	$1,000
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	7,332,481	11,033,130	$12,001,955,980	$15,180,775,403		
	1,080,898	1,110,809	$878,603,470	$918,199,330		

2008 Inventory

Ecology compiled this 2008 inventory building on the 2006 / 2007 inventory. Staff made use of additional planning documents and on-the-ground project reviews (from the 2008 Grant Cycle), as well as inviting contributions from watershed planning units, conservation districts, and tribal governments. In order to solicit projects, Ecology launched the first web based Water Supply Inventory Form. The 2008 Inventory Web Form was made available for new project entries from July 28th to August 30th. Ecology decided to move to webbased inventory updates for greater transparency and because the number of new projects in the inventory each year has begun to peak. For example, in 2006 (the first inventory), staff collated information on about 5,400 storage

Table 5: Summary of Projects Benefiting Instream Uses (non-consumptive)

Type of Project	Number of Projects Listed		Projects with Water Savings (Projects with Cost Data)		Projects with Water Savings & Cost Data	
	2007	2008	2007	2008	2007	2008
Lining/Piping	165	173	109(124)	113(128)	107	111
On-farm Efficiency	5,587	5,589	5,402(5,410)	5,404(5,412)	5,399	5,401
Irrigation Water Management^	33	34	1(1)	2(1)	1	1
Automation & System Control	46	46	21(40)	21(40)	21	21
General Water Conservation*	88	89	5(9)	5(9)	4	4
Tail Water Reuse	4	4	4(4)	4(4)	4	4
Surface to Groundwater Conversion	1	1	1(1)	1(1)	1	1
Reclaimed Water	0	1	0(0)	0(0)	0	0
Municipal Conservation	0	0	0(0)	0(0)	0	0
Total	5,924	5,937	5,543 (5,589)	5,550 (5,595)	5,537	5,543

Table 6: Summary of Projects Benefiting Out-of-Stream Uses (consumptive)

Type of Project	Number of Projects Listed		Projects with Water Savings (Projects with Cost Data)		Projects with Water Savings & Cost Data	
	2007	2008	2007	2008	2007	2008
Partial Season Acquisitions/Leases^	9	10	5(3)	5(3)	3	3
Fallowed Corners/Land Retirement	45	45	31(31)	31(31)	31	31
Crop Water Duty Reductions	15	15	0(0)	0(0)	0	0
Land Conservation Programs	0	0	0(0)	0(0)	0	0
Crop Change	0	0	0(0)	0(0)	0	0
Total	69	70	36 (34)	36 (34)	34	34

2008 numbers reflect 2007 data with added and updated data from 2008.

* General Water Conservation projects include public education, planning, researching and developing innovative irrigation implementation.

^ Annual cost per-acre feet

and conservation projects. In 2007 there were 6,138 projects (an increase of only 12%). 31 new projects were submitted in 2008, which helps shows that Ecology has been successful in documenting the full range of storage and conservation options in the Columbia River Basin. Future legislative reports will continue to update the inventory, but will focus more on showcasing how the investments we're making in funding projects from the inventory are meeting the instream and out-of-stream objectives of the legislation. Table 6 summarizes the types of storage and conservation projects for which data was gathered.

	Estimated Water savings acre-ft/year		Estimated Cost		Estimated Cost per acre-feet	
	2007	2008	2007	2008	2007	2008
	451,310	478,030	$505,691,321	$540,667,321	$1,120	$1,131
	259,952	263,143	$338,459,565	$343,079,425	$1,302	$1,304
	243,503	243,503	$9,167,184	$9,167,184	$38	$38
	26,307	26,307	$9,757,000	$9,757,000	$371	$371
	12,914	12,914	$7,196,300	$7,196,300	$557	$557
	5,800	5,800	$1,040,000	$1,040,000	$179	$179
	360	360	$200,000	$200,000	$556	$556
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	1,000,146	1,030,057	$871,511,370	$911,107,230		

	Estimated Water savings, acre-ft/year		Estimated Cost		Estimated Cost per acre-feet	
	2007	2008	2007	2008	2007	2008
	80,360	80,360	$6,700,000	$6,700,000	$83	$83
	392	392	$392,100	$392,100	$1,000	$1,000
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	unknown	unknown	unknown	unknown	unknown	unknown
	80,752	80,752	7,092,100	7,092,100		

Instream and Out-of Stream Benefits

Ecology has been working to ensure that Program funded projects provide fisheries benefits. In doing so, Ecology has been working with the Washington Department of Fish and Wildlife to determine what projects provide the best instream benefits while still providing water for out-of-stream use. With the exception of funding for the Columbia Basin projects (e.g. Odessa and Supplemental Feed Route, which are inland projects), every project funded by Ecology this year has significant fisheries benefits for salmon and steelhead as required in the statute. These occur via direct flow increases (such as the 1/3rd of storage water from Lake Roosevelt), tributary flow and habitat benefit (such as Barker Ranch, Manastash), aquifer storage projects (that can have both flow and temperature benefits) and surface storage feasibility studies (1/3rd for fish).

To meet the balanced objectives of the Program, out-of-stream benefits are also needed from water supply investments. In some cases these will occur via new permits. For example, there are approximately 500 new permits to be issued from the Lake Roosevelt drawdown project alone. As feasibility studies yield more construction opportunities, permitting will increase. Other out-of-stream benefits will also accrue from the projects. The Boise Cascade ASR project will yield temperature benefits to the paper mill allowing them to save energy and take a chiller off-line. Reliability will increase for the City of White Salmon, Barker Ranch and Kennewick Irrigation District. Ecology will continue to evaluate the balance between out-of-stream and instream benefits each year as it makes funding decisions.

Program Benefits to Fish

Ecology has been working to ensure that Program funded projects provide benefits to fish and wildlife. In doing so, Ecology has been working with WDFW to determine what projects provide the best instream benefits while still providing water for out-of-stream use.

Lake Roosevelt Incremental Releases

Incremental water releases from Lake Roosevelt provide opportunities to benefit both water users and fish and wildlife in and along the Columbia River.

The water releases for both instream and out-of-stream uses are planned for the spring-summer period to increase flows during salmon and steelhead migration times. Flows earmarked for instream use are released April through August in normal and wet years, and April through June in dry and drought years. Flows allocated for municipal and industrial uses and drought relief will also be released in the spring-summer, increasing the magnitude of flows downstream until the point of withdrawal. Bolstering spring and summer flow is a move toward a more normative regime benefiting all instream resources.

Odessa - Making surface water available to groundwater irrigators in the Odessa Subarea is a primary goal of the Program. WDFW, Ecology and Reclamation are working together to ensure that construction of infrastructure and delivery of this water occurs with the least disruption to fish and wildlife resources.

Aquifer Storage and Recovery Projects

The implementation of Aquifer Storage and Recovery instead of more traditional surface storage reservoirs significantly reduces the impacts of new water storage to both aquatic and terrestrial species and their habitats. Aquifer Storage and Recovery (ASR) projects utilizing injection wells reduce the above-ground project area, thus minimizing the impact on important wildlife habitats, which includes sensitive and increasingly rare native shrub steppe. ASR allows us to provide water for instream and out-of-stream use while at the same time minimizing the footprint of impact to native habitats and species such as wintering mule deer, greater sage grouse, and Washington ground squirrel.

Another benefit to ASR is the return of cool clean water to the system when water is needed. This can be accomplished through pump return or by passive filtration of the water. The water can be timed for release to increase flows for fish and reduce water temperatures during critical salmonid life stages. Fish will also benefit from the release of new water for out-of stream uses until the point of withdrawal.

Placement of Aquifer Storage and Recovery projects will depend on the underlying geology and aquifers. Those projects than can be placed upstream in the system along tributaries will increase the distance the water flows to the Columbia River and hence increase the area that fish, wildlife and their habitats will benefit from the increased flows, reduced water temperatures and improved water quality.

Water Conservation Projects

The Columbia River Grant Funding Program incorporated criteria for Fish and Water Quality Benefits when evaluating water conservation project proposals. Scoring captured the number and status of fish and wildlife species benefiting from increased flows; the potential for improved habitat, water quality and quantity; and recreational value.

Many projects evaluated in the 2008 Grant Funding cycle have potential to provide fish, wildlife and water quality and quantity benefits in tributary reaches. Generally tributaries have lower flows than in the mainstem Columbia River. Because of this, increasing flows through water conservation projects has greater proportional benefit in tributaries than the same volume restored to the mainstem. In restoring a greater proportion of the flows, water temperatures can often be reduced, improving instream conditions for fish survival. Flow restoration may also overcome barriers to fish migration.

As mentioned above, many of the projects submitted in the 2008 grant round have potential to provide tributary reach benefits. The proposed piping and lining of the water conveyance system to Barker Ranch has potential to increase flows in a seven-mile stretch of the Yakima River. By consolidating points of diversions, the Manastash Creek Restoration Project has potential to re-wet a portion of the stream that is typically dry during the irrigation season. These are just two examples of the water conservation proposals selected during the grant funding process that have potential to provide fish and wildlife benefits.

Pump Exchange Projects

Pump exchange projects, such as the proposed Wymer and Walla Walla Pump Exchanges, have potential to benefit fish, wildlife and their habitats by substituting tributary diversions with alternative sources of water from lower in the watershed or other water bodies. Water left in the tributary increases flows where habitat is critical for salmonids and other native fish. Water remaining in the tributary also has potential to establish a more normative flow regime that will enhance the growth of riparian vegetation.

The Kennewick Irrigation District pump exchange proposal is one example of the benefits of pump exchange for fish resources. The KID proposes to move a point of diversion in the Yakima River downstream, and to replace some of the water currently pumped from the Yakima River with water pumped from the Columbia River. This has potential to increase flow in the Yakima River Water by 1/3 during the summer irrigation season – a significant benefit to instream resources.

Modification to Existing Storage

The Columbia River is one of the most highly managed waterways in the United States. Ecology is partnering with Reclamation and other federal, state, local, and tribal governments to consider how existing storage facilities can be managed to add to water supplies for instream and out-of-stream uses in the Columbia River Basin. Modifications could include raising the height of existing impoundments (on-channel or off-channel), raising operating pool heights, lowering drawdown depths, or otherwise altering operations at existing facilities. The advantages of modifying existing storage, over new construction, are that both the cost and the environmental and cultural impacts are likely much lower.

Wanapum Dam (*photo by EPA*)

Ecology is currently funding Banks Lake, new incremental storage releases at Lake Roosevelt, and the Wanapum Pool Raise as previously discussed. As additional projects are presented, Ecology will update the inventory.

Modification to Existing Storage	2007	2008
Number of Projects	5	7
Number of Projects w/ Estimated Water Savings	4	6
Number with Estimated Cost	0	1
Estimated Water Savings acre-feet/year	unknown	70,000
Estimated Cost	unknown	$33,000,000
Estimated Cost per acre-feet	unknown	$471

Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) and Shallow Aquifer Recharge (SAR) is a water storage technique that uses underground aquifers as storage reservoirs. ASR is permitted by Ecology under RCW 90.03.370 and Chapters 173-157 (water rights), 173-160 (well construction), 173-200 (water quality), and 173-218 WAC (Underground Injection Control rules). Water may be introduced to the aquifer by infiltration from above ground or directly by using injection wells. Water may be stored for a period of weeks, months, or even longer, and then recovered for potable or other uses. There are two main ways of recovering artificially stored groundwater:

Pump Recovery: a system that uses wells and pumps to recover stored water for beneficial use. This type of ASR is assessed similarly to selecting surface storage. Ideally, the aquifer used to store water does not have excessive leakage or transport of groundwater away from the injection or infiltration site. The water remains in storage until pumped back out for use.

Aquifer Storage and Recovery	2007	2008
Number of Projects	31	37
Number of Projects w/ Estimated Water Savings	6	8
Number with Estimated Cost	10	14
Estimated Water Savings acre-feet/year	343	2,581
Estimated Cost	$3,400,000	$8,857,000
Estimated Cost per acre-feet	$9,913	$3,432

Shallow Aquifer Recharge (SAR) - Passive Leak: a system that relies on excessive aquifer leakage to transport the water back to the river. The purpose of this storage method is to retime the hydrograph from periods of low demand and high supply (such as in winter months when target flows are routinely met) to periods of high demand and low supply (such as summer months when irrigation demands and fish needs are greatest). The precision of a passive leak system in delivering water when and where it is needed tends to be lower than in pump recovery, but the cost is also lower.

Some recognized benefits of ASR / SAR are:

- Substantial amounts of water can be stored deep underground. This may reduce the need to construct large and expensive surface reservoirs.
- ASR/SAR systems are considered more environmentally friendly than surface reservoirs because their ecological footprint tends to be far less than inundation of lands by surface storage.
- ASR/SAR can have greater water quality benefits than surface storage, particularly in regards to temperature.
- ASR/SAR may restore and expand the function of an aquifer that has experienced long-term declines in water levels due to heavy pumping necessary to meet growing urban and agricultural water needs.

Large Storage

RCW 90.90.010 directs Ecology to spend two-thirds of the Columbia River funds "to support the development of new storage facilities." Ecology has been evaluating the potential for new large storage facilities with a capacity of 1 million acre-feet or more for several years. If a single storage facility is large enough, it could potentially resolve major instream and out-of-stream water supply problems in the Columbia River Basin (Ecology, 2006). Currently, Ecology is evaluating five large storage facility sites. Goose Lake and Ninemile Flats are new appraisal-level studies this year.

- Columbia River Mainstem Off-Channel storage (Crab Creek)
- Yakima River Basin water storage (Black Rock)
- Similkameen River storage (Shanker's Bend)
- Goose Lake and Ninemile Flats

Large Storage	2007	2008
Number of Projects	5	5
Number of Projects w/ Estimated Water Savings	5	5
Number with Estimated Cost	5	5
Estimated Water Savings acre-feet/year	6,000,000	9,580,000
Estimated Cost	$10.4 billion	$13.5 billion
Estimated Cost per acre-feet	$1,732	$1,405

In order for new large storage options to be successful, the benefits derived from storage must be "multi-purpose" in nature. RCW 90.90.010 provides guidance on how water supplies from Program-funded storage are to be used: two-thirds for out-of-stream uses and one-third for instream uses. Further, RCW 90.90.020 directs Ecology to meet multiple out-of-stream needs, including providing drought supplies for existing interruptible water rights, providing water for municipal and industrial needs, providing water for new applicants, and replacing groundwater use in the Odessa.

Additionally, Ecology must consider the Governor's climate change directive (Executive Order No. 07- 02). Given the dependence of Eastern Washington on snow pack and the potential for climate change to reduce summer flows derived from snow, the need to evaluate the feasibility of storage in the Columbia Basin is clear.

Small Storage

In addition to large storage evaluations, Ecology has been considering the potential for multiple small storage facilities to resolve major instream and out-of-stream water supply problems in the Columbia River Basin (Ecology, 2006). The Columbia River legislation does not define a preference for the size of storage reservoirs, only that two-thirds of program funds be used to support development of new storage.

In 2006, Ecology evaluated adopted watershed plans, irrigation district plans, and other published documents for small storage opportunities. In 2007, Ecology augmented its research and outreach to watershed groups and conservation districts. For 2008 and beyond, Ecology will continue to update the inventory with potential small storage projects as they are presented.

Small Storage	2007	2008
Number of Projects	104	112
Number of Projects w/ Estimated Water Savings	89	91
Number with Estimated Cost	49	55
Estimated Water Savings acre-feet/year	$251,240	$269,740
Estimated Cost	$727 million	$762 million
Estimated Cost per acre-feet	$2,897	$2,828

Conservation Update

There are many water conservation strategies that can be applied in the Columbia River Basin. While conservation is a long-term approach to reducing the water demand over time, it can be achieved more quickly than construction of new storage. Successful implementation of conservation strategies can meet the dual objectives of the Program: water for fish and water for out-of-stream users. The following table (Table 7) provides a break down of the water supply inventory to date.

Table 7: Conservation Project Breakdown

Agricultural Conservation Projects
• 6,006 projects
• 1,110,809 acre-feet of potential water savings
• Average estimated cost $827 per acre-foot

Not all conservation projects will result in an immediate savings in the Columbia River or benefit the entire Columbia River downstream of the historic point of discharge. Some conservation projects benefit only a particular "reach" of the Columbia River or a tributary. The savings that "accrue" to the river will depend on a number of factors, including:

- Whether the savings accrue due to conservation that reduces consumption (evaporation or transpiration) or reduces return flow (water that returns to the river at a point downstream of the diversion).
- Whether the diversionary water right is a surface water right or a groundwater right.

- The distance between the point of savings and the river; this can create both a time lag and spatial uncertainty about the location where the benefits occur.
- The dynamics of natural recharge and artificial return flows to the river.
- The ability to quantify and monitor water savings.
- Ecology recognizes the difficulty in issuing new permanent consumptive use permits based on water savings that are either temporary or non-consumptive in nature. It is Ecology's intent to match water supplies and demand in-land, in-time, and in-place.

Piping and Lining

Lining and piping (or water conveyance efficiency) is the conversion of open-ditch water conveyance delivery systems to a more efficient delivery pipe or the placement of an impermeable liner within a ditch. This is typically found in irrigation districts, companies, or associations that provide water to multiple end-users, but these projects can be located on individual farms as well (Ecology, 2006).

Canals without liners or with failing liners can lose 30 to 50 percent of their irrigation water through seepage. Canal-lining technologies can minimize seepage losses at reasonable costs (http://www.usbr.gov/pn/programs/wat/canal.html). Water conveyance efficiency projects possess a wide range of benefits including (from Deschutes Water Alliance, 2006):

- Piping reduces liability exposure from safety hazards inherent in open canals in urbanizing areas.
- Piping/lining reduces the diversion at the head gate and frees up water for instream flow and other district water needs.
- Piping can eliminate conflict between urban/suburban landowners.
- Piping will substantially reduce or eliminate operations and maintenance needs.
- Piping can provide gravity pressure, which conserves energy.
- Piping improves reliability and control of water delivery to more closely match demand fluctuation, which reduces need for surplus transport flows.
- Piping supports development of small hydropower facilities, which can increase revenue.

Piping & Lining	2007	2008
Number of Projects	165	173
Number of Projects w/ Estimated Water Savings	109	113
Number with Estimated Cost	124	128
Estimated Water Savings acre-feet/year	451,310	478,030
Estimated Cost	$505 million	$540 million
Estimated Cost per acre-feet	$1,120	$1,131

On-Farm Efficiency

On-farm agricultural water conservation and irrigation efficiency measures are typically implemented by individual landowners, often with technical assistance from the local conservation district or the Natural Resources Conservation Service (NRCS) (Ecology, 2006). On-farm efficiency projects consist of installation of a more efficient irrigation application system. This can be accomplished in several ways.

Examples include replacing open laterals and trenches with closed pipe; replacing non-pressurized irrigation systems with pressurized or drip sprinkler systems; using soil moisture sensors to optimize water use; constructing on-farm ponds to capture and reuse tailwater, and by using automated water management systems with integrated soil moisture sensors (Ecology, 2006).

Ecology contracts with WCC's Irrigation Efficiencies Grants Program (IEGP) to help private landowners partner with local conservation districts to save water and aid salmon recovery. According to the 2003 Farm and Ranch Irrigation Survey (2003 Census), of the approximately 1.8 million acres of irrigated land in the state of Washington 80% are irrigated by sprinkler systems, 5% by drip irrigation, and 15% by gravity flow systems. The Census (2003) data suggests that the average water application is about 2.0 acre-feet for sprinkler irrigation, and 2.9 acre-feet for flood irrigation. Although these figures appear low, they do not include transmission losses and variation in crop duties. Typical crop duties for the Yakima River Basin are approximately five acre-feet. Ecology is currently evaluating opportunities to coordinate Columbia River program funding with IEGP.

Most on-farm efficiency projects only provide benefits to the primary reach unless the irrigation efficiency practice is in combination with fallowed corners. This type of conservation (return flow reduction) benefits the instream flow portion of the program, but is not well-suited to offset new permits without adversely impacting the Columbia River.

On-Farm Efficiency	2007	2008
Number of Projects	5,587	5,589
Number of Projects w/ Estimated Water Savings	5,402	5,404
Number with Estimated Cost	5,410	5,412
Estimated Water Savings acre-feet/year	259,952	263,143
Estimated Cost	$338 million	$343 million
Estimated Cost per acre-feet	$1,302	$1,304

By using best management practices to increase the efficiency of on-farm water application and conveyance systems, the Irrigation Efficiencies Grant Program (IEGP) converts water savings into tributary flows where listed salmonid species will benefit from more consistent and persistent water flows. Best management practices can include:

- Irrigation canal improvements
- Irrigation erosion control
- Irrigation regulating reservoirs
- Irrigation system updates
- Irrigation water conveyance projects
- Irrigation water management
- Pumping plant for water control
- Tail water recovery
- Structures for water control
- Water wells (surface to ground conversion)
- Water flow measuring devices

photo by USGS

Tail Water Reuse

Tail Water Reuse involves the capture and reuse of tail water (surface runoff) from a field or conveyance system rather than returning it back to the stream. Water from a rill/furrow irrigation system is captured in ponds, ditches, or recirculation facilities at the bottom of the field. Captured tail water is then recycled to the head ditch for reuse and withdrawals for irrigation are reduced in equal portion (Ecology, 2006).

Tail water recovery or recirculation facilities collect irrigation runoff and return it to the same or an adjacent field for irrigation use. Such systems can be classified according to the method of handling runoff or tailwater. If the water is returned to a field lying at a higher elevation, it is usually referred to as a return-flow system; if the water is applied to a lower lying field, this is termed sequence use. The components consist of tail water ditches to collect the runoff, drainage ways or waterways to convey water to a central collection area, a sump or reservoir for water storage, a pump, a power unit, and a pipeline or ditch to convey water for redistribution. Under certain conditions where gravity flow can be used, neither pump nor pipeline may be necessary (NRCS, National Engineering Handbook).

Tail water reuse eliminates return flow that would return to the Columbia River. It provides instream benefit in the reach between the point of diversion and the point of return. It does not provide mitigation that can be used for out-of-stream permits.

Tail Water Reuse	2007	2008
Number of Projects	4	4
Number of Projects w/ Estimated Water Savings	4	4
Number with Estimated Cost	4	4
Estimated Water Savings acre-feet/year	5,800	5,800
Estimated Cost	$1,040,000	$1,040,000
Estimated Cost per acre-feet	$179	$179

Surface to Groundwater Conversion

Surface to Groundwater Conversion can reduce direct impacts on surface water supplies. This is particularly useful in times of drought when surface supplies are stressed. By moving surface diversions to groundwater, effects on surface water are diminished both in time (due to delayed effects of pumping) and in space (because effects of pumping are spread out over a longer river reach). For example, in 2005 and previous droughts, Ecology has permitted standby/reserve wells in the Yakima River Basin when surface supplies were curtailed. The wells were located far enough away from the river to avoid impacts on the river due to pumping during the drought.

Surface to Groundwater Conversion	2007	2008
Number of Projects	1	1
Number of Projects w/ Estimated Water Savings	1	1
Number with Estimated Cost	1	1
Estimated Water Savings acre-feet/year	360	360
Estimated Cost	$200,000	$200,000
Estimated Cost per acre-feet	$556	$556

Surface to groundwater conversion does not create new water, but is merely a source substitution. Effects on the surface source still occur, just later and over a larger area. This type of project can benefit instream uses by removing a direct surface diversion, eliminating the need for fish screens, and creating water management flexibility during times of water shortage. Provided the aquifer has sufficient capacity to supply the historic surface water diversions.

This type of conservation project is another tool that can be used to meet the statutory objective in the Columbia River Program to find reliable sources of supplies for interruptible water rights. In some areas of the Columbia, it may be possible to permit standby-reserve groundwater wells that can be used when Columbia River instream flows are not met. By moving demand to groundwater when surface supplies are stressed, instream benefits also occur. This type of project can therefore benefit both the instream and out-of-stream goals of the bill.

Reclaimed Water

In 1992 the Washington State Legislature passed the Reclaimed Water Act, Chapter 90.46 RCW, and directed the Department of Ecology and the Department of Health to develop standards for reclaimed water use and to jointly administer a reclaimed water program. The Reclaimed Water Act has the following goals:

- Encourage and facilitate reclaimed water use
- Provide new basic water supplies to meet future needs
- Protect public health and safety
- Protect and enhance our environment
- Gain public confidence and support for reclaimed water
- Find cost-effective solutions

photo by King County
(beakers are used to demonstrate the exceptional quality of Class A reclaimed water)

Reclaimed water is a water supply obtained through the treatment of the waste water used for municipal or domestic purposes. Sometimes called water recycling or water reuse, reclaimed water may also include incidental contributions of industrial process water or storm water. The process of reclaiming water involves an engineered treatment system that speeds up nature's restoration of water quality. The process provides a high level of disinfection and reliability to assure that only water meeting stringent requirements leaves the treatment facility.

In addition to reclaimed water, which is derived from municipal wastewater, Chapter 90.46 RCW includes provisions for the beneficial use of greywater, agricultural industrial process water, and industrial reuse water.

- "Greywater" is wastewater having the consistency and strength of residential domestic wastewater. Greywater includes wastewater from sinks, showers and laundry fixtures but does not include toilet or urinal waters.
- "Agricultural industrial process water" refers to food processing wastewater that does not have a sewage component. This includes wastewater from the processing of potato, fruit, vegetables, or grain. The wastewater must be adequately and reliably treated so that it is suitable for other agricultural use.
- "Industrial reuse water" is industrial wastewater that does not contain sewage and has been adequately and reliably treated so that it is suitable for beneficial uses.

The owner of the wastewater treatment facility reclaiming the water with a permit issued under Chapter 90.46 RCW has the exclusive right to any reclaimed water generated by the facility. Use and distribution of the reclaimed water is exempted from the water right permit requirements of RCW 90.03.250 and 90.44.061. However, the exclusive right to use reclaimed water is only granted if existing water rights will not be impaired or adequate compensation or mitigation has been provided.

Ecology has developed guidance on evaluating reclaimed water impairment. In summary, if the historic wastewater discharge or disposal method has been to marine waters, via land treatment, or via another consumptive disposal method, then no impairment typically results. However, in areas where historic wastewater disposal has been to rivers or groundwater closed by rule or with instream flows, or in areas where downstream water users rely on that wastewater as part of the availability for their water rights, impairment of existing water right holders is more likely.

In 1997, four cities (Yelm, Sequim, Ephrata, and Royal City) received state funding support to design and construct demonstration projects modeling reclaimed water use within the state. By 2005, 17 facilities had been constructed or upgraded to operate under the state reclaimed water standards. The constructed facilities can produce between one thousand gallons and seven million gallons of water per day. Uses of reclaimed water from these facilities include crop and landscape irrigation, toilet flushing, dust control, construction water, industrial cooling, created wetlands, groundwater recharge, and stream-flow augmentation. There are also several facilities engaged in various stages of planning, design, or construction. The Tulalip Indian Tribe constructed a reclaimed water facility for use at the casino and other tribal properties. Other tribes are planning and constructing reclaimed water facilities (Ecology 2005).

Since the passage of the 2006 Columbia River Bill, Ecology has received several inquiries as to how reclaimed water fits within the program. RCW 90.90 directs Ecology to aggressively pursue the development of new water supplies for instream and out-of-stream uses. Reclaimed water can be an important water supply source for alleviating water shortages and finding new ways to meet the growing water demands of the state. Reclaimed water intersects best with the Columbia River Program where the historic wastewater disposal method has been to consumptive land application, since there is little geographic opportunity for marine discharge. Examples of project costs include:

- The city of Ephrata funded reclaimed water facility construction through a $1.97 million Centennial Clean Water Fund grant appropriated by the Legislature and a $5.35 million Clean Water State Revolving Fund loan. The project's capital construction cost was $6.8 million. The Class A water reclamation plant has a design capacity of 1.22 million gallons per day (mgd). The average operating flows are approximately 0.55 mgd (615 acre-feet/yr).
- Royal City's primary reclaimed water use is aquifer recharge through surface percolation basins located at the water reclamation facility. The Class A water reclamation facility has a maximum design capacity of 0.25 million gallons per day (mgd), and presently averages 0.15 mgd (168 acre-feet/yr). Design and construction costs totaled $3.7 million.
- Quincy's Class A reclaimed water recharges the local aquifer through six infiltration basins located near the water reclamation facility. The Quincy facility treats 0.70 million gallons of water per day (mgd) and has a design capacity to treat up to 1.54 mgd (784 acre-feet/yr). Total capital cost for the reclamation facility project was $5.9 million.

Reclaimed Water	2007	2008
Number of Projects	0	1
Number of Projects w/ Estimated Water Savings	0	0
Number with Estimated Cost	0	0
Estimated Water Savings acre-feet/year	unknown	unknown
Estimated Cost	unknown	unknown
Estimated Cost per acre-feet	unknown	unknown

Since the 2006 Legislative Report, Ecology has sought to augment information on reclaimed water opportunities. Ecology has permits on file for 90 wastewater treatment plants in the Columbia River Basin that dispose of wastewater through land application. No detailed cost or water savings information exists for improvements of these facilities to reclaimed water plants. Since this water is historically lost to evaporation (consumptive use), funding reclaimed water projects of this type can meet both the instream flow objectives and out-of-stream (new permits) objectives of the Program. However, as in all projects funded by the Columbia River Program, the reclaimed water savings would need to be managed by the State for new instream and out-of-stream uses. This would likely manifest itself through a contract between the reclaimed water generator and the State. In exchange for funding, the reclaimed water generator would agree to deliver reclaimed water to the proposed site where beneficial use would occur (if nearby and could be piped) or to waters of the State (e.g. a river for downstream use).

Municipal Conservation

Domestic water use includes water used for household purposes such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, car washing, and watering lawns and gardens. Households include single and multi-family dwellings, such as apartments, condominiums, and small mobile home parks. Domestic use is separated into in-house uses (bathing, flushing toilets, laundry, cleaning, and cooking) and outside uses (lawn and garden watering, car washing, and pools). In-house uses tend to be consistent year round while outside uses tend to increase during specific seasons, usually summer, depending on the type of climate (U.S. Department of Housing and Urban Development, 1984a).

The largest domestic consumptive use is usually lawn watering, since most of this water is evaporated or transpired (Flack, 1981). In 2003 the State Legislature passed the Municipal Water Law, which directed the Department of Health (DOH) to adopt a rule that establishes water use efficiency (WUE) requirements for all municipal water suppliers. The water use efficiency rule will help conserve water for the environment and future generations. It will also enhance public health by improving water system efficiency and reliability.

All municipal water suppliers are affected by the rule requirements. There are hundreds of water use efficiency measures from which a water system may choose, including: landscape efficiency ordinance, low-flow showerheads, rebates to customers for installing water efficient appliances, using weather-based irrigation systems, and other measures appropriate to different municipalities.

The DOH rule states that municipal water suppliers must set their own goals for efficiently using water through a public process. This process assures that water customers and the general public have an opportunity to participate and provide comments on the goals set by the water system to use water efficiently.

Table 8: Eastern Washington Municipality Water System Deadlines

System	County	Last Plan Date	Next Plan Due Date	Total Connections
KENNEWICK, CITY OF	Benton	10/29/2002	10/29/2008	21041
RICHLAND, CITY OF	Benton	03/24/2003	3/24/2009	16008
WEST RICHLAND, CITY OF	Benton	10/29/2002	10/29/2008	4063
PASCO WATER DEPT	Franklin	10/5/2001	10/5/2007	18757
WENATCHEE, CITY OF (Chelan PUD)	Chelan	08/17/2004	08/17/2010	10956
SPOKANE, CITY OF	Spokane	05/03/2007	05/03/2013	68636
YAKIMA, CITY OF	Yakima	05/25/2004	05/25/2010	27258

The outcome and effectiveness of the new DOH rule is yet undetermined since most municipalities have yet to turn in new water system plans based on the six year cycle for new water system plan requirements. Only one eastern Washington city, Garfield, has submitted a new water system plan detailing municipal plans for the city based on the new DOH requirements. This report is in the draft stage and has not yet been accepted by DOH. Next year's report will provide updates as to how the DOH rule is effecting municipal conservation.

Table 8 outlines anticipated water system plan deadlines for the seven eastern Washington municipalities looked at for this report. Ecology will continue to monitor how the new DOH rule is effecting municipal conservation in an effort to determine if the Columbia River Program might be able to derive further water conservation by providing monetary and /or new water permit incentives. Additional detail on municipal conservation provided in Appendix B.

Irrigation Water Management

Irrigation water management (IWM) means to control application of irrigation water in a way that satisfies crop needs without wasting water, soil, or plant nutrients; or degrading the soil resource. This involves applying water (from the WIG 1997):

- According to crop needs
- In amounts that can be held in the soil and be available to crops
- At rates consistent with the intake traits of the soil and the erosion hazard of the site
- So that water quality is maintained or improved

A primary objective of IWM is to give irrigators an understanding of conservation irrigation principles. This is done by showing them how they can judge the effectiveness of their own irrigation practices, make good water management decisions, recognize the need to make minor adjustments in existing systems, and recognize the need to make major improvements in existing systems or to install new systems. The net results of proper irrigation water management typically:

- Prevent excessive use of water for irrigation purposes
- Prevent excessive soil erosion
- Maintain or improve quality of groundwater and downstream surface water
- Minimize pumping cost
- Increase crop biomass yield and product quality
- Reduce labor
- IWM is funded by individual farmers and through local programs. There are 200,000 -300,000 acres currently estimated to be in IWM in the Columbia River Basin, resulting in average water savings of approximately 10% to 17% per acre per year. Annual costs for IWM average $8-$20 per acre.

Irrigation Water Management	2007	2008
Number of Projects	33	34
Number of Projects w/ Estimated Water Savings	1	2
Number with Estimated Cost	1	1
Estimated Water Savings acre-feet/year	243,503	243,503
Estimated Cost	$9.1 million	$9.1 million
Estimated Cost per acre-feet	$38	$38

This category includes automation projects (e.g. telemetry adn control structures) and IWM projects. Generally, IWM projects represent annual savings on the order of $30 to $50 per acre-feet.

IWM primarily reduces return flows. As such, it creates instream flow benefits in the river between the withdrawal point and where irrigation water returns to the river. Depending on the location of the farm, the location and timing of that return flow will vary. This type of conservation is not well-suited for the issuance of new permits without creating a deficit in the river below the point where return flows historically returned.

Automation

Automation of irrigation system water applications can reduce manager time and effort considerably while maintaining yields and allowing control of water use efficiency of cropping systems. The goal is to provide plants with the required amount of water when necessary. By preventing over irrigation, automated systems can reduce fertilizer and water losses to deep percolation and improve yields (http://www.ars.usda.gov/research/). Some benefits of Irrigation Automation include (http://www.arguscontrols.com/articles/Irrig_tech_auto.pdf):

- Increases irrigation system performance
- Reduces run-off, thereby reducing water and fertilizer costs while lessening environmental impact
- Improves irrigation uniformity through more accurate water application
- Improves control of your irrigation by ensuring it gets done exactly when it is needed
- Improves crop quality and yield while often reducing disease

Automation	2007	2008
Number of Projects	46	46
Number of Projects w/ Estimated Water Savings	21	21
Number with Estimated Cost	40	40
Estimated Water Savings acre-feet/year	26,307	26,307
Estimated Cost	$9.7 million	$9.7 million
Estimated Cost per acre-feet	$371	$371

Land Conservation Programs

Land Conservation Programs are generally riparian or upland conservation programs that remove irrigated land from production for some state or federal conservation program purposes. Conservation Reserve Enhancement Program (CREP) and Conservation Reserve Program (CRP) are examples where irrigated agriculture is put to use for some other conservation practice not requiring irrigation (Ecology, 2006).

Land retirement programs are best suited to cropland where environmental costs are high relative to the value of production. Such lands are often characterized by lower productivity in crop uses or exceptionally high ecological services in a natural state, particularly where environmental concerns are acute and ecosystem functions require time to re-establish.

General Water Conservation	2007	2008
Number of Projects	88	89
Number of Projects w/ Estimated Water Savings	5	5
Number with Estimated Cost	9	9
Estimated Water Savings acre-feet/year	12,914	12,914
Estimated Cost	$7.2 million	$7.2 million
Estimated Cost per acre-feet	$557	$557

Land Conservation Programs can include both irrigated and non-irrigated farmland. For lands that have been historically irrigated under a valid water right, these programs can generate water savings. The Legislature has created protection in the water code from relinquishment for participants in these programs (RCW 90.14.140).

Because enrollment in a land conservation program includes fallowing of land, at least on a temporary basis, it can provide significant consumptive use savings. Surface water rights and select groundwater rights can be acquired and managed in the Trust Water Right Program and become a source of supply for both instream and out-of-stream uses. Groundwater rights that cannot be managed in the Trust Water Program, may still be used as a source of supply under the Columbia River Program provided the lands are within the Columbia River Basin Project (See RCW 90.90.010 (5)).

If savings are only available for a specific term, there are three potential coordinated uses for this water under the Columbia River Program.

1. This water can be managed to provide instream benefits under the program (RCW 90.90.005 (2)).
2. This water can be managed as a source of supply for interruptible water users during the term of the savings (RCW 90.90.020 (3) (c)).
3. This water can mitigate for temporary out-of-stream uses through term permits—the term of the permit made equal to the term of savings. If at the end of the term, Ecology has not obtained additional savings, then the permits would cancel.

It may be possible for Ecology to develop a continuous term permitting system to match this type of savings to those applicants that can tolerate some uncertainty in their permit. For example, there are undoubtedly applicants that would accept a seven-year term permit if otherwise their application would be denied. This is particularly true if Ecology could consistently acquire water savings that would allow the term permits to be renewed. However, it would be important for these term permit holders to develop appropriate crops based on the risk of the permit being cancelled in the future (planting row or hay crops, rather than long-term orchard investments). For a list of federal and state land conservation programs that could potentially work in conjunction with the Columbia River Program, please refer to Appendix A.

Crop Water Duty Reduction

By using improved water management strategies, it is possible to manage on-farm water use to maximize profits without maximizing plant growth. This can work for crops like tree fruit and vines where the quality of the fruit is often more important than the quantity produced. This strategy may not work for forage crops where the entire plant is harvested (hay, for example). Because reducing crop duty (deficit irrigation) reduces evaporation and transpiration, the consumptive use water savings can be used to meet other needs.

Some farmers have used crop duty reductions to "spread" water use to additional acreage under RCW 90.03.380. For example, a farmer that reduces crop water duty on 20 acres of wine grapes from 24 inches to 18 inches to stress the crop and improve fruit quality could plant approximately five more acres without exceeding the

Crop Water Duty Reduction	2007	2008
Number of Projects	15	15
Number of Projects w/ Estimated Water Savings	0	0
Number with Estimated Cost	0	0
Estimated Water Savings acre-feet/year	unknown	unknown
Estimated Cost	unknown	unknown
Estimated Cost per acre-feet	unknown	unknown

original consumptive use. Alternatively, the Columbia River Program could buy the water saved to benefit instream uses and to mitigate for new out-of-stream permits. Further, since land is not taken out of production, it addresses one of the concerns that local communities have had with Ecology-funded acquisition programs.

Crop Change

This type of conservation measure reduces the crop water needs on a field through a permanent change in crop. Changing from tree fruit (which can require four to five feet of water per acre) or alfalfa (which can require three to four feet of water per acre) to wine grapes (approximately 1.5 feet per acre) is an example of permanent crop change that produces water savings. Alternatively, conversion of land from irrigated crops to non-irrigated crops (such as dry-land wheat) can similarly produce water savings.

While many farmers change crops from year to year or every few years in rotation cycles to deal with nutrient, pest, and economic issues, investments in permanent crop change require long-term planning for water rights. Options for farmers contemplating long-term crop changes that reduce water requirements include:

- "Spreading" or adding additional acres of lower duty crop is an option under RCW 90.03.380, provided that the consumptive use from the new acres does not exceed the water savings from the crop change. Farmers can "spread" the additional acres to land they own, or can sell the water to another farmer and transfer the acres. "Spreading" requires permission from Ecology through the change application process and a number of statutory tests must be met, including no impairment of existing water rights from the change.
- Selling, leasing, or donating the water to the State's Trust Water Right Program. Water Right sales or leases can be a source of revenue for farmers who have surplus water and donations to the Trust Water Program may have income tax advantages. Because a permanent crop change yields consumptive water savings, this type of conservation measure can help Ecology meet both program goals: benefit for instream resources and potential mitigation for new out-of-stream permits.
- Farmers that voluntarily use less water than their water rights authorize for five years or more may relinquish the excess portion. There are exemptions to relinquishment, but one method is to donate the unused portion of the water right to the Trust Water Rights Program. The effect of relinquishment is that more water is in the river. However, relinquished water cannot be protected against downstream junior priority water users who may benefit from increased availability--especially during times of water shortage. Nor can relinquished water serve as mitigation for new permits. If farmers place this water in trust, either permanently or on a temporary basis, the water retains its priority and can be used to benefit the Program. Temporary placement through leases or donations also allows the farmer to regain use of the water right in the future.

Crop Change	2007	2008
Number of Projects	0	0
Number of Projects w/ Estimated Water Savings	0	0
Number with Estimated Cost	0	0
Estimated Water Savings acre-feet/year	unknown	unknown
Estimated Cost	unknown	unknown
Estimated Cost per acre-feet	unknown	unknown

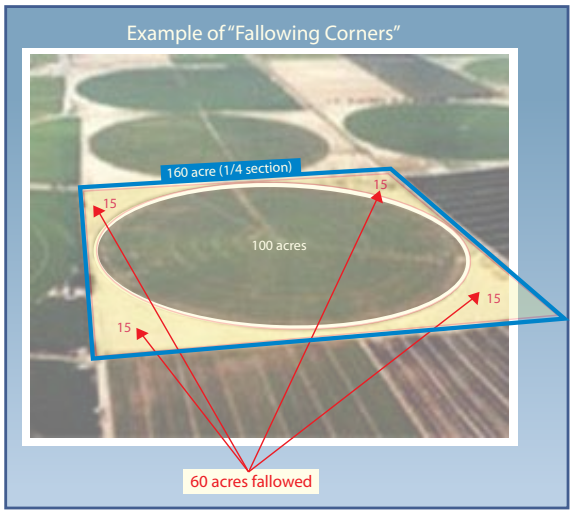
Many Washington farmers are switching to low duty crops such as wine grapes. According to the Washington Vineyard Acreage Report (2006), farmers reported that 31,000 acres of land were being used to grow grapes in 2006; up from 680 acres in 1993. The current emphasis on biofuels may also lead to increased crop change and attendant water savings. If these trends continue, there is potential for continued water savings through permanent crop change.

Fallowed Corners / Land Retirement

Fallowing corners typically results from the installation of a circular, center-pivot irrigation system on a square parcel that has been historically irrigated using less efficient means such as flood irrigation. For example, consider a one-quarter section (160 acres) that has been irrigated using surface (rill or flood) irrigation. An upgrade to a center-pivot system (approximately 100 acres) would leave four 15-acre parcels. During these upgrades, it can be costly or difficult to continue to irrigate the four remaining corners. In some cases, the landowner may choose to fallow the corners in lieu of irrigating them by some other method (Ecology, 2006).

The EIS defined fallowing of corners as one type of "acquisition" under RCW 90.90.010 (making this type of project subject to the same-WRIA permitting standard). Fallowing corners is a type of conservation project that offers multiple benefits to the Columbia River Program, including:

- Allowing Ecology to partner funding from the Account with other funding sources like the Irrigation Efficiencies Program, providing multiple incentives for farmers to upgrade their systems.
- Providing consumptive water savings, which can be typically managed in Ecology's trust water program. This type of trust water results in instream flow benefits and can be used to mitigate for new out-of-stream permits issued under the program.



Land can also be retired from irrigation for conservancy and habitat purposes that can result in water savings. For example, in 2003 Ecology cost-shared ($100,000) with Reclamation to acquire a Wenas Creek (Yakima River, Subbasin No. 15) water right. The property is now owned by Reclamation for habitat enhancement purposes and the water right is managed in the State Trust Water Program. Ecology has also explored other land retirement opportunities with federal, tribal, and river conservancy partners. The fallowed corner projects identified by the conservation programs to-date have been associated with conservation projects (like irrigation efficiency) completed within the lasts years. Higher savings may be possible through future project implementation.

Fallowed Corners/Land Retirement	2007	2008
Number of Projects	45	45
Number of Projects w/ Estimated Water Savings	31	31
Number with Estimated Cost	31	31
Estimated Water Savings acre-feet/year	392	392
Estimated Cost	$392,100	$392,100
Estimated Cost per acre-feet	$1,000	$1,000

Partial Season Acquisition / Lease

Water acquisitions that can be used to secure water supplies for drought relief, mitigate for otherwise interruptible water rights, or improve stream flows for fish. RCW 90.90.010 (2) (a) states that expenditures from the Columbia River Basin Water Supply Development Account (Account) may be used to "assess, plan, and develop new storage, improve or alter operations of existing storage facilities, implement conservation projects, or any other actions designed to provide access to new water supplies within the Columbia River Basin for both instream and out-of-stream uses. Except for the development of new storage projects, there shall be no expenditures from this account for water acquisition or transfers from one Water Resource Inventory Area (WRIA) to another without specific legislative authority."

Water right acquisition involves the selling or leasing of all or a part of a water right to state or federal agencies, or to private conservation organizations. The landowner then reduces diversions equal to the portion of the water right acquired. The diversion reduction may result from fallowing a previously irrigated field or portion thereof, reducing on-farm water duty through efficiency increases, or by other means.

While acquisition is a viable tool to meet Program objectives, local elected officials commonly express a strong preference to keep water savings within a watershed or WRIA. This preference can be accommodated by matching leases or purchases with issuance of new permits within the same WRIA.

The EIS preferred alternative defined "transfer" as the change of a water right from one place and person to another place and person, or the issuance of a new permit where the consumptive demand is mitigated by a water right "acquired" using Account funds and held in the Trust Program.

Since the completion of the Programmatic EIS, Ecology has investigated additional means of acquiring water rights, such as:

- Partnering with state and/or federal conservation programs (i.e. Irrigation Efficiencies Grant Program, Conservation Reserve Enhancement Program)
- Participating in future BPA power buy-back programs

Washington Rivers Conservancy has focused its efforts in Central Washington, particularly in Okanogan, Chelan, Kittitas, Douglas, and Yakima counties. Within these watersheds WRC has held numerous water rights workshops, attended water law seminars, and promoted the Columbia River Program to conservation groups and governmental entities. Specifically, they held workshops in Chelan, Kittitas and Okanogan counties, speaking at water law and water rights seminars state wide and presented our programs to Watershed Planning Units and land trusts. WRC gave informational presentations to NRCS, Conservation Districts, and other land management agencies in our focus region. Additionally, they have provided outreach to sportsman clubs, fishing groups, education programs and real estate agents to help further the Columbia River Program. The Columbia River Program is a routine part of WRC's outreach statewide.

All of the water savings shown in Table 5 (page 26) can benefit instream uses and provide mitigation for new out-of-stream permits. However, the majority of the water savings identified in the table is only available on a

Partial Season Acquisition/Lease	2007	2008
Number of Projects	9	10
Number of Projects w/ Estimated Water Savings	5	5
Number with Estimated Cost	3	3
Estimated Water Savings acre-feet/year	80,360	80,360
Estimated Cost	$6.7 million	$6.7 million
Estimated Cost per acre-feet	$83	$83

temporary basis. Since the majority only provide instream benefit between the point of diversion and the point of return. Thus, most cannot be used to issue new permits. Ecology can use this water to hydrate interruptible water rights in the event of a Columbia River drought. Ecology could also issue permits for a specific "term" (e.g. five years) matched to its lease acquisitions. However, there are fewer permanent projects offering consumptive water savings. Additionally, the costs for both the permanent and lease acquisitions in Table 6 (page 26) are estimations that may reflect more of a "floor" than a "ceiling" as water marketing is still emerging in the State.

While the projects in Table 5 are listed as primarily non-consumptive, there is a small portion of the water savings (on the order of five to ten percent, or perhaps about 50,000 to 100,000 acre-feet) that may include direct consumptive savings. For example, an on-farm efficiency project that replaces an overhead impact center-pivot system with a low-elevation drop-tube system could reduce spray evaporative loss and wind drift by approximately ten percent (Ecology, GUID 1210). Additionally, more water could be used for out-of-stream mitigation if, like storage, the savings are retimed from periods of low demand to high demand. However, because retiming of return flows tends to be project specific, it is difficult to estimate the volume. However, Ecology could consider the magnitude of this retiming potential to be on the order of one-third of the total savings (e.g. approximately 300,000 acre-feet) if water is retimed from four months in winter to four months in summer.

With the exception of conserved water diverted to the Odessa, water from conservation savings must be managed in the State's trust water program. Ecology's goal is to manage water acquired in trust for both the instream and out-of-stream objectives of the legislation. As Ecology funds individual conservation projects, it will determine on a case-by-case basis what portion of the project will result in non-consumptive water savings (protected in the river reach from the point of diversion to the point flow returned, called the primary reach) and what portion of the project will result in consumptive water savings (protected all the way to the Pacific Ocean, called the secondary reach). This process is used today in Ecology's water acquisition program, and with the Conservation Commission through the irrigation efficiencies program.

After reviewing the status of the current conservation inventory, it tends to reinforce Ecology's current investment in storage and the legislature's mandate to spend two-thirds of Columbia River funds on storage-related projects. Even within the conservation portion of the inventory, retiming of water supplies appears to have more promise than conservation based on reductions in consumptive use (ET).

Demand Report Efforts Preview

RCW 90.90.040 directs Ecology to prepare a long-term water supply and demand forecast and to update it every five years. The purpose of the supply and demand forecast is to work in conjunction with the supply inventory. By forecasting how supply will change and what new demands will come to Washington, we can project the need for new water supplies from storage and conservation. Ecology submitted our first Water Supply and Demand Forecast on November 15, 2006 that describes the existing physical, legal and management framework for the Columbia River. Without accurate forecasting information, Ecology cannot accurately determine the role of conservation in providing water supply, how large a storage facility needs to be, and how much staff time and funding is necessary to complete Program mandates. Ecology plans to continue efforts to improve forecasting for its 2011 report and has started a number of efforts to do so.

Ecology is working to compile existing data on historical stream flows in order to address instream projection demands. At present, Ecology has obtained Columbia River flow information from BPA dating from 1929 to present. Ecology is analyzing the data to consider seasonal changes and drought occurrences as we work to understand how best to match available water supplies and projected demand. In the same manner, Ecology is also assessing tributary flow data. Ecology plans to include this information in its Water Resources Information System and make it available to the public through the internet in 2009. The first phase is already available on Ecology's website. The 2011 report will contain a summary of this information.

While Washington State University (WSU) identified agricultural demands, due to time constraints they had to rely only on historical USDA agricultural statistics for their modeling. That data does not reflect changing global market conditions that could alter demand for U.S. crops. Additionally, there were several emerging crop markets for which historical statistics were not available. These include the fast-paced wine industry in Washington State and renewable fuel crops. Ecology plans to initiate a study out of its Columbia River operating funds in 2009 to evaluate these future demands. The timing of this study will coincide with the release of our efforts to better understand climate change, and both will be integrated into the 2011 legislative report.

Ecology is participating with other state and federal agencies to fund a study by the Climate Impacts Group that will provide greater accuracy in predicting climate change in the Columbia River Basin - with a particular focus on the Yakima, Walla Walla, Wenatchee, and Okanogan watersheds. The completed study is expected in 2010 and Ecology will include the results in the 2011 report.

In addition to changing supply, climate change has the potential to change existing crop demands. For example, in Eastern Washington (within the greater Columbia River Basin), US Geological Survey reports approximately 1.7 million acres of irrigated crops in the greater Columbia Basin. If 20 years from now climate change has resulted in a need for an added inch of water per acre, due to hotter weather and decreasing summer rain, then 140,000 acre-feet more water will be needed to maintain current crop production. There is also 5.3 million acres of non-irrigated agriculture in the basin (e.g. dry-land wheat). Increasing temperatures and shifting of water availability due to climate change may result in some of these lands moving to irrigation to maintain yield and profitability, or a decrease in yield for those that cannot obtain irrigation water. This issue will be included in the next Ecology agricultural demand study in 2009.

Ecology is developing a Columbia River Drought Insurance Program. Currently, interruptible water rights total about 300,000 acre-feet. However, the degree to which these water uses are interrupted varies depending on the drought year and the effect of interruption. For example, in 2001 a portion of interruptible water users chose not to take part in an Ecology-sponsored drought program. Reasons varied, but it is clear that municipalities and farmers with high-value crops (such as 50 year-old cherry trees) have a greater need for a reliable water supply than a farmer with a hay crop. Ecology has chosen an alternative for the allocation of new drought supplies to interruptible water users on the 33,000 acre-feet of water associated with the Lake Roosevelt Incremental Storage Release.

ESA-listed salmonids in the Hanford reach suffer increased mortality from flow fluctuations caused by dam operations. As Ecology continues to evaluate storage supplies, we plan to consider how storage could be used with existing river operations to reduce these flow fluctuations. This instream demand could have significant benefits for the Hanford Reach.

One-third of all new storage is dedicated for instream uses. The 2004 Study by the National Academy of Sciences characterizes July and August as the period where low mainstem flows provide the greatest fish risk. Stream flow levels during other months may have fish impacts as well. Desirable flows vary between different fish and at different life stages – making river management much more difficult. Ecology continues to work with our fish partners to better understand instream demands and how best to use water supplies as they are developed. Part of this understanding is coming through the Supplemental EIS for Lake Roosevelt, as we consider options on how to release nearly 50,000 acre-feet of water from storage for fish benefit.

Benefit to fish from implementation of the Columbia River Program goes beyond water instream. Many of the projects being considered in the Columbia River Grant Program can also have water quality benefits (e.g. temperature, turbidity), may remove fish barriers, or have other fish benefits. As Ecology funds conservation and storage improvements, Ecology will track and account for these other non-flow fish improvements on the Columbia River webmap and in future legislative reports

Ecology will incorporate feedback from Columbia River dam operators to better understand how new storage would affect supply for power generation and demand for additional power generation. Diverting water to a reservoir in the winter can result in lost power production in those months. However, the opportunity to produce power returns when that water is released from storage prior to its diversion out-of-stream. There may also a be an opportunity to develop integrated pump-storage in the Columbia River system to give dam operators greater ability to buffer changes in power demand that complement wind-based generation. In some cases, this may also provide a benefit by reducing entrained gases. All new storage developments will require extensive coordination with dam operators so that state water supply actions do not result in unanticipated consequences for hydropower generators.

The Columbia River Program grant funding contains scoring guidelines that favor projects that provide fish benefit to Columbia River tributaries; in particular those tributaries that WDFW has listed as priority streams. Ecology plans to continue recommending specific projects for future funding and begin to measure and account for the specific fish benefits that accrue from construction of conservation and storage projects. This data will be made available on the Columbia River Webmap as it becomes available.

WDFW last updated priority stream reaches in 2003. Since that time, many conservation, habitat and fish barrier improvements have been made through investments by local, state and federal funding partners. Stream reaches also need to be made consistent with federal recovery plans, watershed plans and subbasin plans that have been completed since 2003. Ecology is working with WDFW to provide a way to update this information for use in the Columbia River Grant Program, as well as other local, state and federal funding programs.

Ecology plans to work with the Washington State Department of Health to better understand municipal demand and opportunities for municipal conservation. For example, in the 2006 legislative report, municipal demand was estimated based on data from OFM, USGS and DOH at 170 gallons per capita per day (gpcd). However, in 2003, the legislature passed the Municipal Water Law which includes new conservation mandates for municipalities. In 2007, DOH adopted a new water use efficiency rule (WAC 246-290), whose implementation is expected to alter municipal water use goals in the future. For example, if the 170 gpcd average was reduced by a modest ten percent for the 350,000 additional people projected in the Columbia River Basin in the next 20 years, demand would drop from 67,500 acre-feet to approximately 60,000 acre-feet. Work is also needed to understand how much of the projected savings will offset new consumptive demand from the river (e.g. xeriscaping, lawn watering controls) vs. timing of returns to the river (e.g. fixing leaky pipes). Ecology is working to compile this information as new water system plans are submitted.

Appendix A

Federal and State Conservation Programs

Conservation Reserve Program

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. The CRP provides annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland.

Annual rental payments are based on the agriculture rental value of the land. Cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

CRP protects millions of acres of American topsoil from erosion and is designed to safeguard the Nation's natural resources. By reducing water runoff and sedimentation, CRP protects groundwater and helps improve the condition of lakes, rivers, ponds, and streams. Acreage enrolled in the CRP is planted to resource-conserving vegetative covers, making the program a major contributor to increased wildlife populations in many parts of the country.

Producers can offer land for CRP general sign-up enrollment only during designated sign-up periods. Environmentally desirable land devoted to certain conservation practices may be enrolled at any time under CRP continuous sign-up. Certain eligibility requirements still apply, but offers are not subject to competitive bidding. Local FSA offices can provide information on upcoming sign-up periods.

To be eligible for CRP enrollment, a producer must have owned or operated the land for at least 12 months prior to close of the CRP sign-up period, unless:

- The new owner acquired the land due to the previous owner's death;
- The ownership change occurred due to foreclosure where the owner exercised a timely right or redemption in accordance with state law; or
- The circumstances of the acquisition present adequate assurance to FSA that the new owner did not require the land for the purpose of placing it in CRP.

To be eligible for placement in CRP, land must be either:

- Cropland (including field margins) that is planted or considered planted to an agricultural commodity 4 of the previous 6 crop years from 1996 to 2001, and which is physically and legally capable of being planted in a normal manner to an agricultural commodity; or
- Certain marginal pastureland that is suitable for use as a riparian buffer or for similar water quality purposes.

In addition to the eligible land requirements, cropland must meet one of the following criteria:

- Have a weighted average erosion index of 8 or higher;
- Be expiring CRP acreage; or
- Be located in a national or state CRP conservation priority area.

Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (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 is an offshoot of the country's largest private-lands environmental improvement program - the Conservation Reserve Program (CRP).

Like CRP, CREP is administered by USDA's Farm Service Agency (FSA). By combining CRP resources with state, tribal, and private programs, CREP provides farmers and ranchers with a sound financial package for conserving and enhancing the natural resources of farms.

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.

A specific CREP project begins when a state, Indian tribe, local government, or local non-government entity identifies an agriculture-related environmental issue of state or national significance. These parties and FSA then develop a project proposal to address particular environmental issues and goals.

Enrollment in a state is limited to specific geographic areas and practices. Local FSA offices can help determine if a particular state and county are involved in CREP and if certain land qualifies.

Like CRP, CREP contracts require a 10 to 15-year commitment to keep lands out of agricultural production. 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.

FSA uses CRP funding to pay a percentage of the program's cost, while state, tribal governments or other non-federal sources provide the balance of the funds. States and private groups involved in the effort may also provide technical support and other in-kind services.

Farmable Wetlands Program

Restoring wetlands reduces downstream flood damage, improves surface and groundwater quality, and recharges groundwater supplies. Wetlands provide vital habitat for migratory birds and many wildlife species, including threatened and endangered species, and provide recreational opportunities such as bird watching and hunting.

The Farmable Wetlands Program (FWP) is a voluntary program to restore up to 500,000 acres of farmable wetlands and associated buffers by improving the land's hydrology and vegetation. Eligible producers in all states can enroll eligible land in the FWP through the Conservation Reserve Program (CRP).

FWP is limited to no more than 1 million acres, and no more than 100,000 acres in any one state.

Offers are accepted on a continuous sign-up basis and are automatically accepted provided the acreage and producer meet certain eligibility requirements. Acceptance is not determined by a competitive offer process.

Eligible acreage includes farmed and prior converted wetlands that have been impacted by farming activities. The maximum acreage for enrollment of wetlands and buffers is 40 acres per tract. A producer may enroll multiple wetlands and associated buffers on a tract as long as the total acreage does not exceed 40 acres.

Acreage must meet the following FWP eligibility requirements:

- Land must be cropland planted to an agricultural commodity 3 of the 10 most recent crop years and be physically and legally capable of being planted in a normal manner to an agricultural commodity.
- A wetland must be 10 acres or less. Only the first 5 acres may receive payment.
- A buffer may not exceed the greater of 3 times the size of the wetland or an average of 150 feet on either side of the wetland.
- Participants must agree to restore the hydrology of the wetland to the maximum extent possible.

FWP contracts are from 10 to 15 years in exchange for annual rental payments, incentive payments, and cost-share for installing necessary practices. The effective date of the contract is the first day of the month following the month of approval.

Grassland Reserve Program

GRP is a voluntary program for landowners to protect, restore, and enhance grasslands on their property. USDA's NRCS, FSA, and Forest Service implement GRP to conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable ranching operations.

GRP emphasizes support for working grazing operations: enhancement of plant and animal biodiversity: and protection of grassland and land containing shrubs and forbs under threat of conversion to cropping, urban development, and other activities that threaten grassland resources.

Applications may be filed for an easement or rental agreement with NRCS or FSA at any time. Participants voluntarily limit future use of the land while retaining the right to conduct common grazing practices; produce hay; conduct fire rehabilitation; and construct firebreaks and fences.

GRP contracts and easements prohibit the production of crops (other than hay), fruit trees, and vineyards and any other activity that would disturb the surface of the land, except for appropriate land management activities included in a conservation plan.

Participants may choose a 10-year, 15-year, 20-year, or 30-year contract. USDA provides annual payments in an amount that is not more that 75 percent of the grazing value of the land covered by the agreement for the life of the agreement. Payments will be disbursed on the agreement anniversary date each year.

Landowners who can provide clear title on privately owned lands are eligible to participate for either easement option. Landowners and others who have general control of the acreage may submit an application for a rental agreement.

Offers for enrollment must contain at least 40 contiguous acres, unless NRCS determines that special circumstances exist to accept a lesser amount.

Eligible land includes privately owned and Tribal lands, such as grasslands; land that contains forbs (including improved rangeland and pastureland or shrubland); or land that is located in an area that historically has been dominated by grassland, forbs, or shrubland that has the potential to serve as wildlife habitat of significant ecological value. Incidental lands may be included to allow for the efficient administration of an agreement or easement.

Wildlife Habitat Incentives Program (WHIP)

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program that encourages creation of high quality wildlife habitats that support wildlife populations of National, State, Tribal, and local significance.

Through WHIP, the Natural Resources Conservation Service (NRCS) provides technical and financial assistance to landowners and others to develop upland, wetland, riparian, and aquatic habitat areas on their property.

Eligible lands under the program are:

- Privately owned land;
- Federal land when the primary benefit is on private or Tribal land;
- State and local government land on a limited basis; and
- Tribal land.

If land is determined eligible, NRCS places emphasis on enrolling:

- Habitats for wildlife species experiencing declining or significantly reduced populations;
- Practices beneficial to fish and wildlife that may not otherwise be funded; and
- Wildlife and fishery habitats identified by local and State partners and Indian Tribes in each State.

To be eligible, an entity must own or have control of the land to be enrolled in the program for the duration of the agreement period.

In exchange for entering into a 15-year WHIP agreement, a landowner may receive higher cost-share rates for the implementation of habitat development practices on essential plant and animal habitat. Up to 15 percent of available WHIP funds can be used to enter into 15-year agreements.

Wetlands Reserve Program (WRP)

The Wetlands Reserve Program (WRP) is a voluntary program. It provides technical and financial assistance to eligible landowners to restore, enhance, and protect wetlands.

Landowners have the option of enrolling eligible lands through permanent easements, 30-year easements, or restoration cost-share agreements. The program is offered on a continuous sign-up basis and is available Nationwide. This program offers landowners an opportunity to establish, at minimal cost, long-term conservation and wildlife habitat enhancement practices and protection.

WRP has an acreage enrollment limitation rather than a funding limit. Congress determines how many acres can be enrolled in the program and funding is somewhat flexible. The Natural Resources Conservation Service (NRCS) estimates program funding needs based on the national average cost per acre.

The program offers three enrollment options:

1. **Permanent Easement.** Easement payments for this option equal the lowest of three amounts: the difference in the appraised fair market value of the larger parcel before the easement is in place and appraised fair market value of the larger parcel after the easement is in place, an established payment cap, or an amount offered by the landowner. In addition to paying for the easement, the U.S. Department of Agriculture (USDA) pays up to 100 percent of the cost of restoring the wetland.

2. **30-Year Easement.** Easement payments through this option are 75 percent of what would be paid for a permanent easement. 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.

3. **Restoration Cost-share Agreement.** This is an agreement (generally for a minimum of 10 years) to re-establish degraded or lost wetland functions and values. USDA pays up to 75 percent of the cost of the restoration activity. This enrollment option does not place an easement on the property. For all enrollment options, other agencies and private conservation organizations may provide additional incentives as a way to reduce the landowner's share of the costs. Such special partnership efforts are encouraged.

To qualify, 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 NRCS State Conservationist determines the landowner did not obtain the land for the purpose of enrolling it in the program. To participate in a restoration cost-share agreement, the landowner merely needs to show evidence of ownership.

Eligible Land. Land must be restorable and be suitable for wildlife benefits. This includes:

- Wetlands farmed under natural conditions;
- Farmed wetlands;
- Prior converted cropland;
- Farmed wetland pasture;
- Ag land 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 Dec. 23, 1985;
- Lands with timber stands established under a Conservation Reserve Program contract;
- Federal lands;
- Lands where conditions make restoration impossible.

Agricultural Management Assistance(AMA)

The Agricultural Management Assistance (AMA) program is authorized under Title I, Section 133, of the Agricultural Risk Protection Act of 2000. This Act, which is Public Law 106-224, amended the Federal Crop Insurance Act by adding Section 524(b), Agricultural Management Assistance (AMA). Section 524(b), was further amended by the Farm Security and Rural Investment Act of 2002, (Farm Bill), Public Law 107-171, May 13, 2002. This public law authorizes funding at $20 million per year for AMA through fiscal year (FY) 2007.

NRCS has leadership for the conservation provisions of AMA while USDA's Agricultural Marketing Service (AMS) is responsible for an organic certification cost-share program and the Risk Management Agency (RMA) is responsible for mitigation of financial risk through an insurance cost-share program.

A conservation plan is required for the area covered in the application and becomes the basis for developing the AMA contract. NRCS will work with the landowner to develop a conservation plan. Landowners must agree to maintain cost-shared practices for the life of the practice. Contracts are three to ten years in length.

Producers may construct or improve water management structures or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming.

A person may participate in AMA if he or she owns or leases land, or can provide proof of control of the land for the agreement period.

Land enrolled under other conservation programs is eligible for participation, if:

- AMA is treating a different natural resource concern.
- AMA provides a higher or improved level of treatment for a similar natural resource concern than obtained with the other conservation program.

AMA participants are not subject to the Adjusted Gross Income (AGI) provisions of the 2002 Farm Bill or the Highly Erodible Land and Wetland Conservation provisions of the Food Security Act of 1985.

The NRCS State Conservationist, in consultation with the State Technical Committee, determines eligible practices, using a locally led process. The Federal cost-share rate shall be 75 percent of the cost of an eligible practice, based on the percent of actual cost, or percent of actual cost with not-to-exceed limits, or flat rates. Participants will be paid based upon certification and verification of completion of the approved practice.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program (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.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. 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. The practices are subject to NRCS technical standards adapted for local conditions.

Farmland Protection Policy Act

The National Agricultural Land Study of 1980-81 found that millions of acres of farmland were being converted in the United States each year. The 1981 Congressional report, Compact Cities: Energy-Saving Strategies for the Eighties, identified the need for Congress to implement programs and policies to protect farmland and combat urban sprawl and the waste of energy and resources that accompanies sprawling development.

The FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that—to the extent possible—Federal programs are

administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Federal agencies are required to develop and review their policies and procedures to implement the FPPA every two years.

The FPPA does not authorize the Federal Government to regulate the use of private or nonfederal land or, in any way, affect the property rights of owners.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency. Assistance from a Federal agency includes:

- Acquiring or disposing of land.
- Providing financing or loans.
- Managing property.
- Providing technical assistance.

Activities that may be subject to FPPA include:

- State highway construction projects, (through the Federal Highway Administration).
- Airport expansions.
- Electric cooperative construction projects.
- Railroad construction projects.
- Telephone company construction projects.
- Reservoir and hydroelectric projects.
- Federal agency projects that convert farmland.
- Other projects completed with Federal assistance.

Farm and Ranch Lands Protection Program (FRPP)

The Farm and Ranch Lands Protection Program (FRPP) is a voluntary program that helps farmers and ranchers keep their land in agriculture and prevents conversion of agricultural land to non-agricultural uses. The program provides matching funds to State, Tribal, and local governments and nongovernmental organizations with existing farmland protection programs to purchase conservation easements. These entities purchase easements from landowners in exchange for a lump sum payment, not to exceed the appraised fair market value of the land's development rights. The easements are perpetual easements.

The CCC, through NRCS, requests proposals from Federally recognized Indian Tribes, States, units of local government, and nongovernmental organizations to cooperate in the acquisition of conservation easements on farms and ranches. Once an entity is selected, the NRCS State Conservationist enters into a cooperative agreement with, and obligates money to, the entity. The entity works with the landowner, processes the easement acquisition, and holds, manages, and enforces the easement. The Federal share of any easement acquisition is limited to a maximum of 50 percent of the appraised fair market value of the conservation easement. A contingent right interest in the property must be incorporated in each easement deed for the protection of the Federal investment.

Land. Entire farms or ranches may be enrolled in FRPP. The farmland or ranch land must contain at least 50 percent of prime, unique, Statewide, or locally important soil or contain historic or archaeological sites. These lands also must be subject to a pending offer from an eligible entity for the purpose of limiting conversion of the land to non-agricultural uses. Eligible land includes cropland, rangeland, grassland, pasture land, and forest land that is part of an agricultural operation. Incidental land that otherwise would not be eligible may be considered eligible as part of a pending offer, if inclusion would significantly augment protection of the associated eligible farm or ranch land.

The lands must also be owned by landowners who certify that they do not exceed the Adjusted Gross Income (AGI) limitation. The AGI provision of the 2002 Farm Bill impacts eligibility for FRPP and several other 2002 Farm Bill programs. Individuals or entities that have an average AGI 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 in cases where 75 percent of the AGI is derived from farming, ranching, or forestry operations.

Farms or ranches with historical or archaeological resources must meet the following criteria:

- Be listed in the National Register of Historic Places (established under the National Historic Preservation Act (NHPA), 16 USC 470, et seq.); or
- Be formally determined eligible for listing in the National Register of Historic Places by the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer and the Keeper of the National Register in accordance with Section 106 of the NHPA); or
- Be formally listed in the State or Tribal Register of Historic Places of the SHPO or the Tribal Register of Historic Places.

Entity. An eligible entity must be a Federally recognized Indian Tribe, State or local agency (including farmland protection boards or land resource councils established under State law), or a non-governmental organization that:

- Is organized principally for the preservation of land for recreation, open space, historical preservation, and natural habitat; and
- Is operated exclusively for charitable, religious, or educational purposes, with no part of its net earnings paid to any private shareholder or individual and no substantial part of its activities influencing legislation or intervening in any political campaign for or against a candidate for public office; and
- Normally receives more than one-third of its support in each tax year from any combination of gifts, grants, contributions, or membership fees, and normally receives not more than one-third of its support in each tax year from the sum of gross investment income.

In addition to demonstrating land and entity eligibility, entities wishing to receive FRPP funds must demonstrate:

- A commitment to long-term conservation of agricultural lands;
- The capability to acquire, manage, and enforce easements and other interest in land;
- Staff capacity that would be dedicated to monitoring easement stewardship; and
- The availability of funds.

Cooperative Conservation Partnership Initiative

The majority of NRCS conservation program funding goes directly to producers or small groups of producers. NRCS recognizes the need for multiple approaches to natural resource conservation, and is committed to using various means to assist producers in meeting their natural resource objectives and in complying with local, State, and Federal environmental regulations. NRCS believes that fostering locally-led planning is critical to addressing

natural resource concerns that are watershed-based in scope.
Implementation of the RWA component of CCPI is a reflection of this belief.
Proposals must describe projects that are consistent with the following seven RWA objectives. The projects must encourage:

1. Local stakeholders to come together to identify, assess, and prioritize conservation needs and actions at the 8-, 11-, or 14-digit HUC sized watershed;
2. The use of current and cutting-edge technology to expedite the planning process;
3. Outreach to stakeholders and agricultural producers as to the status of resource conditions in the watershed;
4. Producers to share information and participate in the conservation need identification and assessment phases;
5. Producers to implement and maintain practices identified in the assessment;
6. Cumulative and demonstrable conservation benefits in the watershed; and
7. Participation by partners in the future implementation as well as the assessment phase.

Limited Resource and Beginning Farmers and Ranchers, and Tribes

NRCS intends to select at least one of the CCPI awards for a proposal that addresses the need for RWAs in areas with significant numbers of limited resource or beginning farmers and ranchers, or tribes. NRCS encourages applications that address the natural resource conservation needs of these historically underserved farmers and ranchers.

Proposals and Submission Information

NRCS RWA interim guidance is posted at: http://www.nrcs.usda.gov/programs/rwa/index.html. Applicants submitting proposals should review these documents carefully. RWAs developed using CCPI funding must be consistent with this guidance.

Proposal Evaluation Criteria

The following four criteria will be used to evaluate project proposals:

Purpose and goals – 25%

1. The purpose and goals of the project are clearly stated;
2. The project adheres to the RWA objectives described in this notice;
3. The project describes the need for information on resource conditions and priority concerns in that particular watershed; and,
4. There is clear and significant potential for a positive and measurable outcome.

Stakeholder/partner support – 15%

1. A declaration of support for the RWA by key and/or participating organizations, stakeholders, and partners. Proposals that address the need for RWAs of resource conditions in an area with significant numbers of limited resource or beginning farmers and ranches, or tribes will receive special consideration. NRCS intends to fund at least on proposal that addresses the conservation needs of these historically underserved farmers and ranchers.

Soundness of planning phase – 45%

1. RWAs contain two components: a watershed resource profile and an assessment matrix. Proposals should provide an example template for each component and detail a strategy for:
   - collection of information from local individuals and communities;

- inventorying and mapping of natural resource and environmental conditions;
- assessing current resource conditions;
- identifying the problems, concerns, and opportunities;
- determining the goals and objectives of the local individuals and communities;
- formulating alternative solutions;
- identifying appropriate conservation systems to address the major land uses and associated resource concerns for the watershed; and
- quantifying the costs of implementing appropriate conservation practices with willing landowners in the watershed;

Project management – 15%

1. The proposal has clear milestones and timelines for completing project in one year, designated staff, and demonstrates collaboration and partnership and the use of available technology to expedite the assessment process.
2. The project staff has the relevant expertise needed to do the work.
3. The budget request is reasonable and adequately justified.

Non-Governmental Organizations

Land Trust Alliance

A land trust is a private, nonprofit organization that actively works to conserve land by undertaking or assisting with direct land transactions – primarily the purchase or acceptance of donations of land or conservation easements. Land trusts vary greatly in scope and scale, but all of them share the common mission of working cooperatively with landowners to protect and conserve land for its natural, recreational, scenic, historic, or productive value.

Some land trusts focus on distinct areas, such as a single town, county or region, and support grassroots efforts to conserve lands important to local communities.
Others operate throughout an entire state or even several states. As thousands of acres of open space are lost to development annually, the public is turning more and more frequently to land trusts, which are filling a national need to protect and steward open lands in perpetuity. Land trusts are also sometimes called conservancies, foundations and associations.

Today, there are more than 1,500 local and regional land trusts across the nation protecting more than nine million acres of farmland, wetlands, ranches, forests, watersheds, river corridors, and other land types, as well as several national land trusts that have protected millions more acres.

Land trusts use a variety of tools to help landowners protect their land. The most commonly used protection methods are purchasing or accepting donations of conservation easements and land.

Conservation Easements

A conservation easement (or “conservation restriction”) is a voluntary legal agreement between a landowner and a land trust (or government entity) that permanently restricts certain aspects of land use in order to protect the conservation values of the property. Landowners may either donate or sell a conservation easement. When a landowner places a conservation easement on his or her land, he or she maintains ownership and use of the property and can sell it or pass it on to heirs.

The land is subject to certain restrictions agreed upon by the landowner and the land trust. For example, a landowner might agree to limit development on his or her property to one residence of a particular size.

Future landowners are bound by these restrictions as well, and the land trust is responsible for monitoring the property and upholding the terms of the easement. Conservation easements have become one of the most commonly used land conservation tools in the country. Currently, local and regional land trusts hold more than 11,600 conservation easements, protecting more than five million acres of land.

Benefits of Conservation Easements

In addition to the satisfaction landowners get from knowing their land is protected in perpetuity, there are also three potential tax advantages to granting a conservation
easement: an income tax deduction; an estate tax benefit; and, possibly, a reduction in property taxes.

A conservation easement donation that meets certain federal tax code regulations – that is, one that is perpetual, is given to a qualified conservation organization and is given "exclusively for conservation purposes" – can qualify as a tax-deductible charitable gift (See Internal Revenue Code Section 170(h)(1)). By removing or decreasing a property's development potential, a conservation easement may also result in the reduction of property taxes in some states and estate tax benefits for the landowner and his or her heirs. (Landowners should consult a tax attorney or refer to the publications listed below for more information on the potential tax benefits of donating a conservation easement).

Land Donations

Land can be given to a land trust as an outright donation, or it can be donated to a land trust in a number of other ways, such as through a remainder interest or a bequest (more properly called a "devise"). Most land is donated to land trusts for its important conservation values and is protected in perpetuity; however, commercial and residential property can also be donated to a land trust with the understanding that it will be sold to support the organization's conservation work.

Outright Donation

A donation of land to a land trust can be an effective conservation strategy for one who does not wish to pass land on to heirs; owns highly appreciated property; no longer uses the land they own; wishes to reduce estate tax burdens; or are no longer willing or able to manage and care for the land. By donating land to a land trust, an owner may realize substantial income and estate tax benefits while avoiding capital gains taxes that may have resulted from the sale of the property.

Remainder Interest

A gift of a remainder interest (also known as a reserved life estate) is granted when a landowner donates land to a trust during his or her lifetime, but reserves the right for him or herself, and any other named party, to continue to live on the land until their death(s) or voluntary release of the interest. Donors of remainder interests may be eligible for income tax deductions.

Land Sales

A landowner may want to protect his or her land permanently but be unable or unwilling to relinquish that land without receiving financial compensation. In this case, the landowner may choose to sell his or her land to a land trust. The property may be sold at fair market value or at a price below fair market value, which is referred to as a bargain sale. These are some of the more common conservation tools used by land trusts. There are many other strategies employed, as well.

Where Do Land Trusts Get Funding to Conserve Land?

Land trusts draw upon a variety of sources to buy land, or interests in land, using a unique and proactive method called conservation financing. Conservation financing utilizes local, state, federal and other funding sources to protect open space and manage growth.

Since the amount of federal funding available for conservation fluctuates annually, local funding is the key to effective, long-term conservation financing. It is important to have local commitment and control. Local funds also help leverage federal, state and private dollars, establishing a predictable and sizable conservation funding stream.

State and local governments continue to fund open space acquisition, viewing parks, recreation and habitat as "green infrastructure" important to the quality of life and the economy.

What are the Advantages of Working with a Land Trust?

Land trusts have many advantages as land protection organizations. One advantage of working with land trusts is that they are very closely tied to the communities in which they operate. They can draw on community resources, including volunteer time and skills. Their community orientation is also helpful in selecting and negotiating transactions.

They are familiar with the land in the area and often have the trust and confidence of local landowners who may not want to work with entities from outside the area.
Moreover, the nonprofit tax status of land trusts brings them a variety of tax benefits. Donations of land, conservation easements or money may qualify for income, estate or gift tax savings.

Properly structured land trusts are exempt from Federal and state income taxes and sometimes from local property and real estate transfer taxes as well. Additionally, due to the fact that land trusts are private organizations, they can be more flexible and creative than public or government agencies, and can often act more quickly. They can hold and manage land and other assets as a corporation, and are able to negotiate with landowners discreetly.

Steps in the Process of Working with a Land Trust

The following are the basic steps in donating a conservation easement. These may vary from land trust to land trust and region to region.

1. Find state or local land trust using the Land Trust Alliance's locator service on the web site. Click the "Find a Land Trust" link to see contact information for local and national land trusts in your area. You can also contact your state's service centers that like the Alliance deliver services and technical assistance to strengthen local and regional organizations and land trusts that conserve open space. http://www.landtrustalliance.org/community
2. Landowner and land trust representative(s) meet to discuss landowner's wishes, needs and conservation objectives. The land trust representative describes the land trust and its policies, and explains how a conservation easement works, appropriateness for the property, and any other conservation options that may be available to the landowner.
3. Landowner reviews the material, consults with family members, legal counsel, and/or tax advisors, and indicates an interest in further exploration of an easement. The Alliance has a list of appraisers, attorneys, and consultants experienced in land conservation to assist landowners. http://www.landtrustalliance.org/resources/professional-partners
4. A land trust representative visits the property to evaluate its features and the natural and open-space resources, and consults again with the owner on the easement terms and the long-term objectives. The land trust representative determines whether protection of the property serves the public interest and, (if donated), which of the various IRS public benefits tests is satisfied. The land trust conducts a baseline study to inventory and document the resource values of the property.
5. After consulting with family members, advisors, or others, the landowner reaches a preliminary agreement with the land trust on the proposed terms of the easement and property description.

6. The land trust board approves the conservation easement, making a finding as to the public benefit of the easement and how it fits with the land trust's strategic plan.
7. Landowner provides chain of title, certification of title or title report to the land trust.
8. The landowner contacts the lender, if any, to arrange for subordination of mortgage. The mortgage must be subordinated for the conservation easement to be effective and (if donated) for a tax deduction to be available.
9. Landowner determines if certain IRS requirements for an easement to be tax deductible are met.
10. Conservation easement is finalized and signed.
11. The signed easement documents, usually including the Baseline Report, are recorded at the county courthouse.
12. Most land trusts ask conservation easement donors to make a donation to the land trust to cover the costs of monitoring and enforcing the conservation easement in perpetuity.
13. If the landowner intends to take a qualified tax deduction or claim a credit for the non-cash charitable gift, the landowner is responsible for hiring an independent appraiser to determine the value of the gift.
14. The landowner claims a federal income tax deduction for the donation on a special form with his or her income tax return (Form 8283). Depending on the state, there may be state and local tax savings as well.
15. The land trust has the responsibility of monitoring the property once or twice per year to ensure that all of the easement conditions are met. Strong sentiments and state traditions in favor of private property rights can have a tremendous influence on local land development decisions.

Land Trust Alliance Member Land Trusts Operating Locally

- American Friends of Canadian Land Trusts, Seattle, WA, http://nsnt.ca/afoclt/
- Blue Mountain Land Trust, Walla Walla, WA, http://www.bmlt.org
- Cascade Land Conservancy, Seattle, WA, http://www.cascadeland.org
- Chelan-Douglas Land Trust, Wenatchee, WA, http://www.cdlandtrust.org
- Cowiche Canyon Conservancy, Yakima, WA, http://www.cowichecanyon.org
- Inland Northwest Land Trust, Spokane, WA, http://www.inlandnwlandtrust.org
- Kittitas Conservation Trust, Roslyn, WA, http://www.kittitasconservationtrust.org
- Lummi Island Heritage Trust, Lummi Island, WA, http://www.liht.org
- Methow Conservancy, Winthrop, WA, http://www.methowconservancy.org
- Okanogan Valley Land Council, Tonasket, WA, http://www.ovlandcouncil.org
- PCC Farmland Trust, Seattle, WA, http://www.farmlandtrust.org
- Save Habitat and Diversity of Wetlands Organization, Renton, WA, http://www.shadowhabitat.org
- Tapteal Greenway, Richland, WA, http://www.tapteal.org
- The Trust for Public Land, Northwest Regional Office, Seattle, WA, http://www.tpl.org/

Appendix B

Municipal Water Conservation

The seven largest municipal water users in eastern Washington include Spokane, the Quad-Cities (Richland, Kennewick, Pasco, and West Richland), Yakima, and Wenatchee. Currently, these municipalities have water system plans that include the following:

Spokane (Water System Plan 2007) - The City of Spokane has been promoting water conservation practices since 2000. Ongoing conservation measured include metered consumption, monitoring for inordinate water use and waste, leak detection, source metering, using a declining block rate structure, and implementing pump efficiency standards.

The 2007 water system plan outlines steps the City is planning for the next six years. These conservation measures include:

1. **Education**- The City of Spokane will concentrate on educating City employees, youth, and adults on ethical and appropriate water conservation measures. The City proposed using school presentation, school contests, and informational take home packets for school children; activity books for grades K through 6 and various contests for grades 3 through 12. Adult education will include a space on the Consumer Confidence Report listing conservation ideas. The City also proposed using Public Service Announcements to convey water conservation messages.
2. **Indoor Residential Conservation**- In the 2007 water system plan the City of Spokane planned to supply residential customers with bill stuffers that would provide conservation information. The City also planned to develop a retrofit program with a corresponding Water Star awards program.
3. **Outdoor Residential Conservation**- This type of conservation will be similar to the Indoor Residential Conservation Program, but will also include tips on sprinkler irrigation efficiency, and xeriscaping.
4. **Industrial, Commercial, and Governmental Conservation**- The same type of outreach was propose by the City for this conservation program, however, the program will also include outreach specifically directed at the City's Park Department. In addition, hotels and motels will be targeted to provide information to customers about water savings through repeated towel and bed sheet use. A Water Star awards program will be developed and water audits will be provided to this customer class for no cost.
5. **Regulatory Conservation**- In 2005, the City adopted an increasing block rate structure. In 2007, the City adopted an additional surcharge rate for excessive residential water use during the summer lawn watering season when water saving are most beneficial to the Spokane River.
6. **Regional Conservation Programs**- The City of Spokane reported in 2007 that they will continue to coordinate with neighboring purveyors through the Spokane Aquifer Joint Board (SAJB), River Dischargers, Watershed Planning Groups, Spokane County, Ecology, Department of Health, and other appropriate entities as the become known. They intend to make expenditures toward conservation goals.

Quad-Cities (Kennewick, Richland, Pasco, West Richland)-The Quad-Cities area is being consider in this report as a group of individual cities working together toward water conservation. Additionally, the Cities of Richland, West Richland, Kennewick and Pasco are engaged in efforts to promote a regional approach to water supply in the Quad Cities. Each City's conservation plan is important in determining how the cities are working in coordination.

Kennewick (Water System Plan 2002) - The 2002 Kennewick Water System Plan outlined four objectives for municipal conservation in Kennewick. These included public education, technical assistance, system measures, and incentives / other measures. Included as an element of conservation planning is the consideration of water and / or wastewater reuse with in the City to reduce water system demand.

1. **Public Education**- Kennewick proposed promotion of water conservation plans via television and radio, newspaper articles, and printed handout materials. Cooperation with other major water utilities in the Tri-Cities area is a major component of Kennewick's water conservation plan as outline in the 2002 Water System Plan.
2. **Technical Assistance**- This component of Kennewick's conservation plan includes providing customers with information (upon request) about water conservation. It also includes providing customer assistance and bills which show consumptive history.
3. **System Measures**- System measures include requiring source and customer metering and a meter testing and repair program. Kennewick has had a program for detecting unaccounted for water since 1998 and has been using leak detection equipment aggressively since 1994.
4. **Incentives / Other Measures**- As part of the 2002 Water System Plan, Kennewick outlined some the water conservation measures being considered. Utility measures under consideration included rate structures, leak detection/water audit, billing indicating historic consumption, and pressure reduction. Customer measures under consideration included plumbing retrofits for single family and multi-family housing and plumbing replacement for single and multi-family housing. Kennewick began distributing water conservation items such as toilet bags[1], low flow shower heads, and leak detection tables to utility customers in 1998.

Richland (Water System Plan 2002) – Several conservation strategies have been identified by the City of Richland as being key in a successful conservation program. Some strategies have been in place for years while others were proposed in the 2002 water system plan. The elements of Richland's conservation program are listed as follows:

1. **Water Main Replacement**– The City of Richland began replacing water main lines in 1980. By 2000, approximately 39 miles of the total 82 miles had been replaced. As 0 of the 2002 water system plan, the City of Richland planned to continue with the Water Main Replacement Program until all of the line had been replaced as long as funding could be acquired for the Program.
2. **Leak Detection Program**– As part of the Water Main Replacement Program, the City of Richland periodically conducts leak detection surveys. This allows the City to identify sections of the distribution system that are the most deteriorated and in need of immediate replacement.
3. **Public Awareness and Education**– The City has provide and, as of the 2002 water system plan, will continue to provide printed materials to customers encouraging conservation and ethical water use habits.
4. **Provide / Promote Water Efficiency Devices**– The City of Richland has previously provided low water-use devices and as of the 2002 water system plan stated they would continue the program.
5. **Water Use Audits**– The City of Richland conducts water use audits (typically of high water-use commercial accounts) to identify specific consumption patterns. This information can help the City develop strategies for water use reduction.
6. **Urban Area Irrigation Practices**– As of the 2002 water system plan, the City of Richland planned to pursue measures to help determine how irrigation needs could be best met in the future, while implementing conservation efforts.

1 Toilet tank displacement bags reduce the amount of water used to flush by holding a small amount of water out of use.

Pasco (Water System Plan 2001) – The City of Pasco 2001 water system plan indicated that the City has been implementing water conservation programs since 1995.

1. **Bills Showing Consumptive Use**– In September 2000, the City changed their billing format from a postcard to a full sheet invoice which reflected consumptive use history. The new mailing format also allowed the City to include information about water conservation measures.
2. **Source and Service Meters**– The 2001 report also indicated that the West Pasco water system and wellfield had been updated to include source and customer meters.
3. **Leak Detection**– In 1998, The City of Pasco implemented a leak detection program. The City committed to performing annual leak detection surveys. Identified leaks have been scheduled for repairs. The City has repaired 32 pipeline breaks since 1995 and all known pipeline leaks caused by corrosion are repaired upon discovery.
4. **Utility Financed Retrofit**– Completed in 1996, the Franklin County PUD in cooperation with the Bonneville Power Administration conducted the Residential Appliance Efficiency Program. The City of Pasco supported the program and encouraged water users to participate in showerhead and faucet aerator replacement. The City has since started a similar program.
5. **Reuse and Part of Conservation**– The City of Pasco has participated in recycle and reuse of water in the Columbia River watershed since completion of the primary wastewater treatment plant in 1954. The City upgraded the facility in 1998 to ensure compliance with the NPDES permit as issued by the Washington State Department of Ecology (WDOE).

   The 2001 water system plan indicated that the following conservation measured would be implemented in coordination with Richland, West Richland, and Kennewick beginning in 2002:

   1. **Public Education-** The City of Pasco proposed promotion of water conservation plans via television and radio, newspaper articles, and printed handout materials.
   2. **Technical Assistance-** This component of the Pasco's conservation plan includes providing customers with information about water conservation. It also includes providing customer assistance and bills which show consumptive history.
   3. **System Measures-** System measures include continued service meter replacement for the system, monitoring for unaccounted for water on a annual basis, continued leak detection, continued fire hydrant metering, and continued measuring ands estimating for all water use.
   4. **Incentives / Other Measures-** Pasco outlined some of the water conservation measures being utilized. These measures include continued showerhead replacement, review of water rates annually, promotion of low water demand landscaping in the Building Permit process, provide water use practice information to nurseries and agricultural operations, maintain compliance with NPDES Permit as issued by WDOE, continued evaluation of the City owned compost / soil additive program including use of wastewater bio-solids, and to continue Process Water Reuse Facility operations by irrigating crops with food processing wastewater.

West Richland (Water System Plan 2002) – In the 2002 Water System Plan, the City of West Richland defined conservation goals and objects to include public education about water use, locate and repair leaks more rapidly, locate unaccounted for water by comparing source and meter readings, implement a conservation ordinance, and pursue measures in which the cost of conserved water equals the value of water conserved.

The City grouped conservation measures into four categories:

1. **Public Education**–The City of West Richland proposed in 2002 to educate the public about conservation via flyers, letters and notices that would be mailed out every March. The notifications would address water conservation techniques and programs to be utilized during the summer months. In drought years, the notices would indicate that immediate conservation actions must be taken and radio and television announcements would be initiated indicating that conservation efforts were being initiated.
2. **Technical Assistance**– This conservation effort was proposed in 2002 to aid customer in developing conservation plans that would suit individual needs.
3. **System Measures**–The City proposed to maintain meter testing and repair when meters appear to be working incorrectly.
4. **Promote Sprinkler Irrigation Systems**– In 2002 some of the City was using potable water for irrigation sprinkler systems. The City proposed to promote the development of dual systems wherever practical in order to conserve potable water.

Yakima (Water System Plan 2004) – The 2004 City of Yakima water system plan indicated that the City implemented two water conservation measures in 1995 (irrigation efficiency and conservation pricing). The 2004 Water System Plan indicated that one new measure would be implemented in 2004 (a new billing system to accurately track water usage by user class and geographic region). The following conservation measures are in use:

1. **Program Promotion / Public Education** – The City of Yakima's water conservation public outreach program consists of mailing bill inserts with water-saving tips to customers four times per year. A water conservation elementary school assembly is held once per year. In addition, the City of Yakima provides media based public service announcements geared toward water conservation. The City of Yakima meets regularly with Park Department, School Districts, business and industrial customers to discuss ways to reduce water consumption and improve water conservation.
2. **Meter Replacement Program**– Since 1990 the City of Yakima has replaced existing 3-inch meters and larger meters with compound or turbine meters for greater accuracy. In addition, five percent of the 3/1 and one inch meters are replaced annually.
3. **Leak Detection**– In 1993, the City of Yakima completed a comprehensive leak detection program. Additional leak detection programs were conducted in 1996, 1997, 1999, and 2000. Implementation of future leak detection programs is scheduled to occur every four years beginning in 2003.
4. **New Plumbing Code**– In 1993, the City of Yakima implemented a new plumbing code requiring that new plumbing fixtures sold after July 1, 1993 must meet minimum efficiency standards.
5. **Irrigation Efficiency** – The City of Yakima indicated in the 2004 water system plan that the City continues to work toward alternative irrigation alternatives for nurseries, parks, schools and other larger water users by exploring the use of automatic sprinkler systems, flow timers, drip irrigation, low volume sprinklers, and early morning water schedules. The City planned in 2004 to improve irrigation efficiency in two public parks every year for five years.
6. **Conservation Pricing** – In 1996 the City of Yakima conducted a Cost of Service and Rate Study which recommended that the City begin a transition to a conservation rate structure. The existing water rate structure was a hybrid of several types of rate structures, which included a minimum bill (ready-to-serve-charge) based on a modified decline block rate structure.

While a declining block rate structure attempts to derive revenues in accord with the cost responsibilities of each class of customer, the rate structure does not promote water conservation. No incentive is provided for

conservation when per unit cost decreases as the volume of water used increases. Transition toward conservation pricing has been on-going since 2001.

The City of Yakima stated in the 2004 water system plan that it has been difficult to monitor the effectiveness of the conservation programs that have been in place since 1995 due to the limitations of the billing systems inability to track water usage appropriately. As of 2004, the City was evaluating alternatives for a new billing system that would greatly increase the ability to track water usage by user class and geographic area.

Wenatchee (Water System Plan 2004)- The 2003 City of Wenatchee water system plan outlined three objectives for conservation to be implemented over a five year period. This included a reduction in unaccounted-for water by 4-6 percent, a reduction in water use per capita by 4-6 percent, and to promote public education and awareness of water conservation issues. To achieve this, the City of Wenatchee implemented required source metering measures and program promotion in addition to selected elements of the following four conservation measures as suggested in the Conservation Planning Requirements document:

1. **Public Education**- Wenatchee proposed to develop a promotional program to publicize the needs and methods for achieving community water conservation. As part of the proposed program, the City of Wenatchee planned to emphasize the importance of promoting efficient indoor and outdoor water use through distribution of informational brochures, radio and newspaper articles and other publications.
2. **Technical Assistance**- Wenatchee proposed to work in coordination with the PUD, East Wenatchee Water District and other water utilities to take advantage of water conservation materials and programs. In addition, Wenatchee would provide information and water conservation customer assistance.
3. **System Measures**- Source meters on all connections were installed on Wenatchee's Regional System and have been operational since 1983. Meters are calibrated every three years by the manufacturer. Wenatchee keeps calibration records on file at the Regional Source office. In addition, Wenatchee city ordinance requires that "all use and services for water shall be furnished and measured by meter." Wenatchee has implemented metering by all customers. Wenatchee has leak detection equipment but only uses it on as "as needed" basis to detect suspected leaks. Wenatchee does not currently implement a large-scale leak detection program due to improvement to the City's water delivery system.
4. **Incentives / Other measures**- Wenatchee has a zero base water rate structure, meaning that all customers are charged a base rate with no minimum usage. Customers are charged for all water that passes through their meters.

Appendix C

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Appendix D

Glossary, Acronyms & Abbreviations

Term	Definition
1980 Instream Flow Rule	In June 1980, Ecology adopted an administrative rule for protecting instream flows on the mainstem Columbia River (WAC 173-563). Water rights on the Columbia River mainstem issued after 1980 are subject to the state instream flow rule.
Acquisition	The selling of a whole or partial water right to state or federal agencies or to private conservation organizations.
Acre-Foot	A unit of volume equal to one acre of area by one-foot depth (equal to 43,560 cubic feet or 325,851 gallons). This unit is generally used to measure the volumes of water used or stored in reservoirs. Also used are thousands of acre-feet (kaf) and millions of acre-feet (maf).
Active Storage	Water occupying the active storage capacity of a reservoir.
Active Storage Capacity	The portion of the live storage capacity in which water normally will be stored or withdrawn for beneficial uses, in compliance with operating agreements or restrictions.
Appraisal	Appraisal studies generally rely on existing data and information to develop plans for meeting current and projected needs and problems in a planning area. Appraisal studies involve a more detailed investigation into design issues and costs than a pre-appraisal study, and lead to feasibility studies. Federal appraisal studies are authorized under the Federal Reclamation Law (Act of June 17, 1902, Stat. 388 and acts amendatory thereof or supplementary thereto).
Appropriation	"The establishment of a water right by diversion, due diligence and beneficial use. Must be adjudicated to establish seniority of right" (Clifford, et al., 2004:149).
Appropriative Right	A water right granted by the State using the State water code and the prior-appropriation process
Aquifer Storage and Recovery	A water storage technique that uses underground aquifers as storage reservoirs. ASR is permitted by Ecology under WAC 173-157 and provides an opportunity for utilizing underground storage, provided certain technical conditions are met. Water may be stored for a period of weeks, months or longer, and then recovered for potable or other uses.
Basin	"The land area that drains into [a] waterbody" (Clifford, et al., 2004:156).
Beneficial Use	Beneficial use shall include, but not be limited to, use for domestic water, irrigation, fish, shellfish, game and other aquatic life, municipal, recreation, industrial water, generation of electric power, and navigation (RCW 90.14.031(2) and WAC 173-500-050(4)).
Biological Opinion	A set of recommendations from NMFS defining what operations the Columbia River system operation should be in order to ensure that the endangered species are not placed into jeopardy (Corps, 2003).

Term	Definition
Columbia Basin Project	A federal project authorized by Congress in 1935 and developed in parallel with the construction of Grand Coulee Dam. Primary irrigation facilities are the Feeder Canal, Banks Lake, the Main, West, East High, and East Low Canals, O'Sullivan Dam, Potholes Reservoir and Potholes Canal. There are over 300 miles of main canals, about 2,000 miles of laterals, and 3,500 miles of drains and wasteways on the project (Bureau of Reclamation, 2006a). The project irrigation facilities were planned to deliver a full water supply to 1,029,000 acres of land previously used only for dry farming or grazing. About 621,000 acres are currently authorized to be irrigated and further development is on hold.
Columbia River Initiative (CRI)	An initiative created to address the water management issues in the Columbia River. The CRI included a framework for issuing new water rights from the Columbia River while improving streamflows for fish. The CRI was composed of four elements—a legislative proposal for consideration in the 2005 legislative session, a proposed budget to secure water and conduct feasibility studies of new off-channel storage projects, draft rule language for implementation of the CRI, and cooperative agreements with federal and local partners.
Office of Columbia River	A program established by House Bill 2860 in which Ecology aggressively pursues development of water supplies to benefit both instream and out-of-stream uses through storage, conservation and voluntary regional water management agreements.
Columbia-Snake River Irrigators Association (CSRIA)	An association that represents farming operations in Eastern Washington that irrigate about 250,000 acres of row crop, vineyard and orchard lands. Its members have farming operations along the Columbia-Snake River system north from the City of Brewster, reaching to the south along the John Day and McNary Pools of the Columbia River. Some of the members own farming operations in the Yakima Valley and within the CBP area. The membership also includes several municipal service irrigators, including Brewster, Kennewick, West Richland, and the Kennewick Irrigation and Hospital Districts (Ecology, 2006b).
Conservation	Conservation is the management of water resources so as to maximize efficiency of use and eliminate waste. In the context of the Office of Columbia River Program, conservation generally refers to non-storage projects and can include water right acquisitions, infrastructure efficiency projects, and other projects designed to provide access to new water supplies for both instream and out-of-stream uses.
Consumptive Use	Use of water whereby there is a diminishment of the water source (WAC173-500-050(5)). In the context of irrigation, consumptive use includes crop evapotranspiration, and water evaporated during irrigation applications (e.g. spray, canopy and wind losses).
Crop Water Duty Reduction	Using improved water management strategies to manage on-farm water use to maximize profits without maximizing plant growth.
Cubic Feet Per Second (cfs)	Unit of measure expressing rates of discharge. Also expressed as thousand cubic feet per second (kcfs) (Corps, 2003). One cfs is equal to 449 gallons per minute and approximately two acre-feet per day.
Dam	A barrier built across a watercourse for impounding water.

Term	Definition
Discharge	The rate of flow of a river or stream measured in volume of water per unit of time. The standard units of measure are cubic feet per second (cfs) or thousand cubic feet per second (kcfs) (Corps, 2003).
Diversion	The amount of water withdrawn from surface or groundwater sources (Corps, 2003).
Drawdown	The distance that the water surface of a reservoir is lowered from a given elevation as the result of the withdrawal of water (Corps, 2003).
Efficiency	Generally, efficiency is the ratio of output to input. Efficiency in the Office of Columbia River Program will depend on the context of the project (e.g. agricultural, industrial, municipal). Increasing efficiency could be measured by increasing the output with the same amount of input, or by maintaining the same output with less input. For example, increasing irrigation efficiency means that the same or a greater crop production occurs with less water use. See also, Irrigation Efficiency.
Endangered Species	Any species which, as determined by the U.S. Fish and Wildlife Service, is in danger of extinction throughout all or a significant portion of its range other than a species of the class Insecta determined to constitute a pest whose protection would present an overwhelming and overriding risk to man (Corps, 2003).
Evapotranspiration	A loss of water from the soil both by evaporation and by transpiration from growing plants.
Fallowing Corners	Occurs when a center pivot with a round irrigation pattern is installed on a square(ish) field and the landowner decides to leave the corners uncultivated in lieu of irrigating them by some other method.
Feasability Studies	Feasibility studies involve generation and collection of detailed, site specific data concerning a project and reasonable alternatives. Feasibility studies are usually integrated with National Environmental Policy Act (NEPA) compliance, potentially including development of a NEPA EIS.
Feed Route	A route (can be a combination of artificial and natural channels) used to transport irrigation water from one location to another.
Flood Control	Any activity designed to reduce the flow and impact of a flood. Flood control measures include levees and wall construction; improving discharge capacity of the stream channel; reservoir and dam construction; and diversion of excess water into bypasses or floodways.
Furrow / Rill Irrigation	Rill irrigation is accomplished by making narrow trenches in the land with a tractor and plow. Water is then flooded into these trenches.
Gage	An instrument that can measure water quantity and quality parameters.
Hydropower	Mechanical energy derived from falling or flowing water, e.g., rivers, streams, and the overflow of dams. Water flowing from a higher level to a lower level (as from a dam or waterfall) is used to activate a turbine that drives an electric generator, a process called hydroelectric power generation. The amount of power furnished is proportional to the rate of flow of the water and the vertical distance through which it falls.

Term	Definition
Impoundment	A facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid.
Instream Flow	Used to identify a specific streamflow (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 streamflows needed to protect and preserve instream resources and values, such as fish, wildlife and recreation. (http://www.ecy.wa.gov/programs/wr/instream-flows/isfhm.html). A specific instream flow can be adopted by Ecology in rule, which becomes a water right with a priority date of the adoption of the rule; see 1980 Instream Flow Rule.
Instream Use	"A type of end application of water use that does not require withdrawal from the source. Examples of instream uses are recreational, navigational, and ecosystem preservation" (Clifford, et al., 2004:150).
Interruptible Water Right	Water rights junior to the 1980 instream flow rule that could be curtailed in low flow conditions in order to maintain adequate flows for fish. Interruptible rights can be curtailed when the March 1 forecast for April through September runoff at The Dalles Dam on the lower Columbia River is less than 60 million acre-feet.
Inventory	The water supply inventory described in this report combines the information requirements under Sections 5 and 6 of ESSHB 2860. Section 5 of ESSHB 2860 defines the required elements of the water supply inventory as: • A list of conservation projects that have been implemented under this chapter and the amount of water conservation achieved • A list of potential water supply and storage projects in the Columbia Basin, including: - Cost per acre-foot - Benefit to fish and other instream uses; - Benefit to out-of-steam uses - Environmental and cultural impacts. Section 6 of ESSHB 2860 describes information requirements for a Columbia River mainstem water information system that includes: • Total aggregate quantity of water rights issued under state permits and certificates, and filed under state claims on the Columbia River mainstem and for groundwater within one mile of the mainstem; and • Total volume of current water use under these rights as metered and reported by water users.
Irrigation	The controlled application of water to cropland, hay fields and/or pasture to supplement that supplied by nature.
Irrigation Efficiency	Irrigation efficiency represents the amount of water that needs to be applied in addition to the crop requirement for a particular type of irrigation system to meet the component system losses described below.

Term	Definition
John Day/McNary Reserve	On August 8, 1978, the John Day/McNary Reserve (WAC 173-531) was created to set aside 1,320,000 acre-feet per year to provide a water supply for the 330,000 acres of irrigation projected to be developed in the Columbia Basin by the year 2020 and 26,000 acre-feet of water for municipal use. The reserve is directed toward lands under existing water right permits, pending applications, and land for which appropriation applications may not yet have been filed.
Junior Water Right	"Water rights that were established more recently than senior rights. The more recent a date on a water right, the more "junior" it is relative to water rights with older issuance dates. All water rights are defined in relation to other rights, and a water right holder only acquires the right to use a specific quantity of water under specified conditions. Therefore, when limited water is available, junior rights cannot be exercised until all senior rights have been satisfied" (Clifford, et al., 2004:152).
Land Conservation Program	A riparian or upland conservation program that removes irrigated land from production for some state or federal conservation program purposes. Conservation Reserve Enhancement Program (CREP) and Conservation Reserve Program (CRP) are potential examples where irrigated agriculture may have been fallowed or put to use for some other conservation practice that does not require irrigation.
Large Storage Opportunity	A storage facility with a capacity that is greater than 1 million acre-feet.
Lining/Piping	The conversion of open-ditch water conveyance delivery systems to a more efficient delivery pipe or the placement of an impermeable liner within a ditch.
Management	The application of a system of managing water applications that creates water savings through scheduling changes or other management practices. Irrigation Water Management (IWM) is an example of a management tool that may create water savings. Canal automation is another example.
Management Zone	The one-mile corridor on either side of the Columbia River mainstem as defined in ESSHB 2860.
Municipal Use	There are three situations where water is considered to be for municipal use. The first is when water is used for residential purposes by fifteen or more residential service connections or for a nonresidential population that is, on average, at least 25 people for at least 60 days a year. The second is when water is used for governmental or governmental proprietary purposes by a city, town, public utility district, county, sewer district, or water district. The third includes indirect uses of water for residential, governmental or governmental proprietary purposes through the delivery of treated or raw water to a public water system for such use (RCW 90.03.015).
National Environmental Policy Act (NEPA)	A 1969 federal Act that requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions (http://www.epa.gov/compliance/nepa/).
Non-Consumptive Use	A type of water use where either there is no diversion from a source body, or where there is no diminishment of the source (WAC 173-500-050(9)).
Non-Use	When all or a portion of the water associated with a water right has not been beneficially used.

Term	Definition
OCPI Determinations	Perennial rivers and streams of the state shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values. Lakes and ponds shall be retained substantially in their natural condition. Withdrawals of water which would conflict therewith shall be authorized only in those situations where it is clear that overriding considerations of the public interest will be served.
Odessa Groundwater Management Subarea	An area of approximately 2,000 square miles under the eastern-most portion of the authorized Columbia Basin project, east of the East Low Canal, designated as a groundwater management subarea in 1988. The purpose of establishing the Odessa Groundwater Management Subarea (Odessa Subarea) was to "…provide a procedure for managing groundwater within the Odessa groundwater subarea to insure the maintenance of a safe sustaining yield from the groundwater body within a reasonable and feasible pumping lift" (WAC 173-130A-040). Constraints on water use in the Odessa Subarea are based on controlling the rate of decline in the water level, establishing a maximum lowering of the water table level, regulating withdrawal of groundwater to protect senior water right holders, limiting new water users and limiting the location where new wells may be drilled.
On-Farm Efficiency	The installation of a more efficient irrigation application system. Examples would include a conversion from flood or rill/furrow irrigation to center pivot technology. Also, the replacement of hand-lines or less efficient sprinkler systems to drip irrigation.
On-Farm Water Duty	Water duty is the amount of water that, by careful management and use and without wastage, is reasonably required to be applied to a parcel of land for the period of time that is adequate to produce a maximum amount of such crops as ordinarily are grown on the land. Water duty varies according to conditions.
Out-of-Stream Water Use	A use that requires water to be taken out of the stream.
Partial Season Acquisitions/ Leases	Farmers forgo second and third hay cuttings during the months of July, August, and September when water demand is high. Partial season leases result in consumptive use reduction and therefore benefit fisheries while fulfilling permits on a temporary basis. While partial season leases will not result in a permanent water supply for new permits, they can be used to meet interruptible and short-term water needs.
Permanent Crop Change	A permanent change in a crop grown on a field to one with a smaller irrigation requirement. A change from tree fruit or alfalfa to grapes would be an example.
Permit-Exempt Well	A well that is exempt from the state's water right permitting system because it is used for an exempt use. According to the Attorney General's Office, the four types of groundwater use that are exempt from the state's water right permitting system include: 1) Providing water for livestock (no gallon per day limit or acre restriction); 2) Watering a non-commercial lawn or garden one-half acre in size or less (no gallon per day limit); 3) Providing water for a single home or groups of homes (limited to 5,000 gallons per day); and 4) Providing water for industrial purposes, including irrigation (limited to 5,000 gallons per day but no acre limit).
Planning Unit	"A group that represents a wide range of water resource interests, tasked with conducting a watershed assessment and completing a watershed plan for one (or more) WRIAs. The initiating governments are responsible for development of an inclusive Planning Unit for the WRIA (RCW 90.82)" (Association of Cities, 1999:viii).

Term	Definition
Pool Reach	The length of the mainstem Columbia River between two dams with the exception of the Hanford reach, which is a national monument and not impounded.
Pre-Appraisal	Preliminary studies based on limited analyses, available design data, and professional assumptions but of sufficient detail to provide satisfactory quantities and preliminary field cost estimates leading to an appraisal study.
Priority Date	Water use of any sort is subject to the "first in time, first in right" clause, originally established in historical Western Water Law and now part of Washington State Law. This means that a senior right cannot be impaired by a junior right. Seniority is established by priority date - the date an application was filed for a permitted or certificated water right - or the date that water was first put to beneficial use in the case of claims and exempt groundwater withdrawals.
Reclaimed Water	Effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater (Ecology, 1998).
Relinquishment	Five or more successive years of non-use triggers forfeiture of a water right unless there is sufficient cause to explain the non-use. The burden to prove that the right is still in good standing and should not be considered relinquished, rests on the water right holder. There are several categories of reasons that may serve as "sufficient causes" to explain why water has not been used (RCW 90.14.140).
Reservoir	A natural or artificial pond or lake used for the storage and regulation of water.
Return Flow	Waters that, after having been diverted for a beneficial use, escape control of the water right holder and return to a public water body. Return flows may include, for example, waters lost through conveyance system inefficiency or waters used for a beneficial purpose that are not fully consumed by the purpose of use.
River Mile	River Mile (RM) measurements start at the mouth of the stream (RM 0.0) and are measured in statute miles (one statute mile = 5,280 feet) along the center line of a river.
Runoff	The water from rain, snowmelt or irrigation that flows over the land surface and is not absorbed into the ground, instead flowing into streams or other surface waters or land depressions.
Seepage	The flow of a fluid through the soil pores, in downward or upward direction.
Senior Water Right	"Water rights that are older (more senior) than those of junior rights. All water rights are defined in relation to other rights, and a water right holder only acquires the right to use a specific quantity of water under specified conditions. Thus, when limited water is available, senior rights are satisfied first in the order of their Priority Date" (Clifford, et al., 2004:154).
Small Storage Opportunity	A storage facility with a capacity that is less than 1 million acre-feet.
Snowpack	An area of naturally formed, packed snow that usually melts during the warmer months.

Term	Definition
Split-Season Acquisition	When a farmer voluntarily forgoes mid to late season irrigation. An example is when a hay farmer decides to harvest only the first cutting of hay and forgo the rest of the season through a lease or contractual agreement.
Standby / Reserve Status	A water right that can only be used when the primary water right goes unfilled or cannot satisfy an authorized use during times of drought or other low flow periods. A primary right must be used to the extent available before a standby / reserve right is used.
Streamflow	The rate at which water passes a given point in a stream usually expressed in cubic feet per second (Corps, 2003).
Source	A point of diversion or withdrawal authorized by a water right, not to be confused with a 'same body of groundwater' under RCW 90.44.100, 'same source of supply' under RCW 90.03.265 or other such references.
Source Substitution	A change from one withdrawl source to another. For example, surface to groundwater conversion.
Surface to Groundwater Conversion	When a well is drilled to be used as a primary source for a water right that was previously served from a surface water source. Water savings may accrue from a reduction in canal seepage. This technique may be used in some areas to mitigate for low instream flows.
Tail Water Reuse	The capturing and reuse of surface runoff water from a field or conveyance system rather than returning it back to the stream.
Tributary	A stream that contributes water to a larger stream.
Trust Water	Trust water is a water right or a portion of a right acquired by the state for management in the Trust Water Right Program (Trust Program) (RCW 90.42.020(3)). The state may acquire all or portions of water rights by purchase, lease, or donation, and may acquire trust water rights on a permanent or a temporary basis. A water right exercised through the Trust Program for the beneficial use of instream flows is not relinquished for non-use while it is in the program.
Uninterruptible Water Right	Water rights that are not subject to curtailment in low flow conditions in order to maintain adequate flows for fish due to the June 1980 instream flow rule adopted by Ecology. These include existing pre-1980 rights, pre-1980 reserved water rights, and additional water withdrawn for the Columbia Basin Project.
Vested Water Right	A pre-water code use of water that was developed, put to beneficial use, and continuously beneficially used since prior to the water code.
Water Bank or Water Market	An institutional mechanism that facilitates the legal transfer and market exchange of surface water, groundwater, or water storage. This mechanism may be administered by any type of entity, such as private, public, or non-profit.
Water Resource Inventory Areas (WRIA)	"One of 62 geographic areas comprising the State of Washington, defined on the basis of surface water resources and codified in Washington Administrative Code 173-500-040" (Association of Cities, 1999:ix).

Term	Definition
Water Right Certificate	The legal record of a water right issued by Ecology once the department confirms that all the conditions of the permit have been met. It is recorded at a county auditor's office. Once Ecology issues a certificate, the water right is considered appurtenant (attached) to the land on which the water is used (http://www.ecy.wa.gov/pubs/961804swr.pdf).
Water Right Claim	A claim to a water right, for a water use that predates the state's water permitting system (for surface water, 1917/1932, for groundwater, 1945). The validity of a claim can only be confirmed through judicial processes (http://www.ecy.wa.gov/pubs/961804swr.pdf).
Water Right Permit	Permission by the state to develop a water right; it is not a final water right. A permit allows you to proceed with construction of the water system and start putting the water to beneficial use, in accordance with the terms of your permit. (http://www.ecy.wa.gov/pubs/961804swr.pdf)
Water Right Tracking System	The database Ecology uses to track water rights. The information captured in this database includes the type of water right (surface or ground), the name of the business or person applying for a right or a change to an existing right, the priority date or date of application, the instantaneous quantity (Q_i) or maximum withdrawal rate requested, the annual quantity (Q_a) or volume requested (reported in acre-feet per year), the purpose of use, the water source and the geographic location (township, range and section) for the point of diversion (place of withdrawal) and/or place(s) of use.
Water Year	The period from October 1 through September 30 of the following calendar year. It is the time base used in hydrology (Corps, 2003).
Watershed	"The land area that drains into the defined waterbody" (Clifford, et al., 2004:156).
Watershed Management Plan	A document presenting the findings and recommendations of the planning unit for a Watershed Management Program in the management area" (Association of Cities, 1999:ix).

Standard Water Unit Conversions	
1 cfs =	448.8 gpm
1 cfs =	646,272 gpd
1 cfs =	1.98 ac-ft per day
1 cfs =	0.6463 mgd
1 cubic ft. =	7.48 gallons
1 gpm =	1,440 gallons per 24 hour day
1 gpm =	1.61 ac-ft per year
1 ac-ft =	1 foot of water on 1 acre
1 ac-ft =	325,851 gallons

Acronyms & Abbreviations	
AF	Acre-Feet
ASR	Aquifer Storage and Recovery
BiOp	Biological Opinion
BPA	Bonneville Power Administration
CBP	Columbia Basin Project
CFS	cubic feet per second
CIG	University of Washington Climate Impacts Group
Corps	U.S. Army Corps of Engineers
CREP	Conservation Reserve Enhancement Program
CRI	Columbia River Initiative
CRP	Conservation Reserve Program
CSRIA	Columbia-Snake River Irrigators Association
DEIS	Draft Environmental Impact Statement
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESSHB	Engrossed Second Substitute House Bill
ET	Evapotranspiration
GPD	Gallons per day
GPM	Gallons per Minute
IWM	Irrigation Water Management
kcfs	thousand cubic feet per second
CR Program	Columbia River Basin Water Management Program
Management Zone	Columbia River Management Zone
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
Odessa Subarea	Odessa Ground Water Management Subarea
OCR	Office of Columbia River
OFM	Washington State Office of Financial Management
PEIS	Programmatic Environmental Impact Statement
PUD	Public Utility District
Q_a	Annual Quantity
Q_i	Instantaneous Quantity
RCW	Revised Code of Washington
RM	River Mile
SAR	Shallow Aquifer Recharge
SEPA	State Environmental Policy Act
Trust Program	Washington State Department of Ecology's Trust Water Rights Program
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VRA	Voluntary Regional Agreement

Acronyms & Abbreviations	
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WSU	Washington State University