Fact Sheet

for the

Irrigation System Aquatic Weed Control
National Pollutant Discharge Elimination System (NPDES)
and State Waste Discharge General Permit

(Permit Number WAG – 991000)

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

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Summary

This fact sheet is a companion document to the National Pollutant Discharge Elimination System (NPDES) ***General permit*** for the application of pesticides to control aquatic weeds in irrigation water conveyance systems. It explains the nature of the proposed ***discharge***, the Washington State Department of Ecology's (Ecology) decisions on limiting ***pollutants*** in the receiving water, and the regulatory and technical basis for these decisions.

The Washington State Department of Ecology (Ecology) proposes to reissue a general permit for the application of pesticides to control aquatic weeds in irrigation water conveyance systems. Monitoring is required in certain circumstances. Any short term toxicity to aquatic organisms is allowed under the terms of the permit and the water quality modification provisions to perform essential activities that promote effective water delivery.

The proposed permit does not authorize a violation of the surface water quality standards, or any other applicable state or federal regulations. Ecology may require any person seeking coverage under this permit to obtain coverage under an individual permit instead. Any application of pesticide to surface waters of the state requiring NPDES permit coverage found not covered under either the general permit or an individual permit may be considered to be operating without a discharge permit and subject to potential enforcement action.

Since the *Headwaters, Inc. v. Talent Irrigation District* Ninth Circuit Court decision, Ecology has maintained that to discharge chemicals to waters of the state, coverage under an NPDES permit is required. Ecology has issued general and individual NPDES permits for discharges of aquatic pesticides and other chemicals since 2002. The Sixth Circuit Court recently ruled in *National Cotton Council et al. v. The Environmental Protection Agency (EPA)* that the discharge of pesticides and their residues to waters of the state requires NPDES coverage. This decision means that NPDES permitting is now required for all aquatic pesticide applications throughout the United States. EPA has developed a draft general NPDES permit for this purpose and the EPA permit will become effective October 2011. In Washington, the EPA permit will cover aquatic pesticide applications on federal and Tribal Lands.

Ecology may change the proposed terms, limits, and conditions contained in the draft permit, subsequent to written public comments it receives and testimony provided at public hearings. The draft permit does not authorize a violation of surface water quality standards or the violation of any other applicable local, state, or federal laws or regulations. Ecology may require any person seeking coverage under this permit to obtain coverage under an ***individual permit*** instead. Ecology will consider any person who applies chemicals to surface waters of the state without coverage under this general permit, another applicable general permit, an applicable individual permit, or a ***state experimental use permit*** to be operating without a discharge permit and subject to potential enforcement action.

Ecology proposes to issue this general permit so that dischargers operating under coverage of this permit will comply with the ***Federal Clean Water Act*** and with the Washington Water Pollution Act chapter 90.48.080 Revised Code of Washington (RCW).

Introduction

This fact sheet is a companion document to the draft revised Irrigation System Aquatic Weed Control General Permit (permit) and provides the legal and technical basis for permit reissuance, required in Washington Administrative Code (WAC 173-226-110). Since 2001, and based on *Headwaters v. Talent Irrigation District*, the Washington State Department of Ecology (Ecology) has maintained that the discharge of pesticides to waters of the state requires coverage under a National Pollutant Discharge Elimination System (NPDES) permit.

Ecology issued the current permit in February 2008 and modified it in March 2010. The permit expires in February 2013. Ecology received a request to modify the permit to increase the allowed concentrations of endothall (described in detail in a later section of this fact sheet). Ecology decided to reissue the permit prior to the expiration date for efficiency because the steps Ecology needs to take are similar for both permit modification and permit reissuance. Since Ecology is renewing the permit early, the effective date of the new permit will occur prior to the February 2013 expiration date, which will no longer apply.

Ecology determined it was appropriate to issue a general permit for irrigation system aquatic weed control because of the similar environmental fate of each permitted pesticide, the uniform discharge conditions of all pesticide applications, the statewide scope of irrigation system aquatic weed control, and the significant reduction of resources necessary for permit handling.

Ecology may still require individual permits where a proposed activity requires additional guidance, or when an individual Permittee requests an individual permit and Ecology agrees to develop and issue one.

This permit helps Ecology:

- Mitigate and condition the use of chemicals that may enter the aquatic environment.
- Track pesticide rates and use locations.
- Ensure that notifications and postings occur in areas where the public or local residents may access the treated areas.

This fact sheet explains the nature of the proposed discharges, Ecology's decisions on limiting the pollutants in the receiving water, and the regulatory and technical basis for these decisions. WAC 173-226-130 specifies public notice of the draft permit, public hearings, comment periods, and public notice of issuance before Ecology can issue the general permit. This fact sheet, application for coverage, and draft permit are available for review (see Appendix A - Public Involvement - for more detail on public notice procedures).

After the public comment period closes, Ecology will summarize and respond to substantive comments. These comments may cause Ecology to revise some of the permit language and requirements. The summary and response to comments will become part of the file for this permit and parties submitting comments will receive a copy of Ecology's response. Ecology will **not** revise the original fact sheet after it publishes the public notice. Appendix F (Response to Comments) will summarize comments and the resultant changes to the permit.

The text of this fact sheet contains words or phrases, which are formatted in ***bold and italics*** when first used in the document. These words or phrases are defined in Appendix C.

Aquatic Pesticide Legal History

The Federal Clean Water Act (CWA)

The Federal Clean Water Act [CWA, 1972, and later modifications (1977, 1981, and 1987)], established water quality goals for navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the NPDES system of permits, which the United States Environmental Protection Agency (EPA) administers. The EPA has delegated responsibility for administering the NPDES permit program to the state of Washington. EPA delegated authority to Ecology based on Chapter 90.48 RCW that defines Ecology's authority and obligations in administering the NPDES permit program. Ecology does not have the authority to issue NPDES permits to federal facilities or to facilities on Tribal Lands.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The following excerpt is from the EPA 2010 NPDES Pesticides General Permit Fact Sheet:

> *EPA regulates the sale, distribution, and use of pesticides in the U.S. under the statutory framework of the Federal Insecticide, Fungicide, and Rodenticide Act of 1979, to ensure that when used in conformance with the label, pesticides will not pose unreasonable risks to human health and the environment. All new pesticides must undergo a registration procedure under FIFRA during which EPA assesses a variety of potential human health and environmental effects associated with use of the product. Under FIFRA, EPA is required to consider the effects of pesticides on the environment by determining, among other things, whether a pesticide will perform its intended function without unreasonable adverse effects on the environment, and whether when used in accordance with widespread and commonly recognized practice [the pesticide] will not generally cause unreasonable adverse effects on the environment. 7 U.S.C. 136a(c)(5).*
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> *In performing this analysis, EPA examines the ingredients of a pesticide, the intended type of application site and directions for use, and supporting scientific studies for human health and environmental effects and exposures. The applicant for registration of the pesticide must provide specific data from tests done according to EPA guidelines.*
>
> *When EPA approves a pesticide for a particular use, the Agency imposes restrictions through labeling requirements governing such use. The restrictions are intended to ensure that the pesticide serves an intended purpose and avoids unreasonable adverse effects. It is illegal under Section 12(a)(2)(G) of FIFRA to use a registered pesticide in a manner inconsistent with its labeling. States have primary authority under FIFRA to enforce "use" violations, but both the States and EPA have ample authority to prosecute pesticide misuse when it occurs.*
>
> *After a pesticide has been registered, changes in science, public policy, and pesticide use practices will occur over time. FIFRA, as amended by the Food Quality Protection Act of 1996, mandates a registration review program, under which [EPA] periodically reevaluates pesticides to make sure that as the ability to assess risk evolves and as policies and practices change, all*

registered pesticides continue to meet the statutory standard of no unreasonable adverse effects to human health or the environment. [EPA] is implementing the registration review program pursuant to Section 3(g) of FIFRA and will review each registered pesticide every 15 years to determine whether it continues to meet the FIFRA standard for registration. Information on this program is provided at http://www.epa.gov/oppsrrd1/registration_review/.

FIFRA, as administered by the EPA and the Washington State Department of Agriculture (WSDA), requires that all persons that apply pesticides classified as restricted use be certified according to the provisions of the act, or that they work under the direct supervision of a certified ***applicator***. Commercial and public applicators must demonstrate a practical knowledge of the principles and practices of pest control and safe use of pesticides, which they accomplish by means of a "core" examination. In addition, applicators using or supervising the use of any restricted use pesticides purposefully applied to standing or running water (excluding applicators engaged in public health related activities) must pass an additional exam to demonstrate competency as described in the code of federal regulations as follows:

Aquatic applicators shall demonstrate practical knowledge of the secondary effects which can be caused by improper application rates, incorrect formulations, and faulty application of restricted pesticides used in this category. They shall demonstrate practical knowledge of various water use situations and the potential of downstream effects. Further, they must have practical knowledge concerning potential pesticide effects on plants, fish, birds, beneficial insects, and other organisms which may be present in aquatic environments. Applicants in this category must demonstrate practical knowledge of the principals of limited area application (40 CFR 171.4).

Any person wishing to apply pesticides to waters of the state must obtain an aquatic pesticide applicator license from the Washington State Department of Agriculture, or operate under the supervision of a licensed applicator. See http://agr.wa.gov/PestFert/LicensingEd/Licensing.aspx for information on Washington State licensing requirements and testing.

Headwaters, Inc. v. Talent Irrigation District

In May 1996, as part of routine vegetation management, the Talent Irrigation District (TID) in southern Oregon applied the pesticide acrolein to a system of irrigation canals. Acrolein-treated water discharged into a fish-bearing creek causing a fish kill. Subsequently, Headwaters, Inc. and Oregon Natural Resources Council filed a Clean Water Act citizen suit against the TID for applying a pesticide into a system of irrigation canals without an NPDES permit.

The Ninth Circuit Court in *Headwaters, Inc. v. Talent Irrigation District* found that the applicator should have obtained coverage under an NPDES permit prior to application of aquatic pesticides to an irrigation canal. The decision addressed residues and other products of aquatic pesticides.

Reversing a district court's opinion, the Ninth Circuit Court held that application of the pesticide in compliance with the FIFRA labeling requirements did not exempt TID from having to obtain an NPDES permit and that the irrigation ditches were "waters of the United States" under the CWA (March 12, 2001).

Based on the TID court decision, Ecology determined that all pesticide applications to state surface waters required coverage under NPDES permits. Ecology issued its first NPDES general permits

for pesticide applications to Washington's surface waters in 2002. Prior to 2001, Ecology regulated the application of aquatic pesticides to most surface waters by issuing administrative orders (called Short-Term Modifications of Water Quality Standards) to Washington-state licensed applicators. Since the Talent decision, there have been further court challenges about the applicability of NPDES permits to aquatic pesticide application as discussed below in this section of the fact sheet.

Fairhust v. Hagener

The Montana Department of Fish, Wildlife, and Parks (Department) began a ten-year program to reintroduce threatened native westslope cutthroat trout into Cherry Creek. The Department used antimycin-A, a piscicide, to remove nonnative trout from Cherry Creek over several years, after which they planned to reintroduce native trout.

The Department was sued under the citizen suit provision of the CWA for failing to obtain an NPDES permit before applying antimycin-A to surface waters. During summary judgment, the district court decided in favor of the Department. On appeal, the Ninth Circuit court affirmed the district court's opinion. The Ninth Circuit opined that:

> *A chemical pesticide applied intentionally, in accordance with a FIFRA label, and with no residue or unintended effect is not "waste", and thus not a "pollutant" for the purposes of the Clean Water Act. Because the Department's application of antimycin-A to Cherry Creek was intentional, FIFRA compliant, and without residue or unintended effect, the discharged chemical was not a pollutant and the Department was not required to obtain a NPDES permit*.

Neither the Court nor the EPA offered any guidance regarding which pesticide applications would result in no residue or unintended effect.

Northwest Aquatic Ecosystems v. Ecology, Washington Toxics Coalition

In February 2006, the Pollution Control Hearings Board (PCHB) issued a final order in Case #05-101, *Northwest Aquatic Ecosystems v. Ecology, Washington Toxics Coalition*. This case focused on a number of issues, one of which was whether an NPDES permit is required for the use of federally registered pesticides since the Ninth Circuit Court ruled in *Fairhurst v. Hagener*.

The PCHB ruled on summary judgment that the *Fairhurst* decision does not provide a blanket exemption for the application of aquatic pesticides. Pesticides must meet identified conditions before Ecology can consider it outside the category of a pollutant under the CWA. The pesticide must:

(1) Be applied for a beneficial purpose.
(2) Be applied in compliance with FIFRA.
(3) Produce no pesticide residue.
(4) Produce no unintended effects (Fairhurst, 422 F.3d at 1150).

Northwest Aquatic Ecosystems failed to provide any evidence specifically addressing how the use of the aquatic herbicides diquat and endothall on the proposed sites would meet the four conditions identified in *Fairhurst.* In the absence of such evidence, *Fairhurst* provided no basis for the PCHB to conclude that an NPDES permit is not required for the proposed pesticide applications.

EPA final rule

In November 2006, EPA issued a final rule under the CWA entitled *Application of Pesticides to Waters of the United States in Accordance with FIFRA.* This rule replaced a draft interpretive statement EPA issued in 2003 concerning the use of pesticides in or around waters of the United States. The rule states that any pesticide meant for use in or near water, applied in accordance with the FIFRA label, is not a pollutant under the CWA. Therefore, such applications are not subject to NPDES permitting.

After EPA issued the rule, Ecology met with stakeholders to seek input on how it should regulate the use of aquatic pesticides. Ecology also provided the public with a three-week comment period. Stakeholders affiliated with each of the seven affected permits (Mosquito, Noxious Weeds, Aquatic Plant and Algae, Irrigation, Oyster Growers, Fish Management, and Invasive Moth) commented. The consensus of these stakeholders was that Ecology should continue to issue joint NPDES/state waste permits to regulate aquatic pesticide applications.

To apply a pesticide to the water, state law requires the applicator to obtain a short-term modification of the water quality standards from Ecology. Ecology issued short-term modifications using an administrative order until 2001, when this process was challenged. Currently, the only legal vehicle for implementing a short-term modification is a permit. State law defines only two types of permits for surface water discharges: NPDES (federal) and State Waste Discharge (state).

National Cotton Council et al. v. EPA

In November 2006, EPA issued a final rule under the CWA that determined that pesticides applied in accordance with the FIFRA label are exempt from NPDES permitting requirements. Petitioners filed for review of EPA's final rule in 11 of the 12 federal circuit courts that are able to hear regulatory arguments. The federal courts combined the petitions into one case within the Sixth Circuit Court.

The Sixth Circuit Court made several findings. First, it agreed with the Ninth Circuit (*Fairhurst v. Hagener*) that if a chemical pesticide is intentionally applied to water for a beneficial purpose, and leaves no waste or residue after performing its intended purpose, the discharge would not require an NPDES permit.

Second, the Court found excess pesticides and residues that make their way into waters during and after any pesticide application constitute wastes under the CWA and must have NPDES permit coverage before discharge occurs.

Finally, the Sixth Court determined that because EPA's final rule exempted discharges that the plain reading of the CWA includes as requiring an NPDES permit, the rule could not stand.

After a later motion, the Sixth Circuit granted EPA a stay on the effective date of this ruling for 24 months to allow the agency to develop an NPDES permit for aquatic pesticide discharges. EPA is currently developing a general permit for the discharge of pesticides to manage aquatic plants, ***invasive*** species, larval and aerial mosquito control, and other aquatic pesticide uses. EPA originally intended to issue the general permit by December 2010. EPA received a further extension from the court and issued the permit on October 31, 2011. In Washington, EPA's general permit will cover aquatic pesticide activities conducted on federal lands and Tribal lands. The state regulates aquatic pesticide application to all other lands/waters.

Background Information

1. Aquatic weed management

Aquatic weeds, such as rooted aquatic macrophytes, reduce storage capacity in reservoirs, block screens and intakes on pumps, interfere with hydroelectric production, distort canal design features (increase sedimentation, decrease channel flow, etc.), degrade recreational uses, and reduce water quality and wildlife habitat value. In general, designed capacity of irrigation canals in the West has not accounted for flow resistance caused by aquatic vegetation (Pitlo and Dawson 1993) although recent work provides the empirical basis for such design considerations (Kouwen 1992, Abdelsalam et al. 1992).

Lack of a comprehensive botanical survey and the use of common names, which can vary from district to district, limit description of the problem species in irrigation canals. From the limited botanical surveys conducted, two plants are likely to account for most of the aquatic plant problems in irrigation districts in the northwest, Sago pondweed (*Potamogeton pectinatus*) and Canadian pondweed (*Elodea canadensis*). Other non-native species, such as Brazilian elodea (*Egeria densa*), Eurasian watermilfoil (*Myriophyllum spicatum*), and Curly-leaf pondweed (*Potamogeton crispus*) also create flow blockage in irrigation systems in the state. Bartley et al. (1974) reported that Potamogeton species are the most common nuisance plants in western irrigation canals.

There are approximately 97 irrigation districts and irrigation water companies comprising of over one million acres represented by the Washington State Water Resource Association. The irrigation districts are created and regulated under Chapter 87 RCW - Irrigation District Laws and Chapter 90 - Water Laws. Irrigation water supply companies are private non-profit water suppliers. The Ellensburg Water Company, created in 1885 before irrigation law was established is an example of a private non-profit water supplier. Each irrigation district employs its own Washington State licensed applicator(s). Each licensed applicator must have an aquatic pesticides endorsement. A licensed applicator can supervise unlicensed applicators as long as they are within calling and sight distance. Numbers of applicators (licensed and unlicensed) vary according to the size of the irrigation district.

Applications can start shortly after the irrigation season begins (typically mid-March) and ends before the end of the irrigation season (late October or early November). Depending on the size of the system, needs for delivery, and environmental factors, pesticide applications can occur as often as every two weeks but usually occur once a month. Some of the smaller systems may only require one or two treatments per season.

Depending on the quality of the water, early in the season when light levels are lower and air and water temperatures are lower, moss and green algae growths may need treatments. As light levels and air and water temperatures increase (late May – early June), blue-green algae and aquatic plant growth rates dramatically increase.

2. Aquatic weed management methods

There are several methods to control weeds in irrigation systems. The following pesticides are the subjects of this general permit: acrolein, dipotassium salt of endothall (such as Cascade), mono (N,N-Dimethyl Alkylamine) salt of endothall (such as Teton), xylene, copper, sodium carbonate peroxyhydrate, fluridone and imazapyr. Other pesticides are not as effective or have unwanted effects outside the irrigation supply system. Other non-pesticide methods are available and also discussed in this fact sheet. The other methods include physical removal of weeds such as hand pulling, chaining, backhoe, mechanical harvesting, manipulation of water levels, sediment removal, canal lining, shading, piping, and herbivorous fish.

Acrolein

Acrolein (acrylaldehyde, 2-propenal) is an aliphatic, α,β-unsaturated aldehyde that occurs naturally as a product of combustion and as a metabolite. Acrolein is a pungent, colorless, highly volatile liquid used as a molluscicide and herbicide, as a fixative in histochemical investigations, and as an intermediate in the production of numerous chemicals and reagents, including acrylic acid and DL-methionine (an essential amino acid used to supplement poultry and cattle feed) (Ghilarducci and Tjeerdema 1995). In 1983, approximately 98 percent of all production went to the manufacture of acrylic acid and DL-methionine (Ghilarducci and Tjeerdema 1995). Approximately 54,000 tons were produced industrially in the United States in 1992 (Anonymous 1992, as cited in Ghilarducci and Tjeerdema 1995). The main source of acrolein and the principal mode of human exposure, however, is through incomplete combustion in residential fireplaces, manufacturing, photochemical oxidation of airborne hydrocarbons, and cigarette smoke. The compound is also produced naturally in metabolic processes in soils (formation of humic substances) and in food (dehydration of glycerol) (Ghilarducci and Tjeerdema 1995). In a study of human exposure to acrolein, the greatest measured concentrations in typical ambient air occurred in heating animal and vegetable cooking oils (57.6 - 103.6 mg/m^3), near automobile exhaust (0.13 to 50.6 mg/m^3), and in a coffee roasting outlet (0.59 mg/m^3) (references in Table 4 of Ghilarducci and Tjeerdema 1995).

In 2004, irrigation districts applied 38,100 gallons of acrolein to irrigation waters under the NPDES permit.

Acrolein is a cell toxicant of high reactivity. The compound is capable of spontaneous polymerization, which must be inhibited by hydroquinone. The chemical characteristics of acrolein, in particular the induced polarity caused by electronegative carbonyl oxygen atom, allows the molecule to react with nucleophilic reagents that contain sulfhydryl groups, such as free cysteine or cysteine-containing proteins. Thus, the compound can react with proteins and nucleic acids and induce cross-linkages and macromolecular rearrangements that result in tissue damage (Ghilarducci and Tjeerdema 1995).

Acrolein is highly toxic. The reported 60-day no-observable-effect-level is as low as 11.4 µg/L (WHO 1992, as cited in Ghilarducci and Tjeerdema 1995). Westerdahl and Getsinger (1988) reported that fish are killed when exposed to concentrations greater than 1 mg/L. Concentration-dependent histopathological effects on coho salmon gills, kidneys, and liver were found with exposures ranging up to 100 µg/L, and 100 percent lethality at 75 µg/L within 144 hours (Lorz et

al. 1979). To protect freshwater animals from adverse effects, USEPA recommends a water quality limit of 1.2 μg/L for a 24-hr. average and a maximum of 2.7 μg/L; to protect human health from ingestion of treated water and organisms, the maximum concentration is 6.5 μg/L (Sittig 1980). Registered use concentrations are 1-15 mg/L (Dave Blodget, Baker Petrolite, personal communication, 4 Dec. 1997). Acrolein is not carcinogenic and shows little embryotoxic and teratogenic behavior (Ghilarducci and Tjeerdema 1995)

Plants treated with acrolein become flaccid and disintegrate within a few hours of exposure. Phytotoxicity is temperature dependent (Ashton and Crafts 1973). Bartley and Gangstad (1974) reported that for aquatic plant control, acrolein is applied full strength (95%) directly to the water using metering equipment calibrated to produce a rate not greater than 15 mg/L. In larger canals, applications are often made at 0.1 mg/L over a 48-hour period. Current labels do not allow for applications over 8 hours. In smaller canals the same quantity of materials is applied over a shorter period. The amount of material used is directly related to the volume of water treated. Smaller canals use smaller volumes of chemicals. The amount used is also related to the level of weed growth. The length of time for the treatment, and hence the concentration, varies from 15 minutes to 8 hours and depends on the system conditions such as water velocity.

Acrolein is relatively non-persistent. The half-life in aquatic systems ranges from less than one to approximately four days (Callahan et al. 1979, Bowmer and Higgins 1976, WSSA 1994). The acrolein distributor, Baker Petrolite, conducted extensive field studies, including those done in support of registration. Those studies indicate a half-life in irrigation systems of six to ten hours. Volatilization is of major importance in loss from aquatic systems (Ghilarducci and Tjeerdema 1995), however, it is not the only mechanism. Another fate process is hydration. Upon hydration, β-hydroxypropionaldehyde is produced and is easily biotransformed (Reinert and Rodgers 1987). Half-life in water is not a function of the aerobic or anaerobic condition. Photolysis, hydrolysis, oxidation, and sorption are not considered significant fate processes (Callahan et al. 1979, Mabey 1981).

In irrigation systems, acrolein is applied subsurface at the upstream end of the portion of the canal being treated. The herbicidal activity is a function of the length of the treated water plug, the concentration of chemical, temperature, and flow rate. Because of its high toxicity, and short contact time, acrolein is highly efficacious in irrigation systems (Bowmer and Smith 1984). The compound is a contact herbicide, however, and repeated applications through the growing season are often required to maintain flow.

Endothall

Extensive information on endothall is available in Ecology's *Herbicide Risk Assessment for the Aquatic Plant Management Final Supplemental Environmental Impact Statement.* This document is available online at http://www.ecy.wa.gov/pubs/0010044.pdf.

Endothall (7-oxabicyclo [2,2,1] heptane-2,3-dicarboxylic acid) is the active component in aquatic herbicides and algaecides used in static and flowing water to control aquatic weeds and algae. Endothall is a contact herbicide that disrupts solute transport processes in plant cells. The mode of action of endothall is not fully understood, however, there are several hypotheses to explain endothall's activity. All of the hypotheses indicate that endothall disrupts biochemical processes at

the cellular level, such as interfering with protein synthesis by affecting dipeptidase and proteinase enzymes. These enzymes are needed to support the production of proteins used by the plant for growth. There is also indication that endothall interferes with lipid synthesis and metabolism in the cells. Lipids are incorporated, along with proteins, as structural components in the plant cells.

Additionally, it has been suggested that endothall may interfere with the transport of nutrients and cellular materials across the cell membranes. This would suggest a weakening or disruption of the cell wall and is likely related to the structural components discussed above.

Endothall is formulated in two active ingredient forms: Cascade (dipotassium salt of endothall; also marketed as Aquathol K) and Teton (mono (N,N-dimethyl alkylamine) salt of endothall; also sold as Hydrothol 191). Teton is more toxic. Teton is significantly more toxic to aquatic biota in hard water.

Cascade is used for plant control while Teton is used for algae control. Cascade is applied at 0.5 ppm (48 hours) to 5.0 ppm (5 hours). The previous permit relied on information from initial studies had shown the low-concentration long-duration applications could be more effective. However, use at the low rate by irrigation districts has indicated that Cascade must be used at the higher rate to be effective.

Teton has been applied at 0.15 ppm (8 hours) combined with Cascade at 0.85 ppm.

Endothall breaks down slowly through microbial degradation. The half-life of endothall in water is generally ranges from less than one day to about 8 days. Total persistence time in water normally varies from a day to about 35 days, although persistence to more than 62 days has been reported. In systems without long-term (seasonal) storage, only the addition of non-treated dilution water will reduce the concentration at the point of compliance from the original concentration at the application site. By itself, short-term storage (days to weeks) is not an effective strategy to reduce endothall concentrations.

The following information is from the 2010 fact sheet addendum. A new fish seawater challenge study was commissioned by the Washington Water Resources Association. Ecology reviewed the study and added the newer information below the following original table.

Information from the 2010 Fact Sheet Addendum:

Endpoint	Exposure	Cascade / Aquathol K	Teton / Hydrothol 191
LC50[1] (most sensitive fish)	Acute	11 mg /L[2,3] (acid equivalent) for walleye (23 mg/L (acid equivalent) for chinook)	0.079 mg/L[4] (acid equivalent) for cutthroat trout
No Observed Effects Concentration (NOEC)[5]	Chronic	1.7 mg/L (acid equivalent) for walleye (3.6 mg /L (acid equivalent) for chinook)	0.012 mg/L (acid equivalent) for mayfly (0.022 for fathead minnow)
Interfere with parr to smolt metamorphosis		1.5-3.5 mg/L (acid equivalent) for coho and chinook	0.2-mg/L (acid equivalent) for chinook
MCL[6]	NA	0.1 mg/L	0.1 mg/L

Endpoint	Exposure	Cascade / Aquathol K	Teton / Hydrothol 191
Proposed Effluent Limit	NA[7]	5.0 mg/l (acid equivalent)	0.050 mg/l (equal to 50 ug/l) (acid equivalent) at any time and 0.2 mg/l (equal to 200 ug/l) (acid equivalent), subject to timing windows. See S5.B.6.d.

[1] LC50 is the lethal concentration that kills 50% of the tested organisms.
[2] FEIS Section 4 page 6.
[3] mg/L (acid equivalent) is milligrams of acid equivalent per liter. Cascade conversions:

- 1 mg acid equivalent equals 1.43 mg active ingredient.
- 1 mg acid equivalent equals 3.50 mg product (product is 40.3% dipotassium salt of endothall and 28.6% acid equivalent).
- 1 gallon of product contains 4.23 pounds of active ingredient (dipotassium salt of endothall).

[4] mg/L (acid equivalent) is milligrams of acid equivalent per liter. Teton conversions:

- 1 mg acid equivalent equals 2.27 mg active ingredient.
- 1 mg acid equivalent equals 4.28 mg product (product is 53.0% amine salt of endothall and 23.36% acid equivalent).

[5] FEIS Section 1 Page 6 and Section 4 pages 10-11.
[6] MCL is the Maximum Contaminant Level for drinking water from the Safe Drinking Water Act.
[7] Measured as the maximum instantaneous concentration.

Update of Information on Fish Toxicity of the Endothall Product Cascade: In October 2011, the Washington State Water Resources Association requested a permit modification to allow for the discharge of the endothall product Cascade at the maximum label rate of 5 ppm for the entire length of the irrigation season. The current permit allows the use of endothall at lower concentrations and for only a portion of the irrigation season.

To support the change, WSWRA commissioned a fish seawater challenge study to provide information about the potential effects on aquatic life given a higher discharge rate for the endothall product Cascade. This study is available at <website url>.

The study reported an observed LOEC of 9 ppm for all three species (chinook, coho, and steelhead) tested in the seawater challenge. Based on these results, the authors conclude that allowing discharge of 5 ppm (acid equivalent) endothall in the spring and summer will not pose a risk to survival of salmon and steelhead smolts.

Ecology believes that modification of the permit is favorable for public health and the environment because it is supported by the fish study and because it should significantly reduce the use of the highly toxic acrolein by increasing the effectiveness of endothall usage to control aquatic weeds in irrigation systems.

Update on the Endothall Product Teton: Other aquatic pesticide general permits that Ecology administers allow the use of Teton up to 2 mg/L (acid equivalent) subject to timing windows. Ecology has added this limit and criteria to the proposed permit. Teton may be used year-round with a limit of 0.050 mg/l (acid equivalent) at any time and 0.2 mg/l (acid equivalent), subject to

the same timing window restrictions that are in the other aquatic pesticide permits. See S5.B.6.d of the permit.
Endothall may be used year-round. The requirements for non-irrigation season use are the same as the requirements during irrigation season use.

Condition S6.B5 allows reduced monitoring when applying endothall at concentrations below the effluent limits. Irrigation districts may apply endothall at higher concentrations (limited by the requirements on the label) as long as the effluent limits are met. Since endothall breaks down slowly, dilution water would be necessary. The federal NPDES rules have requirements to report monitoring results with a frequency dependent on the nature and effect of the discharge, but in no case less than once a year (40 CFR 122.44[i]).

The proposed permit includes other requirements which mirror the requirements for other aquatic pesticide use.

Xylene

Xylene (1,2-, 1,3-, and 1,4-dimethyl benzene) is an aromatic solvent registered for aquatic weed control for use in programs of the Bureau of Reclamation, Department of the Interior, and cooperating water user organizations.

Xylene is insoluble in water and must be applied with an emulsifier. Xylene is an effective contact herbicide at concentrations as low as 200 mg/L (Otto 1970). In 2004, 16,000 gallons of xylene was applied to irrigation waters under the NPDES permit.

Xylene is highly toxic to aquatic organisms. The 96-hr LC_{50} for rainbow trout was estimated to be 12 mg/L, with 100 percent mortality at 16.1 mg/L, and "anesthetic-like" effects after 2-hour exposure to 3.6 mg/L. Chronic (56 days) exposure to concentrations as low as 0.36 mg/L caused significant off-flavor in rainbow trout fillets. The no-effect level was established at 7.1 mg/L for a two-hour exposure. At treatment concentration, the emulsifier, Emcol AD-410, is much less toxic to rainbow trout than xylene (Walsh et al. 1975).

Xylene persistence in water is low. The predominant fate process is volatilization (Daniels et al 1975, cited in Reinert and Rodgers 1987). Other factors that contribute to loss of xylene from irrigation water include: breaking or disruption of the emulsion and absorption by plants (Frank and Demint 1970).

In humans and other mammals, xylene exposure at levels greater than those that occur during treatment can result in a variety of central and peripheral nervous system effects (Gandarias et al. 1995). There is no evidence that xylenes are mutagenic or carcinogenic (EHIS 1993).

Xylene is an effective herbicide in irrigation systems because of its phytotoxicity and minimal residual effects on crop plants. High toxicity to fish and other aquatic organisms, however, necessitates a high level of applicator competence and attention.

Copper

Copper was first used as an algaecide in the nineteenth century and is still widely used to control algae and higher aquatic plants (Murphy and Barrett 1993). Recently, chelated copper complexes have been produced that are effective in water with widely varying chemistry and less toxic to fish than copper salts, such as copper sulfate. Chelating compounds include ethylenediamine, alkanolamine, and triethanolamine. The ethylenediamine complex is most effective on rooted, aquatic plants (Anderson et al. 1987, 1993) and the alkanolamine and triethanolamine complexes are used as algaecides (WSSA 1994).

In 2004, the equivalent of 43,000 pounds of elemental copper was applied to irrigation waters under the NPDES permit. This number includes the use of 860 gallons of chelated copper and 169,000 pounds of copper sulfate.

Copper is a required nutrient for plants and is important in a number of physiologically important compounds and processes; however, copper phytotoxicity occurs at high concentrations (Epstein 1972, Mengel and Kirkby 1987, Marschner 1986). Toxicity relates to the ability of copper to displace other metal ions, particularly iron, from physiologically important centers.

Since it is an elemental metal, copper is persistent in the environment. Copper ion is highly reactive, and tends to adsorb to clays and dissolved organic carbon in the water to form inorganic and organic complexes (WSSA 1994). The majority of copper applied to an aquatic system will eventually sorb to the sediments. The soluble copper ion is considered the toxic form and is bioavailable to most species (Reinert and Rodgers 1987). Complexed and adsorbed species are considered nontoxic (USEPA 1980, as cited in Reinert and Rodgers 1987), although fish-kills and loss of invertebrates in some lakes have been attributed to long-term copper application for algae control that led to extremely high sediment copper concentrations (Hanson and Stafan 1984).

Copper efficacy is a function of temperature and pH. Copper is more effective at high temperatures and under acid or neutral conditions. At high pH, copper reacts with dissolved carbonates and is precipitated as copper carbonate. Efficacy of chelated formulations is less susceptible to water chemistry and less toxic to fish (Murphy and Barrett 1993). In water with low alkalinity (50-100 mg/L $CaCO_3$), ethylenediamine-complexed copper controls most common aquatic weeds at 0.75 to 1 mg/L.

Low-rate, long-exposure copper treatments may be effective in control of some aquatic plants. In some irrigation canals copper is applied as a continuously metered supply at concentrations ranging from 0.005 to 0.02 mg/L for periods of days or weeks (Gangstad 1986, as cited in Murphy and Barrett 1993). Copper is sometimes used in irrigation canals to kill epiphytic algae prior to acrolein treatment. Such pretreatment increases the efficacy of acrolein for aquatic weed control.

Sodium Carbonate Peroxyhydrate

Sodium carbonate peroxyhydrate is a granular chemical which is the active ingredient in certain algaecide and fungicide products. The end product containing this active ingredient acts as an

oxidizing agent and thus kills the target algal and fungal pests. The product is used outdoors for treating ornamental plants, turf grasses, and terrestrial landscapes. It is used, as well, for treatments in commercial greenhouses, garden centers and plant nurseries, including their storage areas.

Sodium carbonate peroxyhydrate is a granular substance made by combining sodium carbonate and hydrogen peroxide. The following is its mode of action: When water is present, the compound breaks down into hydrogen peroxide and sodium carbonate. The hydrogen peroxide oxidizes and thus kills the target pests. After contact, the hydrogen peroxide breaks down harmlessly into water and oxygen.

Tests with sodium carbonate peroxyhydrate show minimal to mild toxicity for oral and dermal exposure. Dermal irritation also occurred. There was severe irreversible eye damage. The substance is not considered a dermal sensitizer. Exposure to the general population would be minimal. Workers are required to wear appropriate protective equipment to protect themselves, especially their eyes, from exposure during application.

When the pesticide is applied in accordance with directions on the label, no harm is expected to birds, other terrestrial animals, freshwater fish, or freshwater invertebrates. In the case of non-target plants, no harm is foreseen if the label directions are followed. Precautionary statements are present on the label to prevent exposure to non-target insects, including honey bees.

Fluridone

Fluridone is a systemic herbicide. It was discovered in the mid-1970s and was shown to be effective for the control of submersed plants. This herbicide was registered by the EPA for use in water in 1986. Fluridone is a carotenoid pigment inhibitor; loss of carotenoids in plants allows ultraviolet light to destroy chlorophyll, thus killing the plant by not allowing it to produce food via photosynthesis (effectively starving it).

Fluridone is used for the control of various submersed plants, and some floating-leaved plants, duckweed and salvinia. It does not control algae. Fluridone application rates for plant control are much lower than are those for other herbicides: µg/l (parts per billion) compared to mg/l (parts per million). However, contact time required to control target weeds is measured in weeks or months rather than hours or days. For example: fluridone concentrations in the water must remain for 45-80 or more days for optimum long term control of plants such as hydrilla. This aquatic herbicide is available as liquid and as slow- and fast-release pellet formulations.

Imazapyr

Imazapyr is a systemic, non-selective, pre- and post-emergent herbicide used for the control of terrestrial annual and perennial grasses, broad-leaved herbs, woody species, and riparian and emergent aquatic species. It is registered for use on a variety of agricultural, commercial, and residential use sites, including corn, forestry sites, rights-of-way, fence rows, hedge rows, drainage systems, outdoor industrial areas, outdoor buildings and structures, domestic dwellings, paved areas, driveways, patios, parking areas, walkways, various water bodies (including ponds, lakes, streams, swamps, wetlands, and stagnant water), and urban areas.

Imazapyr is formulated as a liquid, a wettable powder (including water soluble bags), and a granular. Application methods include aerial, groundboom, boat, and tractor-drawn spreader. Applications to smaller areas may be made with handheld equipment, including low-pressure handwand sprayers, backpack sprayers, sprinkling cans, and handgun sprayers. Application rates range from 0.014 lbs ai/acre on corn, to 1.5 lbs ai/acre on non-cropped areas and aquatic sites.

Upon direct application, or indirect release into surface water, photolysis is the only identified mechanism for imazapyr degradation in the environment. The half-life of imazapyr is approximately 3 to 5 days in surface water. The major identified metabolites were pyridine hydroxy-dicarboxylic acid, pyridine dicarboxylic acid, and nicotinic acid. Under laboratory aerobic aquatic conditions, the aerobic aquatic metabolism half-lives for hydroxy-dicarboxylic acid and pyridine dicarboxylic acid were in the range of 3 to 8 days in two different sediment/water systems. Metabolites hydroxy-dicarboxylic acid and pyridine dicarboxylic acid are expected to be more polar, thus more rapidly excreted than imazapyr, and no more toxic than the parent compound. Additionally, pyridine hydroxy-dicarboxylic acid is considered to be less stable than the parent compound. Nicotinic acid is a possible neurotoxin at high dose levels, but there is no concern for low exposures. Nicotinic acid (also called Niacin and referred to as Vitamin B3) is considered an essential nutrient. Imazapyr is not expected to bioaccumulate in aquatic organisms because it exists as an anion at typical environmental pHs.

Hand-pulling

Hand-pulling has been effective in control of some aquatic weeds in small canals and nearshore areas (Sculthorpe 1967, Shibayama 1988, Thamasara 1989), and less effective in others (Varshney and Singh 1976, as cited in Wade 1993). A number of tools have been developed to assist in hand-harvesting of aquatic weeds, including scythes, cutter bars, and mechanized hand-held cutters (Robson 1974, Cooke et al. 1993, McComas 1993). While hand-pulling is the most common method used for small scale aquatic plant management (Madsen 1997), the cost and difficulty of manual labor is often prohibitive and the efficacy limited when plant biomass is substantial and the infestation widespread (Wade 1993). Miles (1976, cited in Wade 1993) estimated the cost of manual control in a 20-m section of canal was more than three times the cost of using a tractor-mounted flail. A diver-operated dredge has proven effective, but expensive, in removing scattered plants in lakes (Madsen 1997).

Hand-pulling has some environmental impacts. Hand-pulling increased suspended sediment concentration by over 1600 percent and produced seven times as many plant fragments in the canal. Re-suspended sediments can adversely impact water quality. In addition, high sediment loads in irrigation water can clog emitters used to increase efficiency of irrigation water use.

Several factors influence the cost and efficiency of hand-pulling for aquatic vegetation management. Physical factors such as channel width, depth, and current velocity affect the rate at which people can move around in the channel. Vegetation density influences the rate of vegetation removal, and worker fatigue can quickly reduce efficiency. For hand-pulling to be a viable option for vegetation management in canals it will likely be in small areas where other

techniques cannot be employed. Canal flow should be reduced as much as possible to increase efficiency and safety of hand-pulling.

Chaining

Dragging a chain attached to tractors on either side of the canal was a common technique for aquatic plant removal prior to the use of herbicide alternatives (Wade 1993, Armellina et al. 1996). Chaining dislodges plant material that must be removed from the canal manually or by mechanical means. Plant material that is not collected may contribute to the dispersal of the plants and more extensive weed infestation.

As with many control techniques, timing of the treatment influences efficacy. Like other harvesting operations, rapid re-growth necessitates repeat treatment. Treatments that result in inhibition of propagule formation may have more long-term efficacy (Armellina et al. 1996), although all disturbance-based control methods probably have low efficacy against disturbance-tolerant species, such as many problem aquatic weeds (Sabbatini and Murphy 1996). Chaining for removal of canal vegetation also requires a roadbed on both sides of the canal, which may limit its applicability in many systems.

Excavator/backhoe

Plants may be physically removed from canals with a backhoe, dragline, or similar excavating equipment. Significant drawbacks in the use of an excavator for aquatic weed control in canals include damage to the canal profile and bottom seal and production of abundant plant fragments and turbidity.

Mechanical removal of aquatic vegetation with a backhoe was not highly effective in the Talent Irrigation District in 1997. Removal efficiency was highly variable because sediment suspension limited the operator's ability to see the plants in the canal. Suspended sediment concentrations increased by 150 times, and plant fragment generation increased by 100 times during backhoe operation. In addition, two weeks following treatment plant biomass was greater than before treatment, suggesting that mechanical removal would have to be repeated frequently.

Mechanical harvesting

Several types of mechanical harvesters have been developed for cutting and removing weeds from lakes and canals. These machines typically include a height-adjustable cutter bar and a basket or conveyor for collecting the cut plants. Floating machines that operate in lakes and reservoirs often have an integrated barge for transporting the cut plants to shore for off-loading. Machines that operate from the bank for use in canals are typically tractor-mounted, hydraulically controlled booms with cutter bars and baskets for collecting the cut plants. When risk of downstream dispersal of problem plants is low, choppers or cutters that leave the plant material in the canal may be more cost-effective than harvesters (Sabol 1987).

Mechanical harvesters must be able to remove approximately two tons of plant material for every mile of canal economically and effectively. In most cases, multiple harvests in a growing season will be required to control aquatic plants (Madsen et al. 1988, Thamasara 1989). Canals to be

harvested must be accessible via maintenance road; and not blocked by trees, bridges, fences, and other obstructions. While plants may be piled on the maintenance road in some instances, plant disposal may be necessary near residences to avoid odor problems. Transportation of cut plants adds substantially to the costs of harvesting.
Mechanical harvesting impacts fish and wildlife when the animals are harvested along with the plants (Mikol 1985, Serafy and Harrell 1994), and it may cause a shift in the aquatic plant community (Best 1994). Machines that chop plants without removing them from the water may also destroy wildlife living in the canal. Timing of the harvest operations to seasonality in plant physiology may enhance the efficacy of harvesting (Kimbel and Carpenter 1981, Perkins and Sytsma 1987) by reducing re-growth rates.

Water level where irrigators have control

Submersed aquatic plants are dependent upon water for physical support, and lack of a cuticle makes them particularly susceptible to desiccation. Drawdown and exposure has been used to effectively control some aquatic plant species. Drawdown is particularly effective in winter when sediments freeze. Some aquatic plants are adapted to fluctuating water levels (Sculthorpe 1967), and species vary in their response to drawdown (Cooke et al. 1993). Species with propagules that are resistant to desiccation, such as Sago pondweed, may survive exposure through water level drawdown. Seed germination in some species is enhanced by desiccation (Stanifer and Madsen 1997).

Timing of water level manipulation and understanding of the lifecycle of the problem species is critical to efficacy of water level manipulation for aquatic plant management. Early flooding of a California irrigation canal, for example, stimulated precocious germination of Variable-leaf pondweed (*Potamogeton gramineus*) winter buds. Subsequent drying of the canal prior to the irrigation season resulted in a reduction of *P. gramineus* and increase in spikerush biomass in the canal for several years (Spencer and Ksander 1996).

Sediment removal

Dredging to remove nutrient rich sediment can provide long-term control of aquatic plant growth. Excavation to depths below the light compensation point or to a substrate that does not support plant growth is critical to the success of dredging for aquatic plant control. Aquatic plants are tolerant of extremely low light intensities, and deepening to increase light limitation is probably not feasible in irrigation systems. However, if low-nutrient sediments or sediments that do not permit rooting and attachment of aquatic plants can be exposed through dredging, permanent and effective plant control may be achieved (Cooke et al. 1993, Madsen 1997). Potential negative impacts of dredging for aquatic plant control in irrigation districts include: increased turbidity and suspended sediment in the water, which may impact efforts to conserve water through drip irrigation; damage to canal seal and increased loss through seepage; and changes in the gradient and flow characteristics of the canal.

Canal lining

Earthen canals provide a good substrate for aquatic plant growth. Lining the canals with geotextile material or concrete, poured in place or sprayed, would reduce availability of rooting

substrate and reduce plant problems. Sediment deposition in the lined canal, however, may quickly negate benefits. Concrete-lined canals typically crack and require ongoing maintenance, and commonly have weed problems (Fred Nibling, USBOR, personal communication).

A new bituminous geotextile material for canal lining may provide a relatively inexpensive, long-term solution to aquatic weed growth in canals (L. Busch, USBOR, personal communication). In addition to reducing aquatic vegetation management costs, canal lining also reduces seepage losses from canals and is an important water conservation tool. Evaluation of this alternative is not yet complete.

Shading

Aquatic plants, like all plants, require light for photosynthesis. Submersed aquatic plants, however, are well adapted to the low-light conditions that result from light scatter and absorption by water and suspended materials in water. Decline of rooted aquatic plants in systems with high turbidity caused by suspended sediment (Johnstone and Robinson 1987; Engel and Nichols 1994) and phytoplankton (Phillips et al. 1978; Hough et al. 1991) has been attributed to light inhibition.

A number of techniques may be used to reduce light availability for aquatic plants, including dyes, shade fabrics, canal bank vegetation, and piping. Light absorbing dyes, such as Aquashade, are commonly used in closed (no outflow) systems, but is not registered for use in flowing systems. The shading effect of bank vegetation has been reported to impact aquatic plant growth (Dawson 1978, Dawson and Haslam 1983, and Pieterse and van Zon 1982, cited in Wade 1993).

Covering the canal with shading material stretched over a framework of metal or plastic may be less expensive initially than pipe for control of aquatic plant growth. An even less expensive alternative may be to train existing canal bank vegetation, e.g., blackberries, to grow over a metal framework to provide shade. Relative to piping water, however, canal covers would have a high maintenance cost and short lifespan.

Shading the canal may produce additional benefits as well as some drawbacks. An ancillary benefit of shading the canal would be a decrease in water lost through evaporation. Use of vegetation to shade the canal, however, may increase water loss through evapotranspiration and entail a maintenance cost associated with tree trimming and fallen branch removal. Root growth into canal banks may also compromise canal bank integrity and increase water loss through seepage.

Piping

The ultimate shading technique for aquatic plant control is to entirely cover the canal with light-blocking material or to pipe the water. Because of the radius of turns required, adequate right-of-way may not be available for pipe installation in large canals. In smaller canals, however, piping water may provide a long-term (25 years) solution to aquatic weed problems. Use of pipe for water delivery depends upon canal slope and canal size. Pipe diameters up to 36 inches may be economically installed in existing canal beds, and provide capacity for 15 to 20 cfs. Pipe

installation has the added benefit of eliminating seepage and evaporation losses and provides the highest level of water conservation.

Stormwater flows may reduce the practicality of pipe for water delivery. For example, some canals are used for stormwater management during winter, and the pipe size necessary for irrigation water delivery may not be adequate for handling stormwater flows. Restricted stormwater flows may causes flooding upstream of piped canal sections. Where possible, stormwater flow should be directed to natural water courses and diverted from irrigation canals. Diversion of stormwater would facilitate use of pipe for water delivery and reduce sediment deposition in canals; thereby increasing water conservation, minimizing the availability of aquatic plant rooting substrate, and reducing the requirement for aquatic plant management efforts with the associated environmental risks.

Fish, grass carp

Several fish species have been considered as biological control agents for aquatic vegetation. Van Zon (1976) listed 29 species that are phytophagous, feeding primarily on phytoplankton or macrophytes. In practice, however, only one species, the grass carp (*Ctenopharyngodon idella*), has been used for large scale aquatic weed control (van der Zweerde 1993). The grass carp, which is a member of the Cyprinidae or minnow family, is a voracious feeder. Small fish may consume a daily ration of aquatic plants equal to several times their body weight per day (Opuszynski 1972, cited in California Dept. Fish and Game 1989). Larger fish may consume a ration equal to their body weight (Leslie et al. 1996, Stocker 1996).

The biology and physiology of grass carp contribute to their effectiveness for aquatic plant control. Grass carp have a short gut, for an herbivore, which allows them to process and eliminate consumed plants quickly (Leslie et al. 1996). Grass carp are essentially 100 percent herbivorous at lengths greater than 3 cm. Although animal prey is not sought by larger fish, animals will be consumed when they are presented in the absence of plants, and inadvertently when they are attached to consumed plants (van der Zweerde 1993).

Grass carp grow rapidly (up to 29 g/day) under uncrowded conditions with abundant food and optimal temperatures (Shelton et al. 1981, Sutton and van Diver 1986, cited in Leslie et al. 1996). In temperate regions, feeding begins at 3 to 9 C, with consumption and growth are typically greatest between 21 and 26 C. Regional acclimation may result in varying temperature optima (Leslie et al. 1996). Plant consumption is reduced at dissolved oxygen concentrations lower than 4 mg/L (Rottmann 1977).

Although rather indiscriminate in their feeding, and not a biocontrol agent in the classical sense (sensu Doutt 1967; Roush and Cate 1980; Pietersee 1993, DeLoach 1997), grass carp do exhibit preferences for certain aquatic plant species. Plant preference depends upon the age, size, physiological state of the fish, and on environmental conditions. Small grass carp select small or soft plants, such as duckweeds, filamentous algae, and softer pondweeds. Larger fish still prefer softer plants (although algae are less preferred) but will accept more fibrous plants (Opuszynski 1972, Rottaman 1977).

Site differences influence palatability of plants. Grass carp preference for a species may differ among plants collected from different sites. In one study (Bonar et al. 1990), consumption was positively correlated with plant calcium and lignin content, and negatively correlated with iron and cellulose. Plant nutrient content is, in turn, determined by site characteristics (Hutchinson 1975). These site difference are likely responsible for the sometimes contradictory results of feeding preference studies (Bowers et al. 1987, Chapman and Coffey 1971, Pine et al. 1989, Pauley et al. 1994).
Grass carp are endemic to the large rivers of Asia from the Amur River in Siberia south. All fish introduced into the U.S. are warm-water acclimated fish of Chinese origin (Pauley et al. 1994). Grass carp were first introduced into the U.S. in 1963 and the first documented stocking for weed control occurred in 1970 in Arkansas (Bailey and Boyd 1972, cited in Leslie et al. 1996). Since then, grass carp have been widely distributed in the U.S. for aquatic weed control.

Escape and establishment of reproductive populations of grass carp into river systems (Brown and Coon 1991, Webb et al. 1994, Raibley et al. 1995, Elder and Murphy 1997), and growing concern about the potential environmental impacts of the fish, stimulated some states to ban grass carp. Research on production of mono-sex fish and sterile hybrids provided unsatisfactory results (Leslie et al. 1996). In the 1980s, however, fish culturists were successful in inducing triploidy in grass carp using heat-shock (Thompson et al. 1987) or hydrostatic pressure-shock (Cassini and Caton 1986) of fertilized grass carp eggs. Triploid grass carp are functionally sterile (U.S. Fish and Wildlife Service 1988).

Diploid grass carp are illegal in West Coast states. Beginning in 1990, Washington permitted the introduction of triploid fish into lakes and ponds for aquatic weed control with requirements for containment (Pauley et al. 1994).

Grass carp were introduced into California to manage hydrilla in the Imperial Irrigation District (IID) in Southern California. Prior to grass carp introduction, costs for aquatic weed management in the IID were $250,000 to $400,000 per year. These costs did not include labor costs of individual farmers required to maintain pipe, pumps, etc. free of plant fragments. The pre-grass carp program was primarily mechanical, and included management of only the worst problems and provided only enough control to maintain flow in the system. The grass carp management program costs approximately $250,000 per year (1992 dollars) to provide plant-free water flow in 2,575 km of canal (approximately $97/km) (Stocker 1996).

REGULATORY INFORMATION

Regulatory pollution reduction requirements

Federal and state regulations require that effluent limits in an NPDES permit must be either technology-or-water-quality-based.

- Technology-based limitations are based upon the methods available to treat specific pollutants. Technology-based limits are set by EPA and published as a regulation or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36).

Ecology must apply the more stringent of these limits to each parameter of concern. These limits are described below.

Technology-based water quality protection requirements

Sections 301, 302, 306, and 307 of the CWA establish discharge standards, prohibitions, and limits based on pollution control technologies. These technology-based limits are *best practical control technology* (BPT), *best available technology economically achievable* (BAT), and *best conventional pollutant control technology economically achievable* (BCT). Permit writers may also determine compliance with BPT/BAT/BCT using their *best professional judgment* (BPJ). EPA has stated that for pesticide application to water (in its draft aquatic pesticide NPDES general permit) that technology-based requirements are Best Management Practices (BMPs); not numeric limits.

Washington has similar technology-based limits that are described as ***all known, available, and reasonable methods of control, prevention, and treatment* (*AKART*)** methods. State law refers to AKART under RCW 90.48.010, 90.48.520, 90.52.040, and 90.54.020. The federal technology-based limits and AKART are similar but not equivalent.

Ecology may establish AKART:

- For an industrial category or for an individual permit on a case-by-case basis.
- That is more stringent than federal regulations.
- That includes BMP's such as prevention and control methods (e.g., waste minimization, waste/source reduction, or reduction in total contaminant releases to the environment).

Ecology and EPA concur that AKART may be equivalent to BPJ determinations.

Historically, EPA has regulated the pesticide application industry under FIFRA. EPA developed label use requirements to regulate the use of pesticides. EPA also requires the pesticide manufacturer to register each pesticide, provide evidence that the pesticide will work as promised, and minimize unacceptable environmental harm.

The Pesticide Management Division of the Washington State Department of Agriculture (WSDA) ensures that applicators use pesticides legally and safely in Washington. WSDA registers pesticides for use in Washington (in addition to EPA registration); licenses pesticide applicators, dealers and consultants; investigates complaints; maintains a registry of pesticide sensitive individuals; and administers a waste pesticide collection program. These duties are performed under the authority of the Washington Pesticide Control Act (chapter 15.58 RCW), the Washington Pesticide Application Act (chapter 17.21 RCW), the General Pesticide Rules (chapter16-228 WAC), the Worker Protection Standard (chapter 16-233 WAC) and a number of pesticide and/or county specific regulations (http://agr.wa.gov/PestFert/Pesticides/.)

The standards for environmental protection are different between the CWA and FIFRA. Because of the *National Cotton Council, et al. v. EPA* court decision, in 2011, EPA will regulate the application of aquatic pesticides under a general NPDES permit. EPA is currently developing a general NPDES permit for non-delegated states, federal lands, and Tribal lands. EPA expects all delegated states to develop their own NPDES permits for aquatic pesticide application to comply with the federal court decision. To comply with the *National Cotton Council, et al. v. EPA* court decision, by October 2011, all aquatic pesticide applications in the United States must occur under NPDES permits.

Because of the *Headwaters Inc. v. Talent Irrigation District* decision, Ecology has regulated aquatic pesticide application under NPDES permits since 2002. It is Ecology's intent that reissuing the permit will authorize irrigation system aquatic weed control in a manner that complies with all federal and state requirements.

All wastewater discharge permits issued by Ecology must incorporate requirements to implement reasonable prevention, treatment, and control of pollutants. Ecology acknowledges that applicators could treat the pollutants addressed in this permit only with great difficulty due to the diffuse nature and low concentrations that exist after the pesticides have become waste. The *Headwater, Inc. v. Talent* ruling established that aquatic pesticides become waste in the water after the pesticide has performed its intended action and the target organisms are controlled or if excess pesticide is present during treatment.

Integrated Pest Management (IPM)

After the *National Cotton Council et al. v. EPA* decision, the Sixth Circuit Court allowed EPA 24 months to develop a general NPDES permit for aquatic pesticide use and later granted an extension of a further six months to finalize the permit. In its draft permit, EPA regards IPM as meeting technology-based-effluent-limits for aquatic pesticide application. EPA anticipates having all Permittees applying for coverage under its general permit implement basic IPM practices. EPA's draft permit requires a subset of Permittees to implement *Pesticide Discharge Management Plans* that include comprehensive IPM practices.

EPA expects dischargers to keep these written plans on site and make them available to state or federal inspectors on request. EPA requires that any state-issued aquatic pesticide NPDES permits be at least as stringent as the EPA-administered aquatic pesticide general permit.

The proposed permit requires that the Permittee develop or maintain an Integrated Vegetation Management Plan. For irrigation system aquatic weed control, Ecology considers that an existing

plan prepared for the permit is equivalent to a DMP. However, the Permittee must update the plan and any addendums to the plan to keep the document current.

Experimental use permits

Entities operating under WSDA-issued experimental use permits (WSEUP) do not need coverage under this permit. WSDA requires WSEUP for all research experiments involving pesticides that are not federally registered or for uses not allowed on the pesticide label. WSDA experimental use permits limit the amount of an experimental use pesticide that a Permittee can use for testing purposes. WSDA grants experimental use permits for gathering data in support of registration under FIFRA Section (3) or Section 24(c). In many situations, only a state WSEUP is required for the use of an experimental pesticide.

When a proponent conducts a small-scale test on more than one surface acre of water per pest, it must obtain a federal experimental use permit in addition to a state experimental use permit. Any person may apply to the EPA for a federal experimental use permit for pesticides and these permits are usually valid for only one year. Applicants holding a federal experimental use permit must also apply for and obtain a state experimental use permit before initiating any shipment of the pesticide to Washington. Ecology requires coverage under the Irrigation System Aquatic Weed Control General Permit for applicants operating under a federal experimental use permit.

Water quality-based requirements

Surface Water Quality-Based effluent limits

The Washington State Surface Water Quality Standards (chapter 173-201A WAC) were designed to protect existing water quality and preserve the ***beneficial uses*** of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet established surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin-wide total maximum daily loading study (TMDL).

Ecology conditions NPDES and waste discharge permits in such a manner that authorized discharges meet water quality standards. The characteristic beneficial uses of surface waters include, but are not limited to, the following: domestic, industrial and agricultural water supply; stock watering; the spawning, rearing, migration and harvesting of fish; the spawning, rearing and harvesting of shellfish; wildlife habitat; recreation (primary contact, sport fishing, boating, and aesthetic enjoyment of nature); commerce; aesthetics and navigation.

Numeric criteria for the protection of aquatic life and recreation

Numeric water quality criteria are published in the Water Quality Standards for Surface Waters (chapter 173-201A WAC). They specify the levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numeric criteria along with chemical and physical data for the wastewater and receiving water to derive effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

The EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (40 CFR 131.36). EPA designed these criteria to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The Water Quality Standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g. WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that may be discharged to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values
- Adversely affect human heath

Narrative criteria are statements that describe the desired water quality goal, such as waters being "free from" pollutants such as oil and scum, color and odor, and other substances that can harm people and fish. These criteria are used for pollutants for which numeric criteria are difficult to specify, such as those that offend the senses (e.g., color and odor). Narrative criteria protect the specific designated uses of all freshwaters (WAC 173-201-A-200, 2006) and of all marine waters (WAC 173-201A-210; 2006) in the State of Washington.

Antidegradation analysis and antidegradation plan

The following narrative represents Ecology's antidegradation analysis and antidegradation plan for the Irrigation System Aquatic Weed Control General Permit. The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply AKART.
- Apply three Tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollution. Tier II ensures that dischargers do not degrade waters of a higher quality than the criteria assigned unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters" and applies to all sources of pollution.

WAC 173-201A-320(6) describes how Ecology implements Tier I and II antidegradation in general permits. All Permittees covered under the general permit must comply with the provisions of Tier 1. There are no Tier III waters in Washington.

Under state law, the use of herbicides is in the public interest.

> *Many commercially available herbicides have been demonstrated to be effective in controlling nuisance and noxious aquatic weeds and algae and do not pose a risk to the environment or public health. The purpose of this act is to allow the use of commercially available herbicides that have been approved by the environmental protection agency and the department of agriculture and subject to rigorous evaluation by the department of ecology through an environmental impact statement for the aquatic plant management program (RCW 90.48.447).*

The water quality standards at WAC 173-201A-320(6) describe how Ecology should conduct an antidegradation Tier II analysis when it issues NPDES general permits. The following bullets explain actions that Ecology has taken or will take to meet this section of the standards:

1. Use the information collected, from implementation of the permit, to revise the permit or program requirements.

    - Ecology revised the proposed permit based on feedback from Permittees, parties affected by the permit, internal staff, and government agencies. Ecology will further revise the draft permit based on a formal public comment period and testimony received at the public hearing.
    - Ecology reviewed a study a fish seawater challenge study sponsored by the Washington Water Resources Association to provide information about the potential effects on aquatic life given for the endothall product Cascade. Endothall is much less toxic than acrolein and its use should reduce use of acrolein.
    - Ecology may modify the permit if monitoring data show significant adverse impacts to water quality through the continued use of a specific pesticide or application method or if EPA fails to reregister a pesticide for aquatic use. n addition, the permit requires immediate reporting of any adverse impacts from treatment to fauna or humans. Ecology investigates these reports and determines if the treatment caused or contributed to the problem.
2. Review and refine management and control programs in cycles not to exceed five years or the period of permit reissuance.

    - Ecology issued the current permit in 2008 and modified it in 2010. The current permit expires in 2013. Ecology plans to reissue the permit in 2012 prior to the current permit's expiration date. The proposed 2012 permit will expire in 2017. Permit reissuance includes a public involvement process as described below.

    - Ecology solicits input from users and affected parties, rewriting and revising permit conditions, and reviewing relevant data before soliciting public comment on the permit and accompanying documents and finalizing the proposed new version of the permit.

3. Include a plan that describes how Ecology will obtain and use information to ensure full compliance with water quality standards. Ecology must develop and document the plan in advance of permit or program approval.

    - The information in the fact sheet and in the antidegradation section of this fact sheet constitutes Ecology's antidegradation plan for the permit. This is despite language in Ecology's guidance document implementing Tier II antidegradation requirements that

indicates such a plan may not be required. Ecology *Supplementary Guidance Implementing the Tier II Antidegradation Rules* dated July 18, 2005 (http://www.ecy.wa.gov/programs/wq/swqs/antideg-tier2-guidance.pdf). A Tier II analysis is not required in association with activities regulated under a short-term modification (WAC 173-201A-410) such as what would occur with irrigation system aquatic weed control.

Short-term water quality modification provisions

The short-term water quality modification provision of the draft permit allows the authorized discharges to cause a temporary diminishment of some designated beneficial uses while it alters the water body to restore flow capacity. The conditions of this permit constitute the requirements of a short-term water quality modification.

A short-term exceedance only applies to short lived (hours or days) impairments, but short-term exceedances may occur periodically throughout the five-year permit term. Short-term exceedances may also extend over the five-year life span of the permit (long-term exceedance) provided the Permittee satisfies the requirements of WAC 173-201A-410.

Evaluation of surface water quality-based effluent limits for numeric criteria

The reasonable potential to cause a violation of water quality standards requires that Ecology place a limit on the discharge at the points of compliance. For fluridone and imazapyr, conditions in the permit require virtually no-discharge at the point of compliance. Ecology derived numeric limits derived for acrolein, xylene, endothall, and copper. The resultant limits are as follows:

Table 1 – Numeric Limits for Pesticides

Parameter	Maximum instantaneous concentration
Copper, dissolved	25 ug/l
Acrolein	21 ug/l
Dipotassium Salt of Endothall (such as Cascade)	5.0 mg/l (acid equivalent)
Mono (N,N-Dimethyl Alkylamine) Salt of Endothall (such as Teton)	0.050 mg/l (equal to 50 ug/l) (acid equivalent) at any time and 0.2 mg/l (equal to 200 ug/l) (acid equivalent), subject to timing windows. See S5.B.9.d.
Xylene	5.1 mg/l
Sodium Carbonate Peroxyhydrate	See S5.B4
Fluridone	See S5.B4
Imazapyr	See S5.B4
The maximum daily limitation is defined as the highest allowable discharge at any time.	

Acrolein limit

Ecology based the acrolein limit on a level established by the state of Oregon to protect freshwater organisms from adverse toxic effects due to chronic exposure (OAR Chapter 340). Washington State has not established water quality criteria for acrolein but requires that concentrations of toxic substances without specific criteria that are protective of aquatic organisms be determined from available relevant information.

The data available on acrolein shows that acute toxicity (48-h LC50) for *Daphnia spp.* is 57 and 80 μg/l (Macek, et al. 1976, and U.S. EPA, 1978). The LC50 for bluegill sunfish at 96-h is 100 and 90 μg/l (Louder & McCoy, 1962, and US EPA, 1978). The LC50 for largemouth bass at 96-h is 160 μg/l (Louder & McCoy, 1962).
The data shows that acute toxicity to freshwater aquatic life occur at concentrations as low as 68 μg/l, and would occur at lower concentrations among those species that are more sensitive than those tested in previous studies.

The data shows that chronic toxicity would occur at 21 μg/l, and would occur at lower concentrations among those species that are more sensitive than those tested in previous studies.

Based on this information, Ecology established an acrolein limit of 21 μg/l.

Copper limit

The copper limit is based on the water quality criteria established in Washington State water quality standards, WAC 173-201A. The copper criterion is dependent on the hardness of the water. The acute cropper criterion is $\leq (0.960)(e^{(0.9422[\ln(\text{hardness})] - 1.464)})$. It is a one-hour average concentration not to be exceeded more than once every three years on the average. The criteria are for the dissolved fraction of copper.

Ecology analyzed hardness data from eight irrigation districts in 2004 and 2005. That analysis found average hardness values ranging from 17 mg/L to 184 mg/L.

Table 2 – Average hardness values (mg/L) for irrigation districts from 2004-2005

District	Minimum Value	Average Value	Maximum Value	n
Cascade	42	79	135	30
Columbia	17	102	133	84
ECBID	68	184	440	131
Kittitas	14	37	220	49
Naches Selah	22	29	40	48
Quincy	48	129	350	142
SCBID	11	150	230	252
Wenatchee	10	17	24	46
Grand Total	**10**	**122**	**440**	**782**

Using the formula for the copper criterion, these average hardness values would correspond to acute criteria ranging from 3.3 μg/L to 30.2 μg/L. The overall average based on all data would correspond to a criterion of 20 μg/L.

Table 3 – Average hardness values (mg/L) and corresponding acute and chronic copper criteria (g/L)

District	Average Hardness	Acute Criterion	Chronic Criterion
Cascade	79	13.6	9.3
Columbia	102	17.4	11.6
ECBID	184	30.2	19.1
Kittitas	37	6.6	4.8
Naches Selah	29	5.4	4.0
Quincy	129	21.6	14.1
SCBID	150	24.9	16.0
Wenatchee	17	3.3	2.5
Grand Total	**122**	**20**	**13.4**

Xylene limit

Results from recent Parametrix studies (2004) showed an EC50 of 11.5 mg/l after only two hours of exposure for rainbow trout. The 48-h LC50 is 24.3 mg/l for rainbow trout (for xylene plus the emulsifier). The 48-h LC50 for *Daphnia magna* was 5.1 mg/l (Parametrix, 2004).

Endothall limit

Ecology based the proposed endothall limit on a recent (2011) study by Cramer Fish Sciences and others entitled Effects Of The Aquatic Herbicide Cascade® on Survival of Salmon and Steelhead Smolts during Seawater Transition.

The study reported an observed LOEC of 9 ppm for all three species (chinook, coho, and steelhead) tested in the seawater challenge. Based on these results, the authors conclude that allowing discharge of 5 ppm (acid equivalent) endothall in the spring and summer will not pose a risk to survival of salmon and steelhead smolts.

Sediment quality

Generally, copper is adsorbed quickly to particles in the water column that settle out to the sediments. In lake systems, these rates of adsorption can be very high and persistent. However, this may not be the case for rapidly flowing systems such as irrigation canals. When Farmers Ditch Irrigation Canal was treated continuously at rates of 0.19, 0.05 or 0.5 mg/L, 60 percent of the applied copper remained adsorbed to the ditch bottom sediments. At the end of the treatment season, sediment concentrations of copper were generally below 50 mg/l.

During treatment of the Roza Main Canal with copper sulfate, copper did not significantly settle into the bottom sediments. Even though sediment concentrations rose after a single slug treatment, they returned to background levels within about seven to eight days. This may be due to release of copper from sediments due to hydrolysis. Also, copper may also be removed from the area by scouring action of the flowing water (Nelson et al, 1969). However, daily treatments of the East 14.7 Lateral Canal for 4.5 months at a 1 lb Cu/ft3 resulted in an increase of sediment copper concentrations from 20 mg/L to approximately 120 mg/L.

There is no good evidence that the copper in the sediments re-dissolves or is simply transported downstream by the water currents. If it does re-dissolve then it may eventually be transported into receiving waters where it is available biologically to in-stream biota. If it stays adsorbed and is transported downstream, then high-copper sediments may be deposited into the downstream water systems. If it is dredged out during the off-season, then it can be effectively removed from the system.

Ecology has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that Ecology may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

We do not have enough information to conclude whether or not there is reasonable potential to violate the Sediment Management Standards. When freshwater sediment criteria are established, the department will review the concentrations of copper in sediments due to copper treatments in irrigation supply systems.

Ground Water Quality Standards

The Ground Water Quality Standards, (chapter 173-200 WAC), protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards.

SEPA Compliance

In 1980, Ecology completed an Environmental Impact Statement (EIS) for statewide program guidance in the issuance of administrative orders called *short-term modifications of water quality standards* for herbicides and algaecides used in aquatic plant and algae control. In 1992, Ecology updated and supplemented the EIS with the *Final Supplemental Environmental Impact Statement* (SEIS) *for the Aquatic Plant Management Program*. In 2003, WSDA issued an ecological risk assessment for imazapyr to control *Spartina* spp. in Washington estuaries. In 2009, WSDA issued a human health and freshwater ecological risk assessment for imazapyr.

Endangered and sensitive species

EPA has implemented an Endangered Species Protection Program (ESPP) to identify all pesticides that may cause adverse impacts on threatened/endangered species and to implement measures that will mitigate these impacts. When the ESPP identifies an adverse impact, it requires use restrictions to protect these species at the county level. EPA will specify these use restrictions on the product label or by distributing a county-specific Endangered Species Protection Bulletin. Bulletins are enforceable under FIFRA. General Condition G9 of the permit requires the Permittee to comply with all applicable federal regulations. See www.epa.gov/espp/frequent-ques.htm for more information.

The Fish and Wildlife Service and National Marine Fisheries Service are involved in EPA's processes to protect listed species and designated critical habitat in several ways: by consulting with EPA on specific endangered species concerns; by issuing Biological Opinions on certain species; or other ways, as necessary. For details on how EPA evaluates the potential risks from pesticides to listed species and consults with the Services, see their risk assessment process web page at www.epa.gov/espp/litstatus/riskasses.htm.

Small business economic impact analysis

The general permit requires compliance with federal and state laws and regulations and places no disproportionate burden on small business. The monitoring is flexible and meeting pesticide label requirements is already required under FIFRA. Complying with water quality standards is required by state and federal law. Most irrigation districts in the state are public entities.

Responsibility to comply with other requirements

Ecology has established, and will enforce, limits and conditions in the permit for the discharge of aquatic herbicides registered for use by the EPA and the WSDA. EPA and WSDA will enforce the use, storage, and disposal requirements expressed on pesticide labels. The Permittee must comply with the pesticide label requirements (FIFRA) and all of the conditions of this general permit. The permit does not supersede or preempt federal or state label requirements or any other applicable laws and regulations.

Recommendation for permit issuance

The general permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. Ecology is issuing the general permit for five (5) years.

SPECIAL CONDITIONS

S1. Activities covered

The proposed permit applies to the control of aquatic weeds in waters of the state within irrigation systems and at the point of compliance. Irrigation water suppliers whose system is capable of discharging to or intersecting with points of compliance, whether unintentionally or by design, are required to be covered under this permit or another NPDES permit.

The majority of irrigation water delivery systems occur in the Yakima, Wenatchee, Okanogan, Spokane, Touchet, and Walla Walla River drainages and the three Columbia Basin Project irrigation districts make up the majority of the acres irrigated in the state. Attachment C lists the Washington State irrigation districts.

S2. Geographic area covered

This general permit covers the use of pesticides in irrigation supply systems in the state of Washington on both state and federal land, with the following exclusions:

a. Tribal land
b. Federal facilities
c. Federal land where a federal agency controls the decision to apply pesticides

The Environmental Protection Agency (EPA) is the NPDES permitting authority for federal facilities and tribal land in Washington State.

Each applicant for coverage under this permit must describe the specific areas where aquatic weed control activities occur.

S3. Obtaining coverage

Who may obtain permit coverage

A definition of "Permittee" is not provided in chapter 90.48 RCW, chapters 173-216, 173-220, or 173-226 WAC, nor is one provided in 40 CFR 122 (EPA NPDES Permit Program) or State NPDES Permit Programs. Based upon the usage of Permittee in federal and Washington State law, Ecology takes the term "Permittee" to mean the person or entity that discharges or controls the discharge of pollutants to waters of the state (surface or ground) and holds permit coverage allowing that specific discharge.

How to obtain coverage

Permittees that plan to continue coverage under the revised permit must apply to Ecology to extend their coverage prior to the effective date of the reissued permit. This is because Ecology proposes to reissue the permit in 2012, prior to the 2013 expiration date. At the end of the next five-year period, Permittees must apply at least180 days before the 2012 permit expires.

Ecology will consider any Permittee that does not reapply prior to the effective date of the proposed permit as a new applicant. ***New applicants*** must submit a complete application for permit coverage a minimum of 60 days before applying pesticides that result in discharge to waters of the state.

The new permit applicant must submit a complete application including a ***Notice of Intent*** (NOI). An official who has signature authority (WAC 173-226-200) for the entity applying for permit coverage must sign all documents. Ecology must receive the complete application for permit coverage on or before the publication date of the public notice the permit applicant posted in a newspaper of general circulation (WAC 173-226-130). Ecology considers a newspaper of general circulation as the major newspaper publication for a region.

When Ecology receives the new applicant's complete application before public notice it can review the application and communicate necessary changes on application documents. Communication (prior to publishing public notice) about document changes can save the applicant money by identifying any necessary changes before the applicant publishes and sends out the public notice.

The public has the opportunity to comment on the permit application and the proposed coverage during the 30 days after publication of the second public notice (public comment period). Ecology will consider comments about the applicability of the permit to the proposed activity received during this period. If Ecology receives no substantive comments, it will issue permit coverage on the 61st day following receipt of a complete application. The public has the right to appeal any coverage decision.

How to terminate permit coverage

Ecology plans to issue the permit for a period of five years, starting on the effective date of the permit (WAC 173-226-330). Coverage will last from the date of coverage to the date of permit expiration, which will be up to five years, unless the Permittee terminates coverage by submitting a notice of termination. If the Permittee does not terminate coverage, the Permittee will continue to incur an annual permit fee.

Ecology bases the conditions for coverage under this general permit on state regulations found in WAC 173-216 and WAC 173-226.

When coverage is effective

Ecology will not issue coverage until at least 60 days following the receipt of a completed application for coverage. In the event that Ecology receives relevant comments on the Application for Coverage, Ecology may need to work with the applicant prior to issuing permit coverage. In this instance, obtaining permit coverage may require more than 60 days.

Ecology derived the requirements for public notice when applying for coverage under the general permit from state regulation, WAC 173-226-130.

S4. Point of compliance

The point of compliance means the location where water treated with pesticides enters surface water bodies that existed prior to the creation of reclamation and irrigation projects. Points of compliance that are not explicitly stated in the permit in Section S4.B are documented in the permit applications of each district.

The following are the points of compliance listed in the current permit. The permit states that for Amon Wasteway, Snipes Creek Wasteway, Sulphur Creek Wasteway, and Crab Creek, the point of compliance shall be at or above the following locations:

1. Amon Wasteway where it exits the golf course at Gage Road (approximately latitude 46.22715, longitude -119.26024).
2. Snipes Creek Wasteway at the Benton 29.32 Lateral (near McCreadie Road) (approximately at latitude 46.25630, longitude -119.67406).
3. Sulphur Creek Wasteway at Sheller Road (approximately at latitude 46.33167, longitude -119.98021).
4. Crab Creek at Red Rock Coulee / DCC1 wasteway (approximately at latitude 46.84693, longitude -119.58673).

These four locations were added because there is documented salmonid presence at these locations. These four locations are the upper extent of documented salmonid presence for these waterways. The raw data used to determine documented presence of salmonids is included in Appendix D. For the purposes of determining presence of salmonids, Ecology required:

- Documentation of salmonid presence (either salmon or steelhead),
- More than one fish found at the site, and
- Sufficient geographical information to determine the location of the data.

Ecology is proposing to remove the S4.B.3 point of compliance for Sulphur Creek. The Sunnyside Valley Irrigation District and the Roza Irrigation District installed a fish barrier at Holaday Road and received approval from Ecology to use the Holaday Road point of compliance site for Sulphur Creek Wasteway.

S.5 Discharge limits

Compliance with standards

See also the section "Technology-Based Water Quality Protection Requirements" for a description of AKART requirements. Ecology also believes that implementing the Irrigation System Aquatic Weed Control General Permit will help meet AKART. Ecology based the planning requirements on:

- A similar planning requirement in EPA's draft NPDES permit for aquatic pesticide application. In its draft permit, EPA considers Integrated Pest Management (IPM) to meet technology-based standards.
- Integrated Pest Management Law (chapter 17.15 RCW).
- Washington's Water Quality Standards (WAC 173-201A-110).
- Similar planning requirements in the Irrigation System Aquatic Weed Control NPDES permit that allows treatment of in-water weeds.

Temporary exceedance of water quality standards

See also the section "Water Quality-based Effluent Limits" for a description of the requirements necessary to ensure water quality standards are met. Discharges from aquatic weed control activities may contain pollutants which, in excessive amounts, have a reasonable potential to cause, or contribute to, violations of State water quality due to the presence of materials toxic to aquatic life. Ecology has determined that, when properly applied and handled in accordance with the terms and conditions of the general permit, aquatic weed control activities will comply with state water quality standards, will maintain and protect the existing characteristic beneficial uses of the surface waters of the State, and will protect human health. New information regarding previously unknown environmental and human health risks may cause reopening of the general permit.

The proposed permit does not authorize a mixing or dilution zone to the Permittee for any discharge to natural surface waters under this general permit. The short term water quality modification provisions of the permit will allow the discharges authorized by the general permit to cause a temporary diminishment of some beneficial uses while the water body is altered to restore flow capacity. The short term modification will be short in that the actual impairment will be short lived, while the overall availability of authorization extends through the term of the permit. The permit conditions and the integrated pest management plan satisfy the regulatory requirement for a long term plan that allows short term modifications to extend for five years.

Application requirements

This general permit provides the authority to discharge the listed aquatic pesticides but does not authorize the discharge of other pollutants which may be present in the irrigation system. Impacts not directly associated with discharge of pesticides will be addressed using other regulatory tools.

S6. Monitoring

Monitoring requirements are specified in Condition S6 of the permit. WAC 173-226-090 provides Ecology the authority to specify appropriate monitoring requirements.

Condition S6.C

Analytically tracking treatments at the point of compliance meets the requirements of this condition. For example, if a facility takes samples at a point of compliance every hour for 24

hours and is able to track when the peak concentration of pesticide arrives and departs, this sampling meets the requirements of this condition for that point of compliance.

Condition S6.B4

Condition S6.B4 allows for no monitoring if the permittee meets the requirements of this special situation. This condition is based on travel time studies conducted by permittees. The studies were analyzed to determine how long after a peak arrives at a location it takes for no pesticide residue (or dye simulating a pesticide) to be detected. After that amount of time, plus a margin of safety, no monitoring is required for canals/spillways that are reopened (see condition S6.B4 for details).

The analysis of twelve travel time studies showed that waiting two travel times would result in no detectable pesticides at a particular location. For example, if it takes 8 hours for the peak pesticide concentration to reach location X, after an additional 8 hours (16 hours total), no detectable pesticides should be present.

Table 4 summarizes results from the thirteen studies. As the table shows, the maximum amount of time found in the study for no detectable pesticides to be found was 1.8 times the travel time. Adding a margin of safety of 0.2 to the maximum result yields the 2 travel time standard found in condition S6.B4.

Table 4 – Time travel studies

District	Location	Total travel times until no pesticide or dye was detected
Roza Irrigation District	Roza Canal MP 37.2 on 06-20-06 @ 14:37	1.1
Wenatchee Reclamation District	Wenatchee RD on September 20, 2006	1.17
Sunnyside Valley Irrigation District	SVID Sunnyside Canal MP 17.70	1.20
Roza Irrigation District	WW5 @ Blockhouse Bridge below Roza Canal	1.2
Roza Irrigation District	Snipes Creek Wasteway @ Benton #2 Siphon	1.2
Sunnyside Valley Irrigation District	SVID Granger Drain Site 24	1.22
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on July 17	1.23
Sunnyside Valley Irrigation District	SVID Matheson HW	1.25
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Sept 11	1.32
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Apr 22	1.37
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Aug 14	1.42
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on June 19	1.51
Wenatchee Reclamation District	Wenatchee RD on September 20, 2006	1.80

As Figure 1 shows, the amount of travel times it takes before finding no detectable levels of pesticides is independent of the actual length of the travel time.

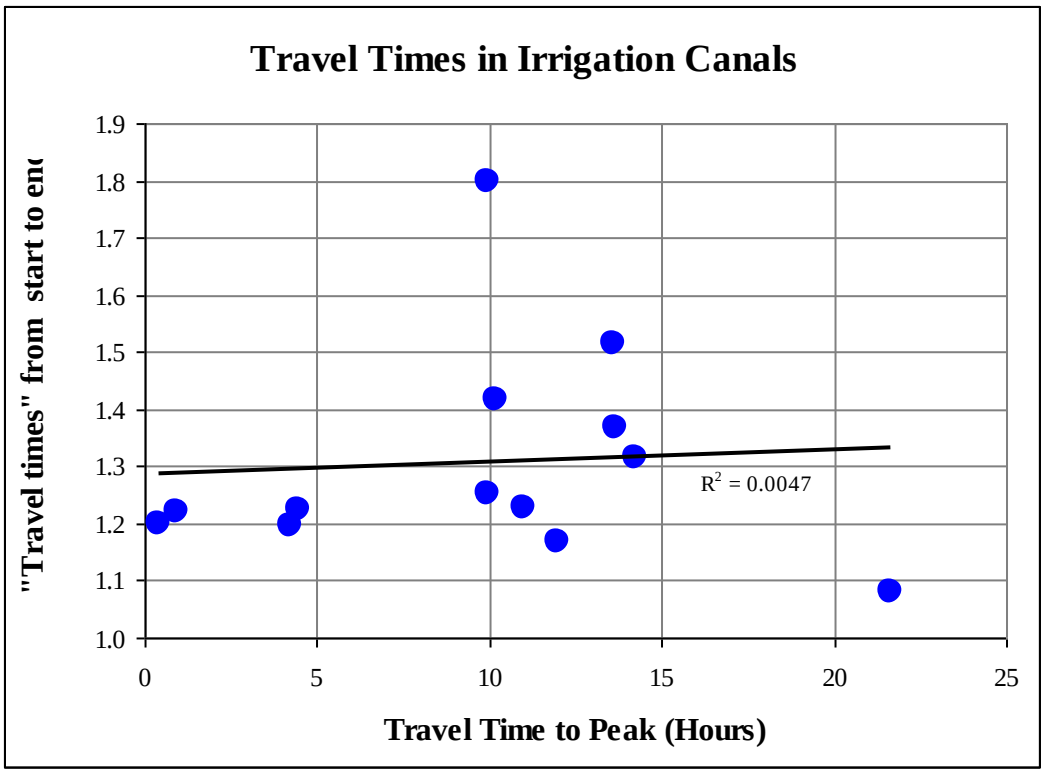

Figure 1—Travel Times in Irrigation Canals

Lab accreditation

With the exception of certain parameters, the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, Accreditation of Environmental Laboratories.

S7. Integrated pest management and best management practices

The permit requires industry to continue examining alternatives to reduce the need for aquatic pesticides. The following practices have been used in similar activities:

1) All errors in application and spills are reported to the proper authority.

2) Informing the public of planned spray activities.

3) Applying a decision matrix concept to the choice of the most appropriate formulation.

4) Staff training in the proper application of pesticides and handling of spills.

5) The applicators must follow the pesticide label requirements and be knowledgeable about human health risks and mitigation processes as outlined in the MSDS.

6) The irrigation district must develop and follow an IVPM plan accepted by Ecology.

7) The irrigation districts will be required to monitor treated waters during the season. Monitoring can result in a better management of pesticide applications, avoidance of excessive applications, and also reduced amounts of the pesticides.

S8. Operation and maintenance

S9. Spill plan for pesticide storage and application sites

S10. Public notice procedures

S11. Reporting and recordkeeping requirements

WAC 173-226-090 provides Ecology the authority to specify any appropriate reporting and recordkeeping requirements to control discharges to waters of the state.

S12. Compliance with standards

This general permit does not authorize activities that have a reasonable potential to cause a violation of state water quality standards (WAC 173-201A) within the irrigation system so long as the activities are allowed under the short term water quality modification. Activities covered under this permit are allocated a temporary zone of impact on beneficial uses, but the impact must be transient, and must allow for full restoration of water quality and protection of beneficial uses upon project completion. The conditions of this permit constitute the requirements of a short term water quality modification.

S13. Permit fees

S14. Solid and liquid waste management

General Conditions

General conditions are based directly on state and federal law and regulations and are included in all aquatic pesticide general permits.

General conditions are based directly on state and federal law and regulations and have been standardized for all NPDES permits issued by the Ecology. Some of these conditions were developed for different types of discharges. Many of these conditions are not directly applicable to the application of pesticides.

Appendix A – Public Opportunity to Comment

A Public Notice of Draft was published in the State Register on February 15, 2012. Public hearings on the draft General Permit were held on:

March 27, 2012 6:30 p.m.
Dept. of Ecology
Central Regional Office
15 West Yakima Ave -- Suite 200
Yakima, Washington

A short workshop to explain proposed changes and answer questions was held immediately preceding the hearings.

Interested persons were invited to submit comments regarding the proposed issuance of the General Permit. All comments submitted by March 30, 2012 were considered in the final permit determination.

The proposed and final general permit, fact sheet, application form, and other related documents are on file and may be inspected and copied between the hours of 8:00 a.m. and 4:30 p.m., weekdays at the following Ecology locations:

Washington State Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902
(509) 454-7298
TDD (509) 454-7673
FAX (509) 575-2809

Washington State Department of Ecology
Eastern Regional Office
North 4601 Monroe, Suite 202
Spokane, WA 99205
(509) 456-2874
TDD (509) 458-2055
FAX (509) 456-6175

Washington State Department of Ecology
Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452
(425) 649-7133
TDD (435) 649-4259
FAX (425)649-7098

Washington State Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
(360) 407-6300
TDD (360) 407-6306
FAX (360) 407-6305

Appendix B--Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).
To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C -- Definitions

"Administrator" means the administrator of the EPA.

“Antidegradation Policy” is as stated in WAC 173-201A-070.

"Authorized representative" means:

1. If the entity is a corporation, the president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operation facilities, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. If the entity is a partnership or sole proprietorship, a general partner or proprietor, respectively; and

3. If the entity is a federal, state or local governmental facility, a director or the highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or his/her designee.

The individuals described in paragraphs 1 through 3, above, may designate another authorized representative if the authorization is in writing, the authorization specifies the individual or position responsible, and the written authorization is submitted to the Department.

"Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State and their sediments. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Certified applicator" means any individual who is licensed as a commercial pesticide applicator, commercial pesticide operator, public operator, private-commercial applicator, demonstration and research applicator, or certified private applicator, or any other individual who is certified by the director to use or supervise the use of any pesticide which is classified by the EPA or the director as a restricted use pesticide.

"Code of Federal Regulations (CFR)" means a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. Environmental regulations are in Title 40.

"Composite sample" means the combined mixture of not less than four (4) "discrete samples" taken at selected intervals based on an increment of either flow or time. Volatile pollutant discrete samples must be combined in the laboratory immediately prior to analysis. Each discrete sample shall be of not less than 200 ml and shall be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for Examination of Water and Wastewater.

"Conveyance" means a mechanism for transporting water or wastewater from one location to another location including, but not limited to, pipes, ditches, and channels.

"Department" means the Washington State Department of Ecology.

"Detention" means the collection of water into a temporary storage device with the subsequent release of water either at a rate slower than the collection rate, or after a specified time period has passed since the time of collection.

"Director" means the director of the Washington State Department of Ecology or his/her authorized representative.

"Discharger" means an owner or operator of any "facility", "operation", or activity subject to regulation under Chapter 90.48 RCW.

"Discrete sample" means an individual sample which is collected from a waste stream on a one-time basis without consideration to flow or time, except that aliquot collection time should not exceed fifteen (15) minutes in duration.

"Effluent limitation" means any restriction established by the local government, the Department, and EPA on quantities, rates, and concentrations of chemical, physical, biological, and/or other effluent constituents which are discharged from point sources to any site including, but not limited to, waters of the state.

"Environmental Protection Agency (EPA)" means the U.S. Environmental Protection Agency or, where appropriate, the term may also be used as a designation for a duly authorized official of said agency.

"Erosion" means the wearing away of the land surface by movements of water, wind, ice, or other agents including, but not limited to, such geological processes as gravitational creep.

"Existing operation" means an operation which commenced activities resulting in a discharge, or potential discharge, to waters of the state prior to the effective date of the general permit for which a request for coverage is made.

"Facility" means the actual individual premises owned or operated by a "discharger" where process or industrial wastewater is discharged.

"FWPCA" means the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as now or as it may be amended.

"General permit" means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger.

"Gpd" means gallons per day.

"Grab sample" is synonymous with "discrete sample".

"Ground water" means any natural occurring water in a saturated zone or stratum beneath the surface or land or a surface water body.

“Hazardous waste" means those wastes designated by 40 CFR Part 261, and regulated by the EPA.

"Individual permit" means a discharge permit for a single point source or a single facility.

"Industrial wastewater" means water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feedlots, poultry house, or dairies. The term includes contaminated storm water and also, leachate from solid waste facilities.

“Irrigation System” means a controlled system consisting primarily of manmade canals, ditches, and ponds designed and operated for the delivery or management of water for irrigation purposes.

"mg/L" means milligrams per liter and is equivalent to parts per million (ppm).

"New operation" means an operation which commenced activities which result in a discharge, or a potential discharge, to waters of the state on or after the effective date of an applicable general permit.

"NPDES" means the National Pollutant Discharge Elimination System under section 402 of FWPCA.

"Operation" is synonymous with "facility".

"Party" means an individual, firm, corporation, association, partnership, copartnership, consortium, company, joint venture, commercial entity, industry, private corporation, port district, special purpose district, irrigation district, trust, estate, unit of local government, state government agency, federal government agency, Indian tribe, or any other legal entity whatsoever, or their legal representatives, agents, or assignee.

"Permit" means an authorization, license, or equivalent control document issued by the Department to implement Chapter 173-200 WAC, Chapter 173-216 WAC and/or Chapter 173-226 WAC.

"Person" is synonymous with "party".

"pH" means the logarithm of the reciprocal of the mass of hydrogen ions in grams per liter of solution. Neutral water, for example, has a pH value of 7 and a hydrogen-ion concentration of 10^{-7}. pH is a measure of a substance's corrosivity (acidity or alkalinity).

"Point source" means any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

"Pollutant" means any substance discharged, if discharged directly, would alter the chemical, physical, thermal, biological, or radiological integrity of the waters of the state, or would be likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to any legitimate beneficial use, or to any animal life, either terrestrial or aquatic. Pollutants include, but are not limited to, the following: dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, pH, temperature, TSS, turbidity, color, BOD_5, TDS, toxicity, odor and industrial, municipal, and agricultural waste.

"Priority pollutant" means those substances listed in the federal 40 CFR Part 423, Appendix A, or as may be amended.

"Process wastewater" means water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product.

"Reasonable times" means any time during normal business hours; hours during which production, treatment, or discharge occurs; or times when the Department suspects occurrence of a violation.

"Regional administrator" means the regional administrator of Region X of the EPA or his/her authorized representative.

"Retention" means the collection of water into a permanent storage device, with no subsequent release of water.

"Severe property damage" means substantial physical damage to property, damage to the pretreatment facilities or treatment/disposal facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays or losses in production.

"Shall" is mandatory.

"Significant" is synonymous with "substantial".

"Significant process change" means any change in a facility's processing nature which will result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or violate the terms and conditions of this general permit, including but not limited to, facility expansions, production increases, or process modifications.

"Site" means the land or water area where any "facility", "operation", or "activity" is physically located or conducted, including any adjacent land used in connection with such facility, operation, or activity. "Site" also means the land or water area receiving any effluent discharged from any facility, operation, or activity.

"Small business" has the meaning given in RCW 43.31.025(4).

"Standard Industrial Classification (SIC) Code" means a classification pursuant to the *Standard Industrial Classification Manual* issued by the U.S. Office of Management and Budget.

"State" means the State of Washington.

"Substantial" means any difference in any parameter including, but not limited to, the following: monitoring result, process characteristic, permit term or condition; which the Department considers to be of significant importance, value, degree, amount, or extent.

"Surface waters of the state" includes lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands, and all other surface waters and water courses within the jurisdiction of the state of Washington.

"Total suspended solids (TSS)" means total suspended matter that either floats on the surface of, or is in suspension in water or wastewater, expressed in mg/L.

"Toxic amounts" means any amount, i.e., concentration or volume, of a pollutant which causes, or could potentially cause, the death of, or injury to, fish, animals, vegetation or other desirable resources of the state, or otherwise causes, or could potentially cause, a reduction in the quality of the state's waters below the standards set by the Department or, if no standards have been set, causes significant degradation of water quality, thereby damaging the same.

"Toxics" means those substances listed in the federal priority pollutant list and any other pollutant or combination of pollutants listed as toxic in regulations promulgated by the EPA under section 307 of the FWPCA (33 U.S.C. 1317 et seq.), or the Department under Chapter 173-200 WAC, Chapter 173-201A WAC, or Chapter 173-204 WAC.

"μg/L" means micograms per liter and is equivalent to parts per billion (ppb).

"Unirrigated" means any lands having not been irrigated within 10 days prior to, or within 60 days after the application of any waste stream.

"Upset" means an exceptional incident in which a discharger unintentionally and temporarily is in a state of noncompliance with permit effluent limitations due to factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation thereof.

"Wastewater" means liquid-carried human wastes or a combination of liquid-carried waste from residences, business buildings, or industrial establishments.

"Waters of the state" means all waters defined as "surface waters of the state" and all waters defined as "waters of the state" in RCW 90.40.020.

"Water quality" means the chemical, physical, biological characteristics of water, usually in respect to its suitability for a particular purpose.

“Water Quality Preservation Area (WQPA)” means waters which have been designated as high quality waters based upon one or more of the following criteria:

1. Waters in designated federal and state parks, monuments, preserves, wildlife refuges, wilderness areas, marine sanctuaries, estuarine research reserves, and wild and scenic rivers;
2. Aquatic habitat having exceptional importance to one or more life stage of a candidate of listed priority species, established by the state Department of Fish & Wildlife, or a federally proposed or listed threatened or endangered species;
3. Rare aquatic habitat, ecological reference sites, or other waters having unique and exceptional ecological or recreational significance.

"Water quality standards" means the state of Washington's water quality standards for ground waters of the state (Chapter 173-200 WAC) and the state of Washington's water quality standards for surface waters of the state (Chapter 173-201A WAC).

In the absence of other definitions as set forth herein, the definitions as set forth in 40 CFR Part 403.3 shall be used for circumstances concerning the discharge of wastes.

Appendix D – List of Permittees

The following entities have applied for coverage under this general permit (the corresponding city is in parentheses):

1. Cascade Irrigation District (Ellensburg)
2. Columbia Irrigation District (Kennewick)
3. East Columbia Basin Irrigation District (Othello)
4. Ellensburg Water Company (Ellensburg)
5. Icicle & Peshastin Irrigation District
6. Kennewick Irrigation District (Kennewick)
7. Kittitas Reclamation District (Ellensburg)
8. Naches-Selah Irrigation District (Selah)
9. Quincy-Columbia Basin Irrigation District (Quincy)
10. Roza Irrigation District (Sunnyside)
11. Selah-Moxee Irrigation District (Moxee)
12. South Columbia Basin Irrigation District (Pasco)
13. Sunnyside Valley Irrigation District (Sunnyside)
14. Union Gap Irrigation District (Wapato)
15. Wenatchee Reclamation District (Wenatchee)
16. Westside Irrigating Company (Ellensburg)
17. Yakima-Tieton Irrigation District (Yakima)

In addition to these 17 entities, other irrigation districts in the state that may apply for coverage under the permit include:

Aeneas Lake Irrigation District (Tonasket)
Agnew Irrigation District (Carlsborg)
Ahtanum Irrigation District (Yakima)
Alta Vista Irrigation District (Okanogan)
Artesian Irrigation District (Walla Walla)
Badger Mountain Irrigation District (Kennewick)
Beehive Irrigation District (Wenatchee)
Benton Irrigation District (Benton City)
Black Sands Irrigation District (Moses Lake)
Blalock Irrigation District #3 (Walla Walla)
Blalock Orchard District #12 (Walla Walla)
Brewster Flat Irrigation District (Brewster)
Bridgeport Bar Irrigation District (Brewster)
Bridgeport Irrigation District #1 (Bridgeport)
Buena Irrigation District (Zillah)
Burbank Irrigation District #4 (Pasco)
Carnhope Irrigation District (Spokane)
Chelan Falls Irrigation District (Chelan)

Chelan River Irrigation District (Chelan)
Cline Irrigation District (Sequim)
Columbia Water & Power District (Paterson)
Consolidated Irrigation District #14 (College Place)
Consolidated Irrigation District #19 (Greenacres)
Eastside Irrigation District #6 (Touchet)
Entiat Irrigation District (Entiat)
Franklin County Irrigation District #1 (Pasco)
Gardena Farms Irrigation District #13 (Touchet)
Grandview Irrigation District (Grandview)
Greater Wenatchee Irrigation District (East Wenatchee)
Green Tank Irrigation District #11 (Walla Walla)
Hearn Irrigation District (Dayton)
Helensdale Reclamation District (Malott)
Highland Irrigation District (Sequim)
Hutchinson Irrigation District (Spokane)
Hydro Irrigation District (Walla Walla)
Icicle Irrigation District (Cashmere)
Isenhart Irrigation District (Chelan)
Kiona Irrigation District (Benton City)
Lake Chelan Reclamation District (Manson)
Lowden Irrigation District #2 (Lowden)
Lower Squilchuck Irrigation District (Wenatchee)
Lower Stemilt Irrigation District (Wenatchee)
Methow Valley Irrigation District (Twisp)
Millerdale Irrigation District (Wenatchee)
Moab Irrigation District #20 (Newman Lake)
Model Irrigation District (Spokane)
Moses Lake Irrigation & Rehabilitation District (Moses Lake)
Mud Creek Irrigation District #7 (Lowden)
Naches-Union Irrigation District (Yakima)
North Dales Irrigation District (Dallesport)
North Spokane Irrigation District #8 (Spokane)
Okanogan Irrigation District (Okanogan)
Orchard Avenue Irrigation District #6 (Spokane)
Orchard Irrigation District #10 (Walla Walla)
Oroville-Tonasket Irrigation District (Oroville)
Palisades Irrigation District (East Wenatchee)
Pasadena Park Irrigation District #17 (Spokane)
Peshastin Irrigation District (Cashmere)
Sequim Dungeness Valley Water Users (Sequim)
Sequim Prairie Tri Irrigation Company (Sequim)
South Naches Irrigation District (Nahes)
Stemilt Irrigation District (Wenatchee)
Terrace Heights Irrigation District (Yakima)
Touchet Valley Irrigation District #16 (Waitsburg)
Trentwood Irrigation District #3 (Spokane)

Vera Water and Power (Veradale)
Walla Walla Water & Power District #18 (Walla Walla)
Wenatchee Heights Reclamation District (Wenatchee)
Wenatchee-Chiwawa Irrigation District (Leavenworth)
West End Irrigation District (Dayton)
White Salmon Irrigation District (White Salmon)
Whitestone Reclamation District (Loomis)
Wolf Creek Reclamation District (Winthrop)
Yakima Reservation Irrigation District (Yakima)
Zillah Irrigation District (Zillah)

Appendix E – Data Used to Determine Documented Presence of Salmonids

Note: Appendix E is a separate file.

Appendix F – Response to Comments

NOTE: This section will be completed after the Public Comment period has closed.