EFFICIENT IRRIGATION & LANDSCAPE STANDARDS

A MENU OF OPTIONS FOR PREPARING AND ADOPTING AN ORDINANCE OR STANDARDS

Options to help implement best practices to conserve water during summer months when demand for outdoor water use can be 3-4 times higher.

A LETTER FROM THE IDAHO WASHINGTON AQUIFER COLLABORATIVE

IDAHO WASHINGTON AQUIFER COLLABORATIVE

www.iwac.us | info@iwac.us
P.O. Box 1822
Post Falls, ID 83877

Dear Commissioners, Council and Board Members, Mayors, Water Purveyors, Administrators, City Planners, Regulators, Landscape Designers, Irrigation System Installers and valued Decision Makers for local jurisdictions and municipalities,

Water and wastewater purveyors from Idaho and Washington have teamed up to efficient irrigation and landscape design standards. This menu of options will help you implement best practices to conserve water during summer months when demand for outdoor water use can be three to four times higher than the amount used for domestic needs during the winter.

Water quality can also be protected by proper installation and maintenance of irrigation systems and backflow devices to reduce runoff and keep pesticides, fertilizers, herbicides and automotive fluids out of storm drains, dry wells, the aquifer and river.

These efficient irrigation and landscape design standards will help support growth, provide confidence to withstand drought conditions and protect the quality of our sole source aquifer. They provide voluntary actions that can have big impacts on conserving and protecting our precious water resources.

As elected and appointed decision makers, our constituents, customers and voters, need your leadership to adopt the design standards that address your unique situation.

Thank you for thoughtfully considering ways to voluntarily implement a few or many of the recommended best practices included in this guidance document for Efficient Irrigation and Landscape Design Standards.

Sincerely,

Terry Pickel

IWAC President

The Idaho Washington Aquifer Collaborative (IWAC) works to maintain and enhance water quality and quantity for present and future generations by developing management strategies which benefit the Spokane Valley Rathdrum Prairie Aquifer and the Spokane River watersheds.

TABLE OF CONTENTS

USING THIS GUIDE

This guide provides local jurisdictions, agencies, and water purveyors the recommended elements that an ordinance or design standard could include, to ensure landscapes are designed with water efficiency in mind.

Most jurisdictions do not have strong provisions for water efficiency within their landscape codes. Also, the landscape irrigation industry lacks national or international standards for construction and operation.

Some of the recommended elements contained within this guide may be considered best practice in water efficient design. Others may include recommendations with "ranges" of standards a local jurisdiction can choose from depending on their individual goals. There is not a one size fits all standard and local jurisdictions may choose to alter or apply these standards as they see fit.

If the regulating entity is a water provider but has no land use authority, the regulations could be implemented through their adopted design standards and specifications or through an agreement entered into during the application for water service (e.g. tied to applications for water availability).

This guide is key for both municipalities and water providers alike.

Should water conservation efforts be ignored at the permitting agency level, water providers will ultimately be forced to increase water rates in order to meet increased peak demands.

Within water providers' design standards for water systems, landscape water efficiency should also be addressed. Water providers could consider requiring a separate meter for outdoor irrigation in an effort to monitor and bring awareness to outdoor water usage and inefficiencies.

INTRODUCTION

Landscape irrigation is the single largest use of potable water in the United States. During summer months, outdoor water use creates peak demand on existing water supplies and system capacity. Water purveyors and utilities must increase supply to meet irrigation needs, sometimes as much as **three to four** times the amount used for domestic needs during the winter.

Nationwide, landscape irrigation is estimated to account for nearly one-third of all residential water use, totaling nearly 9 billion gallons per day. As much as 50 percent of water used for irrigation is wasted due to evaporation, wind, or runoff caused by inefficient irrigation methods and systems.

Sprinkler systems left unmaintained can cause runoff and damage hardscapes.

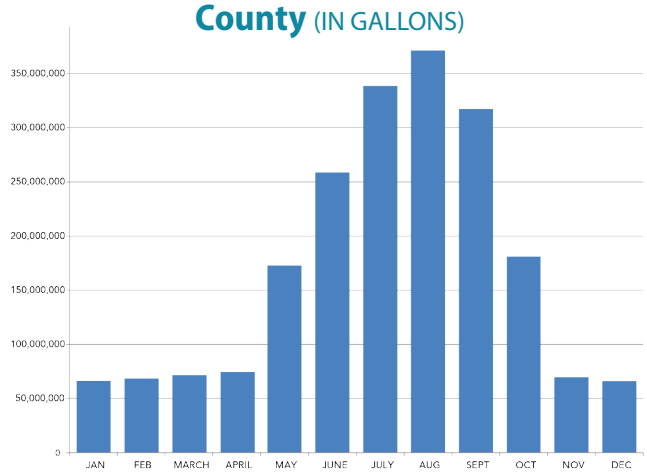
Locally, forecasts show water use increasing substantially by 2040 in the Spokane Valley-Rathdrum Prairie (SVRP) aquifer. **Water demand in Spokane County is forecasted to increase 31% by 2040.** The increase is approximately 156 CFS, which is significant given that the most recent USGS study indicates a close relationship between increases in aquifer withdrawal and decreases in Spokane River's flow.

The public supply sector and self-supplied residential sectors are projected to increase by 41% and 47% respectively. During the same time frame population is projected to increase by 55% (based on the Washington State Office of Financial Management medium population projection for Spokane County).

In Idaho, approximately two thirds of the total non-agricultural water withdrawn from the SVRP is devoted to landscape irrigation use. The population of Kootenai County living within the SVRP is projected to increase 81% by 2045. As it exists presently, water purveyors must petition the Idaho Department of Water Resources for additional water rights to serve their growing populations.

Forecasts show that water shortages will be occurring in the SVRP aquifer unless conservation measures are implemented or additional pumping capacity is added. Measures to conserve water should be implemented to lessen the burden on rate payers, otherwise rate increases will be unavoidable in the future as water purveyors are required to install new infrastructure.

Daily Average Water Use In Spokane County (IN GALLONS)

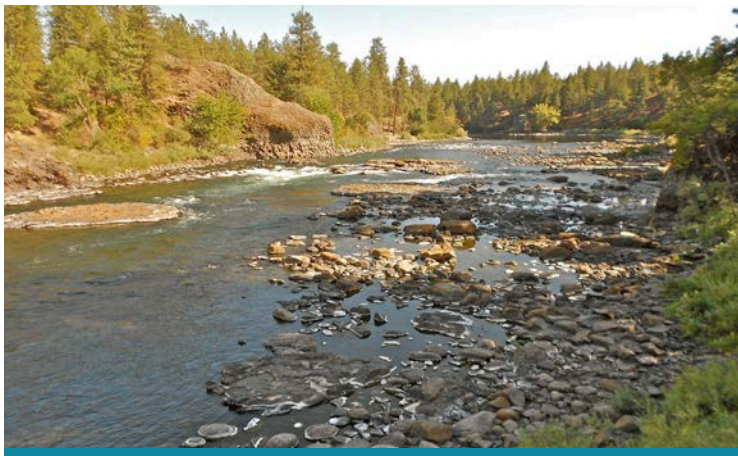


Average summer consumption can increase to more than 350 million gallons per day in Spokane County.

2015 DROUGHT

During the 2015 drought, water sources that typically feed the aquifer ran low. In some cases rivers ran dry and area lakes had water levels lower than had been seen in decades. In contrast, the hot dry summer weather caused homeowners and landscape maintenance staff to dramatically increase watering times in an effort to keep landscapes looking lush. Private well owners in the City of Coeur d'Alene went to the City and other purveyors to purchase water. The City of Airway Heights, which sits adjacent to the SVRP, ran out of water and enacted odd and even day watering. Airway Heights was eventually forced to purchase water from the City of Spokane SVRP system as their wells were depleted.

Scientific weather models predict more years of drought like 2015 in the future. Warmer winter weather is leading to winter precipitation falling in the mountains as rain instead of snow. With a lower snow pack, this "snow drought" causes rivers and streams feeding the aquifer to run dry earlier in the year. More frequent water shortages combined with increased demand and population growth mandate more efficient use of water withdrawn from the SVRP aquifer.



August 8, 2015, Spokane River flows at 630 cfs. photo – John Osborn

July 15, 2014 Spokane River flows at 2500 cfs. photo – John Osborn

A REGIONAL NEED OF EFFICIENCY

One way to combat water shortages is to enact water efficient irrigation and landscape requirements for new and rehabilitated landscape projects. Water conservation has not historically been specifically addressed in irrigation and landscape design practices in the region.

Due to ever-increasing demands on our limited water resources and inefficient uses of water there is a need for regional irrigation efficiency and design standards. For that purpose, IWAC developed these regional Efficient Irrigation and Landscape Design Standards. This guide will aid municipalities and water purveyors to promote water use efficiency of our sole source aquifer.

Nine Mile, WA

Liberty Lake, WA

Coeur d'Alene , ID

1 SETTING YOUR PURPOSE

Landscape standards may be adopted for many reasons. The original purpose may have been for beautification, or to protect property values. Standards may serve to minimize erosion on sensitive slopes, or to retain specific locally important plant species. This section of the guidelines provides purpose and goal statements that may be incorporated into a water efficient irrigation and landscape ordinance to respond to the specific goals that would be achieved through the implementation of newly adopted standards for water efficiency in landscape and irrigation design. It is important to note that water conservation compliments other landscaping goals. The goals of this chapter should harmonize with local jurisdiction goals.

The following includes a summary of the recommended elements that may be included within design standards for water efficient landscaping and irrigation systems. A local jurisdiction may choose to alter or amend these standards to comply with their own local goals or vision.

Efficient landscapes can still achieve the purposes of their landscape ordinance, not by asking people to remove turf, but by using drought tolerant plantings and efficient irrigation systems and watering practices.

EXAMPLE LANGUAGE

From the Colorado Model Water-Efficient Landscape Ordinance for Commercial Businesses:

The City Council has found that it is in the public interest to conserve the public's water resources and to promote water-efficient landscaping. The purpose of this ordinance is to protect and enhance the community's environmental, economic, recreational, and aesthetic resources by promoting efficient use of water in the community's landscapes, reduce water waste and establish a structure for the designing, installing and maintaining of water-efficient landscapes throughout the City.

The Water-Smart Landscapes publication by the Environmental Protection Agency includes language that may be a source of inspiration for purpose statements in a water efficient irrigation and landscape ordinance:

- Reducing outdoor irrigation which can account for up to 60 percent of a household's water use.
- Replacing eye-catching landscapes, which require extensive watering, fertilization, and pesticide application, with drought-tolerant and water-smart landscaping. These landscapes can be designed to be aesthetically pleasing, save water, and protect the environment.

From the California Model Water Efficient Landscape Ordinance (MWELO):

- Create the conditions to support life in the soil by reducing compaction, incorporating organic matter that increases water retention, and promoting productive plant growth that leads to more carbon storage, oxygen production, shade, habitat, and aesthetic benefits.
- Minimize energy use by reducing irrigation water requirements, reducing reliance on petroleum based fertilizers and pesticides, and planting climate appropriate shade trees in urban areas.
- Conserve water by capturing and reusing rainwater and greywater wherever possible and selecting climate appropriate plants that need minimal supplemental water after establishment.
- Protect air and water quality by reducing power equipment use and landfill disposal trips, selecting recycled and locally sourced materials, and using compost, mulch and efficient irrigation equipment to prevent erosion.
- Protect existing habitat and create new habitat by choosing local native plants, climate adapted non-natives and avoiding invasive plants. Utilize integrated pest management with least toxic methods as the first course of action.

EXAMPLE LANGUAGE

The City of Hayward, CA, has similar goal statements to the California MWELO:

- Encourage the use of a watershed approach and reducing compaction, incorporating organic matter that increases water retention, and promoting productive plant growth that leads to more carbon storage, oxygen production, shade, habitat and aesthetic benefits.
- Establish provisions for water management practices and water waste prevention for existing landscapes.
- Set a Maximum Applied Water Allowance as an upper limit for water use and reducing water use to the lowest practical amount.

From the King County, Washington Municipal Code:

The purpose of this chapter is to preserve the aesthetic character of communities; to improve the aesthetic quality of the built environment; to promote retention and protection of existing vegetation; to promote water efficiency; to promote native wildlife; to reduce the impacts of development on drainage systems and natural habitats; and to increase privacy for rural area and residential zones by:

A. Provide visual relief from large expanses of parking areas and reduce perceived building scale.

B. Provide physical separation between rural area or residential zones and nonresidential zones.

C. Provide visual screens and barriers as a transition between differing land uses.

D. Retain existing vegetation and significant trees by incorporating them into the site design.

E. Provide increased areas of permeable surfaces to allow for:

  » Infiltration of surface water into groundwater resources.

  » Reduction in the quantity of storm water discharge.

  » Improvement in the quality of storm water discharge.

F. Encourage the use of native plant species by their retention or use in the landscape design.

G. Require water use efficiency through water budgeting and efficient irrigation design standards.

H. Encourage the use of a diversity of plant species that promote native wildlife habitat.

With future population projections seeing increases as high as 81%, water smart policies are essential to: accommodate growth without large infastructure costs, protect recreation and habitat, ensure quality water for the future.

2 APPLICABILITY

There is no one-size-fits-all approach to applying water efficient landscape standards and the communities adopting them should think about their existing landscaping standards and their applicability. Enacting water efficient requirements for residential development will likely be met with resistance. However, since residential irrigation use accounts for the highest amount of annual water demand, it will be critical to address water efficiency in residential zones in the future.

2.1 THRESHOLDS

Depending on the jurisdiction, landscape applicability standards may already exist, that will need to be reviewed in implementing water efficient landscape standards. The applicability section will describe which and what kinds of development actions must comply with the water efficient standards. Consider implementing a structured time frame that adopts irrigation efficiency applicability for the following types of projects in five-year increments:

- New construction and rehabilitated landscapes of:
  - » Public agency projects
  - » Commercial/industrial development
  - » Single-family and multi-family projects by a developer
  - » Single-family on lots of record
- Existing landscapes (with criteria for remodels or renovated landscape greater than a minimum area)

The most difficult category of new construction to implement stems from the facts that there are no design standards and that irrigation/landscape plans are not currently required for single-family residences. Residential homes account for the bulk of peak demand water use in summer months. In addition, most residential irrigation systems are poorly designed, installed, and maintained due to the lack of standards. This leads residential systems to have typically less than 40% efficiency in the system's water use.

When adding any of the included sections of this guide to a local ordinance, the implementation procedures should be aligned with the local jurisdiction's existing procedures and regulations.

Implementation of a water efficient irrigation and landscape ordinance should occur through the building permit process and there may be a minimum threshold project size for which it applies.

The adopting jurisdiction or agency should evaluate appropriate thresholds for when these standards are triggered. Several local jurisdictions within the SVRP aquifer already specify a minimum size of the landscape area for when the landscape ordinance applies. As a practical matter, this size threshold would only apply generally when development permits or review is required. In many instances, this means that activities that do not require a development permit are not reviewed under the landscape provisions.

RANGE OF STANDARDS CURRENTLY EMPLOYED IN THE AREA:

MUNICIPALITY	CODE REFERENCE	SUMMARY OF STANDARDS
Airway Heights, WA	AHMC 17.22	Landscaping is not required in the residential zones. Requires water efficient design and irrigation plans on sites over 10,000 sf of irrigated area.
Spokane, WA	SMC 17C.200.110	Landscape plans are not required for residential homes, an attached house or a duplex on a lot. For development of sites 7,000 square feet or larger, including planned unit developments, a landscape plan is required. No irrigation plans required.
Spokane Valley, WA	SVMC 22.70.90	Applies to multifamily and nonresidential projects. No irrigation plans required.
Liberty Lake, WA	Article 10-3C	Applies to all new development except single-family. No irrigation plans required. Must comply with City Water Conservation Ordinances.
Spokane County	SCC 14.806	Applies to all new development except single-family requirements. No irrigation plans required.
Post Falls, ID	PFMC 18.24.080	Applies to all new development except single-family. Irrigation required, but plans for water efficiency are not.
Hayden, ID	Chapter 11-11-11	Applies to all new development except single-family. Irrigation plans are not required for any type of development.
Coeur d'Alene, ID	Chapter 17.06	Does not have any single-family landscape requirements. For non-residential use, the only requirement for documentation is to specify the method of irrigation and water spray pattern plan.
Kootenai County, ID	KCC 8.4.6	Does not have any residential landscape requirements, nor does it require irrigation plans for any type of development.

2.2 EXCEPTIONS

An adopting jurisdiction may choose to exempt some development activities from all or some of the provisions of the efficient irrigation and landscape design standards. An example of some activities that communities may choose to exempt include:

- Existing landscapes (consider requiring public landscapes to be retrofitted)
- Cemeteries (consider requiring any irrigation to use recycled water)
- Registered local, state or federal historic sites.
- Ecological restoration sites.
- Golf courses with actively managed watering systems.

3 LANDSCAPE AND IRRIGATION PLANS

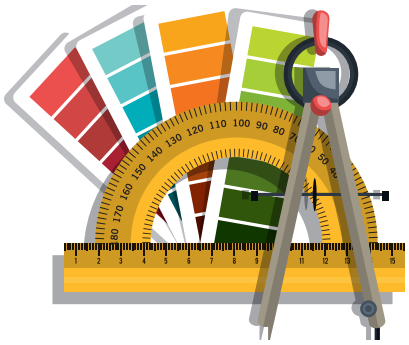
3.1 REQUIRED DOCUMENTATION PACKAGE

In order to determine conformance with water-efficient landscape and irrigation design standards, applicants will need to prepare various documentation, including, but not limited to the following:

- Landscape design plan
- Irrigation design plan
- Irrigation water demand calculations and a watering schedule
- Landscape maintenance schedule
- Grading design plan
- Soil analysis
- Reclaimed water use

The adopting jurisdiction may also consider requiring certain elements of this package at different stages of project review.

3.2 REQUIREMENTS OF A LANDSCAPE PLAN



The adopted water efficient irrigation and landscape ordinance/standards should identify the required items that will be shown on a submitted landscape plan to determine conformance with the water efficient landscape design standards.

The adopting jurisdiction should examine its existing landscape plan requirements to ensure that the plans depict water efficient landscape features such that they can be reviewed for conformance with water efficient landscape standards.

For example, the City of Post Falls, ID requires the following to be shown on a submitted landscape plan. This language is typical of most jurisdictions in the region:

- Boundaries and dimensions of the site.
- Location of existing and proposed streets, curbs, utility lines, sidewalks.
- Location of buildings and structures, parking lots, driveways, loading areas, outdoor mechanical equipment, signs, refuse enclosures, overhead utilities, water meter location, grassy swales, parking lot lighting, and any plants or trees that are to remain on site.
- The location and design of landscape areas to be landscaped, and plant list to include the location, number, size and type of plant material by botanical and common name.
- North arrow and scale.
- Proposed irrigation system. All landscaped areas, including adjacent rights of way shall be provided with an underground irrigation system.
- Planting details (using Post Falls detail for trees).

It should be noted that most local jurisdictions require irrigation as shown in Post Fall's ordinance. However, submittals of irrigation plans and calculations are almost never required to ensure water conservation measures are employed.

EXAMPLE LANGUAGE

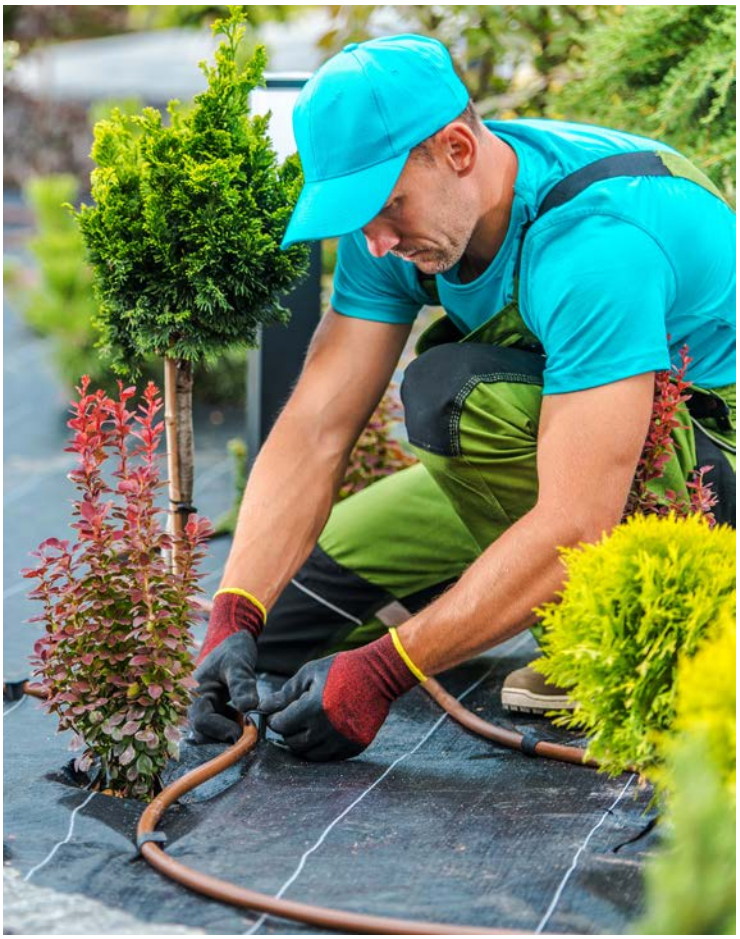
The following items could be added or incorporated into landscape plan requirements in order to encourage water efficient landscape design, installation and maintenance practices. These have been adapted from codes and ordinances throughout the Pacific Northwest and arid regions of the western United States.

1. Landscape Design Plans shall be designed by a licensed Landscape Architect or landscape contractor, or a Certified Master Gardener. Provide the name, address and phone number of preparer, license number, and expiration date.
2. The landscape plan submitted to the [agency] shall be drawn on the same base map as the development plans and shall identify the following:
   - » Indicate existing and proposed topographic lines and elevations, 100 year floodplain line and riparian or shoreline habitats.
   - » The total square footage for each of the following: the site, impervious areas, gross parking area, undisturbed landscape areas, landscaping required, and landscaping provided.
   - » Total square footage for each landscaped area separated by service meter. For example: if there are multiple landscape meters, the area served by each meter must be measured (in square feet) and the % of total site determined for each area.
   - » Designation of planting hydrozones.
   - » A calculation of the estimated applied irrigation water to establish the landscape.
   - » A calculation of the estimated applied irrigation water for the landscape at maturity.
   - » Graphically show the extent of disturbed/graded areas and all materials and elements provided for the revegetation and/or slope stabilization of these areas.
3. A plant list and legend, indicating the scientific (botanical) and common name and total quantity of each plant, planting size, location and symbol, hydrozone/water need.
4. Specifications and/or details for plant installation, soil preparation, and mulch.

5. When grading plans or a combination paving/grading plan is required, the landscaping plans must be submitted concurrently with the first submittal of the grading plans.
6. The proposed landscape plan shall be certified by a state licensed landscape architect.
   - » An affidavit signed by the individual specified in subsection 1. of this section, certifying that the landscaping has been installed in compliance with the approved landscaping plan, shall be submitted to the [agency] within thirty days of installation completion, unless the installed landscaping has been inspected and accepted by the [agency].
7. A design concept statement, plan notes or sketches that contain:
   - » Plant selection. Plant materials with intrusive root systems cannot be placed within drainage basins with engineered bottoms.
   - » Irrigation. Groundwater and stormwater runoff detention and use; temporary or permanent systems.
   - » Site grading and how it benefits landscaping. Where applicable, specifications for stockpiling and reapplying site topsoil or imported topsoil.
   - » Use of groundcover or mulch (both organic and inorganic).
   - » Use or disposal of existing, on-site vegetation.
   - » Address maintenance requirements. Specifically describe the maintenance and include a statement assuring the continued maintenance program of the required landscaping and assigning the responsibility of the maintenance to the property owner or agent, a homeowners' association or other liable entity.

3.3 REQUIREMENTS OF AN IRRIGATION PLAN

An irrigation plan, if not already, should be included in the list of required materials submitted as part of the water-efficient landscape documentation package. The irrigation plan should demonstrate conformance with the nationally recognized irrigation design standards identified in the most recent version of the Irrigation Association's "Landscape Irrigation Best Management Practices". *(see appendix 7.2)*



EXAMPLE LANGUAGE

The Irrigation Design Plan must meet the irrigation design standards identified in the most recent version of the Irrigation Association's "Landscape Irrigation Best Management Practices".

1. The applicant shall provide the following information:
   - » Identity of person or entity responsible for maintenance of the irrigation; and
   - » Location of shut-off valves.
2. **Irrigation water shall be applied with goals of avoiding runoff, low head drainage, overspray or other similar conditions where water flows onto adjacent property, non-irrigated areas and impervious surfaces by:**
   - » Considering soil type and infiltration rates;
   - » Using proper irrigation equipment and schedules, including features such as repeat cycles, to closely match precipitation rates with infiltration rates; and
   - » Considering special problems posed by irrigation on slopes and in median strips.
3. All irrigation water outlets, except those using alternative water sources, shall be downstream of a meter used to measure irrigation water use.
4. Irrigation systems shall be subject to the following additional provisions:
   - » **Systems in landscape strips less than five feet in width shall be designed to ensure that overspray and/or runoff does not occur by use of system design options such as low volume emitters.**
   - » Systems shall be designed to be consistent with the requirements of the hydrozone in which they are located. **Separate valves shall be used to irrigate plants with differing water needs**
   - » **Systems shall be designed with the minimum average irrigation efficiency of 0.625.**
   - » The use of automatic shutoff or override capabilities using rain shutoffs or moisture sensors is encouraged.
   - » Systems shall utilize a central control valve connected to an automatic controller.
   - » Systems shall make provisions for winterization either by providing:
     - manual drains (automatic drain valves are not permitted at all low points), or
     - means to blow out lines with pressurized air.
   - » **Sprinkler heads with matched precipitation rates shall be selected for proper area coverage, operating pressure, and adjustment capability.**
   - » All irrigation systems must have, at a minimum, a rain/freeze sensor installed.
5. The Irrigation Plan design shall be certified by an Irrigation Association (IA)-certified designer or a registered Landscape Architect or professional engineer with irrigation design experience. The Plan shall be drawn on the same base project map at the scale as the Landscape Plan and clearly identify:
   - » Location and size of separate water meter(s) for the landscape.
   - » The static water pressure in pounds per square inch (p.s.i.), at the point of connection to the public water

supply (or to a water well where applicable).

- Total landscape water demand, effective rainfall, watering window, assumed irrigation system efficiency, and system operation constraints.
- Layout of the irrigation system, (i.e. backflow prevention device, pump, pressure regulator, automatic controller, main and lateral lines, valves, sprinklers, bubblers, drip emitters, quick couplers, and filters where applicable).
- A legend containing a general description of all components of the irrigation system, including: manufacturer's name and model number, operating pressure, manufacturer's irrigation nozzle rating in gallons per minute (g.p.m.) or gallons per hour (g.p.h.), as necessary, spray radius, and calculated precipitation rate per nozzle, based on the Irrigation Design Plan.
- A critical zone pressure calculation indicating the highest pressure demand to assure adequate operating pressure.
- A valve chart indicating flow rate (in gallons per minute) and design operating pressure, (p.s.i). for each valve, and precipitation rates in inches per hour.
- Installation specifications and details for workmanship and installation of irrigation components and requirements for owner/operator training.
- **A calculation of the estimated applied irrigation water to establish the landscape.**
- **A calculation of the estimated applied irrigation water for the landscape at maturity.**

6. The irrigation system must be audited and accepted at the completion of installation by an IA-certified irrigation auditor.

3.4 QUALIFICATIONS TO PREPARE LANDSCAPE AND IRRIGATION DOCUMENTATION

The local jurisdiction should determine who is qualified to prepare landscape and irrigation plans. It is recommended that landscape plans be prepared by a licensed landscape architect, licensed/certified landscape contractor, or any other person authorized to design a landscape.

EXAMPLE LANGUAGE

From the City of Lakewood, WA Municipal Code:

Persons Qualified to Prepare Landscape Plans. The landscape plans shall be prepared by a Washington state registered landscape architect, a Washington state certified nurseryman, or a Washington state certified landscaper, except that planting plans for short plats may be prepared by the applicant, subject to approval by the Community Development Director.

Persons Qualified to Prepare Irrigation Plans. The irrigation plan shall be prepared by a Washington State registered landscape architect or an Irrigation Association Certified Irrigation Designer, except that irrigation plans for short plats may be prepared by the applicant.

4 LANDSCAPE DESIGN CRITERIA

This section includes a range of landscape design criteria an adopting jurisdiction may consider as a way of achieving a goal for landscape design. Examples include lists of approved plant species, spacing, quantity, minimum landscape areas, etc. The adopting jurisdiction may already have adopted landscape design criteria. As a part of adopting water efficient landscape standards, the adopting jurisdiction should review their existing codes to identify where existing provisions can be enhanced by water efficient landscape requirements (such as requiring drought tolerant plants).

4.1 LANDSCAPE DESIGN PACKAGE

A Landscape Design Plan meeting the following requirements must be submitted as part of the Irrigation and Landscape Documentation Package.

EXAMPLE LANGUAGE

1. Planting design must be consistent with all requirements of current landscape codes (existing facilities of pre-existing landscaped areas are not subject to landscape code requirements unless the landscape was installed after the effective date of the (jurisdiction/department) landscape ordinance(s), except in areas where there has been a major renovation or expansion to the landscape areas).
2. Plant Selection - Plants must be selected from the approved Drought Tolerant/Low Water Use Plant list.
3. Plants that are not on the approved Drought Tolerant/ Low Water Use Plant list, or that require spray irrigation cannot be used in street medians or public rights of way.
4. Plants having similar water use must be grouped together in distinct hydrozones. Consideration must also be given to variations in: exposure (e.g. microclimates); slope; and soil infiltration rates when determining hydrozones.

5. Plants must be selected appropriately based upon their adaptability to the climatic, geologic, and topographical conditions of the site.
6. Landscaping associated with storm drainage facilities shall be integrated into the overall design of the project.

7. For projects located at the interface between urban areas and natural open space (non-irrigated), Drought Tolerant/Low Water Use plants shall be selected that will blend with the native vegetation and are fire resistant or fire retardant. Plants with low fuel volume or high moisture content shall be emphasized. Plants that tend to accumulate excessive amount of dead wood or debris shall be avoided.
8. A mulch (organic or inorganic) of at least three inches must be applied to all planting areas except turf. Placing non-porous material under the mulch is not allowed.

4.2 MAINTENANCE

A maintenance schedule should be submitted as part of the required landscape documentation package. Regular maintenance of installed landscapes should include reviewing irrigation systems for water efficiency.

EXAMPLE LANGUAGE

A regular maintenance schedule satisfying the following conditions must be submitted as part of the Irrigation and Landscape Documentation Package:

1. Maintenance must consist of regular watering, pruning, fertilizing, clearing of debris and weeds, the removal and replacement of dead plants, aerating and de-thatching turf areas; replenishing mulch in all landscaped areas and the repair of architectural features.
2. Pruning and thinning of foliage should not be done during hot months since it can increase plant water requirements (i.e. shading of the ground creates microclimates and reduces ETO rates.)
3. Landscapes must be maintained to ensure water efficiency, which must include but is not limited to regularly checking, adjusting, repairing and replacing of irrigation equipment. This is particularly important because irrigation scheduling occurs at a time that the system operation is not routinely observed.
   - » Schedules should include cleaning of filters and strainers, flushing of drip irrigation lines, adjusting sprinkler patterns to maintain uniformity, and calibrating all sensing and recording equipment.
   - » Repair or replacement of irrigation equipment should be done with the originally specified materials or their equivalents in order to meet the original specifications in the approved Irrigation Design Plan.
4. Monthly irrigation meter reading to check the landscape water use and necessary adjustment of the automatic controller. In addition, the battery and fuse in the controller should be checked and replaced when necessary.
5. Annual backflow assembly testing (test reports are required by the water purveyor).
6. Maintenance Assurances: The final approval of any subdivision plat or development plan that includes an approved final Landscaping Design Plan will require covenants or assurances that:
   - » Ensure the continued maintenance of required landscaping, buffering and associated irrigation systems; and
   - » Assign the responsibility of maintenance to the property owner or agent, homeowners' association or other liable entity.

5 IRRIGATION DESIGN CRITERIA

This section includes irrigation design criteria for reducing irrigation water use. The standards should be reviewed to ensure compatibility with the water purveyor's existing water system (i.e. requiring a separate meter and backflow prevention device). Similar to the above provisions for landscape design, this section should be reviewed where a local jurisdiction has existing irrigation standards to identify where they may conflict with water efficient irrigation requirements.

Two methods exist for regulators to control irrigation water efficiency: Distribution Uniformity and Water Budget Allowance. The first method targets the design of the system directly through regulation of the Distribution Uniformity of the system.

5.1 DISTRIBUTION UNIFORMITY

Distribution Uniformity (DU) is a measure of how evenly water is applied across a landscape during irrigation. For example, if one inch of water is applied in one part of a lawn and only half an inch is applied in another part of the lawn, this is considered poor DU. DU is expressed as a percentage between 0 and 100%, although it is virtually impossible to attain 100% in practice. DUs of less than 50% are considered poor, DUs of 60 - 74% are good, and DUs greater than 75% are excellent. Poor DU means that either too much water is applied, costing unnecessary waste, or too little water is applied, causing stress to plants.

If an irrigation system is 50% efficient (common for most systems) it will take twice as much water to keep a lawn looking green and healthy.

DU%	PLANT WATER NEEDS	÷	DU DECIMAL	=	AMOUNT OF WATER NEEDED TO KEEP DRY AREAS GREEN
30%	1 INCH	÷	0.3	=	3.33 INCHES
50%	1 INCH	÷	0.5	=	2.00 INCHES
70%	1 INCH	÷	0.7	=	1.42 INCHES

EXCELLENT (ACHIEVABLE)	GOOD (EXPECTED)	POOR (COMMON)
75%	**60%**	**50%**

Examples of public facilities from Idaho to Washington that illustrate how poor DU and poor system design looks in the field across the landscape. This is observable by the numerous dry spots and "green doughnuts". Most irrigation managers and homeowners adjust watering times to cater to the dry spots. Regardless of how much water is applied or how much you increase in run times, these dry spots will never improve because the system isn't spraying head-to-head.

Coeur d'Alene , ID

Liberty Lake, WA

Spokane Valley, WA

IRRIGATION AUDIT

Jurisdictions should consider requiring irrigation systems be designed to a high distribution uniformity. Designers will be forced to create water-efficient designs, but this will then be confirmed after construction with a certified irrigation audit. The audit is a process where the system is turned on and water is captured in measuring devices to calculate uniformity.

A catch can test is used to determine how long to run an irrigation system and how well the water is distributed over the landscape.

EXAMPLE LANGUAGE

An in-depth evaluation of the performance of an irrigation system shall be conducted by a certified landscape irrigation auditor. An irrigation audit includes, but is not limited to: inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted in a manner consistent with the Irrigation Association's Landscape Irrigation Auditor Certification program or other U.S. Environmental Protection Agency "WaterSense" labeled auditing programs.

Sprinkler heads shall be selected based on a distribution uniformity low quarter of 0.65 or higher using the protocol defined in American Society of Agricultural and Biological Engineers'/International Code Council's (ASABE/ICC) 802-2014 "Landscaped Irrigation Sprinkler and Emitter Standard.

The proposed Florida irrigation code, and City of Allen, Texas irrigation plan checklist included in the appendices include additional examples.

5.2 WATER BUDGET ALLOWANCE

A Water Budget Allowance is a tool that allows regulators to verify water efficient measures are being employed during design. Calculations compare a baseline design, typically the entire site in turf with inefficient irrigation, and an efficient design. The water budget is established as an allowable percentage of the baseline design or a required amount of water savings.

To provide for efficient use of water, a water budget and irrigation schedule should be developed and managed to utilize the minimum amount of water required to maintain plant health. The water efficient irrigation and landscape ordinance should include requirements for irrigation to be regulated by automatic irrigation controllers and, at a minimum, rain sensor overrides should be provided to ensure irrigation is delayed during and immediately following rain events. The water efficient irrigation and landscape ordinance may establish allowable hours for irrigation, with irrigation scheduled for the evening hours when evaporation and evapotranspiration are minimized. The local jurisdiction should limit scheduled irrigation during the day, and may consider appropriate time limitations (in the range of 7:00pm – 10:00am). Exceptions may be permitted for performing audits of irrigation systems. It should be noted that switching to night-time watering typically results in at least 10% water savings so runtimes should be reduced accordingly.

5.2 WATER BUDGET ALLOWANCE (continued)

Irrigation schedules should provide parameters for the irrigation controller to be applied during the following:

- The plant establishment period.
- The established landscape.
- Temporarily irrigated areas.

The local jurisdiction should also require the following information to be submitted within an irrigation schedule:

- Irrigation interval (days between irrigation).
- Irrigation run times (hours or minutes per irrigation event to avoid runoff).
- Number of cycle starts required for each irrigation event to avoid runoff.
- Amount of applied water scheduled to be adjusted on a monthly basis.
- Application rate settings for:
  - » root depth
  - » plant type
  - » soil type
  - » slope factor
  - » shade factor
  - » irrigation uniformity or efficiency

EXAMPLE LANGUAGE

Irrigation Water Budgets and Schedules satisfying the following conditions must be submitted as part of the Irrigation and Landscape Documentation Package:

1. A water budget analysis based on one of the following calculation methods:
   - » Appendix B - Landscape Water Budget. Landscape Irrigation Best Management Practices. The Irrigation Association and American Society of Irrigation Consultants, May 2014.
   - » WaterSense Water Budget Tool. United States Environmental Protection Agency.
   - » Landscape water features shall not use potable water unless the water feature recirculates water used in its operation.
   - » The irrigation water use may be monitored by the water purveyor after the date of release of the performance bond.
   - » Alternative water sources such as recycled wastewater or rainwater are encouraged as permitted by the Department of Ecology. Such water sources shall not be subject to the limits of the water budget.
2. An annual irrigation program with monthly irrigation schedules, are required for:
   - » The plant establishment period.
   - » The established landscape.
   - » Any temporarily irrigated areas.
   - » A schedule for weaning water requirement plants from irrigation.
3. The irrigation schedule must:
   - » Be included on the Irrigation Design Plan as well as in the Irrigation and Landscape Documentation Package.
   - » Include run time (in minutes per cycle), number of cycles per day, frequency of irrigation for each station (weekly/monthly) and maximum operating hours per day for peak demand.
   - » Program valves for multiple repeat cycles shall be required where necessary to reduce runoff, particularly on slopes and soils with slow infiltration rates.
   - » Provide the amount of applied water (in hundred cubic feet, gallons, or in whatever billing units the local water supplier uses) recommended on a monthly and annual basis.
4. Whenever possible, irrigation scheduling will incorporate the use of evapotranspiration data such as those from the AgriMet weather stations to apply the appropriate levels of water for different climates.
5. Sprinkler irrigation will be scheduled between the hours of 7 p.m. - 10 a.m. to avoid irrigating during times of high temperature. Avoid irrigating during winds greater than 20 mph. Both practices will reduce losses due to evaporation.

EXAMPLE LANGUAGE

Language from the Sammamish, WA Municipal Code offers a terrific example of how water efficiency can be required. Sammamish provides calculations and standard budgeting values within their code to simplify review.

Water use – Irrigation water budget calculated.

1. The water budget (WB) allocation shall be calculated using the following formula:
   - » WB = (ETO) x (AF) x (LA) x (CF)
   - » ETO: Referenced evapotranspiration rate (net seasonal irrigation requirement in inches; see table below)
   - » AF: Adjustment factor value of 0.8 (i.e., 0.5 x (ETO)/0.625 irrigation efficiency coefficient)
   - » LA: Landscape area (square feet)
   - » CF: Conversion factor value of 0.62 (ETO inches to gallons per square foot)

	Monthly Net Irrigation Requirement (inches)
January	.00
February	.00
March	.00
April	.00
May	1.59
June	3.13
July	4.46
August	3.51
September	1.77
October	.03
November	.00
December	.00
Season Total	***14.49***

**These figures are based on a 30-year average of National Weather Service Data and represent the amount of additional irrigation required for turf grass. The figures are adjusted for turf typically used in commercial landscaping.*

2. The City shall periodically undertake an evaluation of the WB calculation (formula shown above). The evaluation shall include a recommendation to retain or modify the adjustment factor or components thereof, and shall be made in consultation with groups including landscape professionals and water purveyors.
3. The water budget will be calculated upon the total area of the site in landscape areas and in landscape water features (such as decorative ponds, pools or fountains) that are fed by irrigation water. For the purpose of calculating the water budget, "landscape area" shall mean the entire parcel, less:
   - » Sensitive areas and their buffers;
   - » The building footprint;
   - » Driveways;
   - » Paved portions of parking lots; and
   - » Hardscapes (e.g., decks, patios, sidewalks, and other nonporous areas).
4. Areas such as playgrounds, sport fields, golf courses, school yards, or other recreational spaces where the turf provides a playing surface or serves other recreational purposes may be allowed additional water beyond the calculated water budget. In order to receive additional water for such turf areas, the applicant shall submit a statement designating such turf areas for recreational purposes and specifying additional water needs above the water budget. This additional water need will be based upon the ETO information for the turf grass species or species mix used in such turf areas.
5. Landscape water features shall not use potable water unless the water feature recirculates water used in its operation.
6. The irrigation water use may be monitored by the water purveyor after the date of release of the performance bond.
7. Alternative water sources such as [reclaimed] water or rainwater are encouraged as permitted by the Department of Ecology. Such water sources shall not be subject to the limits of the water budget.

5.3 MAINTENANCE

Irrigation systems should be regularly inspected and maintained. Consider the language below from the City of Sammamish, Washington.

EXAMPLE LANGUAGE

Irrigation systems shall be maintained and inspected annually to assure proper functioning and compliance with the calculated water budget for the system. Replacement of components shall be of originally specified parts or materials, or their equivalents.

6 ADDITIONAL CRITERIA

6.1 GRADING DESIGN PLAN

A grading plan is likely already required for construction permits to review site grading and drainage patterns for opportunities to reduce runoff. These plans should be reviewed in conjunction with the irrigation and landscape design standards to ensure consistency. In the event a grading plan is not already required for a type of permit application, the following language may be adopted.

A Grading Design Plan, if required, satisfying the following conditions must be submitted as part of the Irrigation and Landscape Documentation Package:

1. A Grading Design Plan must be drawn on project base sheets. It must be separate from, but use the same format as, the Landscape Design Plan and Irrigation Design Plan.
2. The plan must indicate finished configurations (pre-existing and new contour elevations) of the landscaped area(s), including the height of graded slopes, drainage patterns, pad elevations, and finish grade.
3. Erosion and sediment control measures and features.
   - » All temporary stormwater barriers and siltation fences shall be maintained in a satisfactory condition by the owner of the property, or his/her agents or contractors, until such time that grading and/or construction is completed.

6.2 SOIL ANALYSIS

A soil analysis may be required to assist in identifying appropriate plant species that minimize the need for artificial irrigation.

EXAMPLE LANGUAGE

The Irrigation and Landscape Documentation Package must include the following soil analysis data:

4. Determination of soil texture, indicating the percentage of organic matter.
5. An approximate soil infiltration rate (either measured or derived from soil texture/infiltration rate tables). A range of infiltration rates will be noted where appropriate.

6.3 RECLAIMED WATER USE

The adopting jurisdiction should consider requiring the use of reclaimed or recycled water for plantings within the public right-of-way (such as medians and planting strips). Other landscapes such as parks, golf courses, and other facilities, may also be required to use reclaimed water or other non-potable water supplies for irrigation. Consider including statements encouraging the use of reclaimed water for private landscapes.

DEFINITIONS 7

Adapted Plant: Adapted plants are not native and not invasive but are able to thrive in the local climate and soil conditions. These plants may be native to other regions of the United States, or have been imported from other continents.

Backflow Prevention Device: A backflow prevention device is used to protect potable water supplies from contamination or pollution due to backflow conditions. In water supply systems, water is normally maintained at a significant pressure to enable water to flow from the meter to the sprinkler head. In a backflow condition, higher pressure on the sprinkler side can push contaminated water into the potable water system.

Distribution Uniformity (D.U.): The measure of the uniformity of irrigation applied across a defined area.

Drip Emitter/Drip Irrigation: Drip irrigation fittings that deliver water slowly at the root zone of the plant, usually measured in gallons per hour.

Drought Tolerant Plant: Plants that have relatively low water requirements, or plants that are well adapted to an arid climate are often described as drought resistant or drought tolerant. Drought tolerant plants are considered adapted or native and able to survive on a region's natural rainfall with very little supplemental irrigation.

Evapotranspiration (ET): The quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time, expressed in inches per day, month or year.

Hydrozone: A portion of the landscaped area having plants with similar water needs, areas with similar microclimate (i.e. slope, exposure, wind, etc.) and soil conditions, and areas that will be similarly irrigated. A landscape hydrozone can be served by one irrigation valve, or a set of valves with the same schedule. A landscape plan prepared with water efficient landscaping in mind should group plantings by hydrozone to minimize irrigation needs. Landscape design plans should prioritize the use of native plant species, and minimize site disturbance where appropriate.

Infiltration Rate: The infiltration rate is the speed at which water enters into the soil. It is usually measured by the depth (in inches) of the water layer that can enter the soil in one hour. An infiltration rate of 1.0 in/hour means that a water layer 1 inch deep on the soil surface will take one hour to infiltrate.

Irrigation Efficiency: The measurement of the amount of water beneficially applied, divided by the total amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system hardware characteristics and management practices.

Irrigation Contractor: A person who has been certified by the Irrigation Association (IA) to install irrigation systems.

Irrigation Designer: A person who has been certified by the IA to prepare irrigation system designs, and/or a Landscape Architect.

Landscape Architect: A person who holds a certificate to practice landscape architecture in the state of Washington/Idaho.

Landscape Irrigation Auditor: A person who has been certified by the IA to conduct a landscape irrigation audit.

Matched Precipitation Rate (MPR): A term used to indicate that the amount of precipitation from sprinklers with MPR in a given area is uniform. MPR sprinklers allow water conservation by limiting dry spots.

Microclimate: The climate of a very small or restricted area, especially when this significantly differs from the climate of the surrounding area. Shaded north sides of buildings have a microclimate compared to areas further from the building that receive more sunlight.

Native Plant: Native plants are defined as the species that exist in a region without human introduction. Native plants in the Spokane region range from desert to alpine environments.

Precipitation Rate: The depth of water applied to a given area, usually measured in inches per hour.

Plant Water Requirement: The depth (or amount) of water needed to meet a plant's water loss through evapotranspiration. In other words, it is the amount of water needed by the various plants to grow optimally.

Rain Shut-Off Device: A device wired to the automatic controller that shuts off the irrigation system when it rains.

Reference Evapotranspiration Rate or ETO: A standard measurement of environmental parameters that affect the water use of plants. ETO is expressed in inches per day, month or year and is an estimate of the evapotranspiration of a large field of cool season grass, 4-7" tall, that is well watered.

Runtime: The length of time an irrigation zone needs to water a given area.

Root Zone: In irrigation terms, the depth and spread of a plant's root system.

Soils Report: A report by a soils laboratory indicating soil type(s), soil depth, uniformity, composition, bulk density, infiltration rates, and pH for the topsoil and subsoil for a given site. The soils report also includes recommendations for soil amendments.

Soil Water Holding Capacity: The amount of water that a given soil can hold for plant use. Excess water will infiltrate below the plant root zone and become unusable.

Water Budget Allowance: A water budget is a water management tool used to estimate the amount of water a landscape will require. The water budget takes into account reference evapotranspiration data, plant type(s), purpose and functionality of the landscape, irrigated landscape area, irrigation efficiency, water quality, and rainfall.

8 LIST OF APPENDICES AVAILABLE ONLINE

Complete appendix can be found online at: iwac.us

Directly at: iwac.us/wp-content/uploads/2019/09/Guideline-Irrigation-and-Landscape-Design-Standards-appendicies.pdf

APPENDIX:

- ❒ 7.1 LITERATURE REVIEW BY AHBL
- ❒ 7.2 IRRIGATION ASSOCIATION: IRRIGATION BEST MANAGEMENT PRACTICES
- ❒ 7.3 RAIN BIRD'S GUIDE TO: CALIFORNIA CODE OF REGULATIONS CHAPTER 2.7: MODEL WATER EFFICIENT LANDSCAPE ORDINANCE
- ❒ 7.4 FLORIDA BUILDING CODE: APPENDIX F – PROPOSED CONSTRUCTION BUILDING CODES FOR TURF AND LANDSCAPE IRRIGATION SYSTEMS
- ❒ 7.5 CITY OF ALLEN, TEXAS: IRRIGATION PLAN REVIEW CHECKLIST

IWAC
IDAHO WASHINGTON AQUIFER COLLABORATIVE

NOTES

OUR WATER. OUR FUTURE.

OUR MEMBERS:

REGIONAL COLLABORATION MAINTAINING AND ENHANCING WATER QUALITY AND QUANTITY FOR PRESENT AND FUTURE GENERATIONS

Protect and enjoy our most precious resource – clean water.

Together we can improve water quality in our lakes, rivers, ground and drinking water.

Efficient water use and conservation is good for our environment and economy.

Education and awareness are essential to protecting and preserving our waters.

IDAHO WASHINGTON AQUIFER COLLABORATIVE

www.iwac.us | info@iwac.us