

January 13, 2005

Memorandum

From: Holly Schroeder, Administrator, Water Quality Program *HRS*

To: Regional Division Administrators
Water Quality Program Managers Team

Re: The Final Internal Management Directive on Water Quality Trading

Background

I am very pleased to announce the completion of an internal management directive (IMD) on water quality trading, attached for your use and information. As you know, this is the first of several program IMDs my office is preparing. The purpose of this IMD is to provide guidance and an implementation protocol for regional personnel to evaluate proposed water quality trades between two or more point sources, or between point sources and nonpoint sources. This IMD replaces all previous Oregon guidance on the topic.

Water quality trading is an emerging approach to addressing complex watershed problems that otherwise might be technically or financially unsolvable. However, it can also be pursued simply to arrive at a more cost-effective solution than a more traditional approach. The IMD is based on EPA's own 2003 trading guidance, but goes beyond the federal document in order to answer some practical questions that are not addressed by EPA. We believe the regulated community will have an increasing interest in proposing trades once we are further down the watershed permitting path.

As an IMD, this document establishes a framework for DEQ staff. However, this document need not be followed in those rare cases where circumstances are clearly "different" and require DEQ to pursue a modified approach. Similarly, this IMD is expected to evolve and improve over time as our trading experience grows. This document will be revised from time to time to reflect our need to find enhanced ways of obtaining cost-effective approaches that lead to more effective environment protection.

I would like to thank your staff for contributing to this IMD. In particular, I would like to acknowledge Sonja Biorn-Hansen as the principal author of this IMD. Should you or your staff have any comments or questions on this IMD, please contact Sonja at (503) 229-5257.

cc: DEQ Water Quality Staff
Mike Gearherd – EPA Region 10

Water Quality Trading

*Internal Management Directive
January 2005*



State of Oregon
Department of
Environmental
Quality



Disclaimers

This internal management directive (IMD) has been drafted by the Surface Water Section of the Water Quality Division at the Oregon Department of Environmental Quality (DEQ). The directive represents the Department's current recommendations with regard to water quality trades between and among point sources and nonpoint sources. It is not meant to limit potential trades but rather to define concepts, explain eligibility and describe specific trading scenarios that the Department anticipates and generally supports. However, the reader should note that all specific trading proposals will be evaluated on a case-by-case basis. Those trading proposals that are consistent with this directive should be approved with minimal oversight by Department personnel.

The recommendations contained in this directive should not be construed as a requirement of rule or statute.

DEQ anticipates revising this document from time to time as our experience and understanding of water quality trading improves.

Table of Contents

- I. Introduction – What is Water Quality Trading?
- II. Trading Objectives
- III. Water Quality Trading Program Policies
 - A. Legal Authority and Mechanisms
 - B. Compliance with Current Regulations
 - C. Enforceability
 - D. Public participation and Access to Information
 - E. Protecting Designated Uses
 - F. Antibacksliding
 - G. Antidegradation
 - H. Baselines for Water Quality Trading
 - I. Creation and Duration of Credits
 - J. Compliance and Enforcement Provisions
 - K. Program Evaluations
 - L. EPA's Oversight Role
 - M. Dissolution of Credits
- IV. Scope of Trades
 - A. When Trading May Occur
 - B. Pollutants and Parameters That May Be Traded
 - C. Potential Trades
 - D. Trading Models
- V. Proposing Trades
 - A. Process for Proposing a Trade
 - B. Criteria for identifying acceptable trades
- VI. Incorporating Trades Into Permits
 - A. Approaches to Incorporating Trades into Permits
 - B. Units of Trade
 - C. Quantifying Credits and Addressing Uncertainty
 - D. Consistency with Standard Methods
 - E. Compliance and Enforcement Provisions
 - F. Public Notice, Comment and Opportunity for Hearing

Appendix A: Sample Protocols for Temperature Trading

Appendix B: Sample Protocols for Inter and Intra-plant BOD and Ammonia Trading

Appendix C: Sample Protocols for Trades Involving Nutrients

I. Introduction

Water quality trading, or simply trading, is an innovative approach that can be used to achieve water quality goals more efficiently. Trading programs allow regulated parties to meet their obligations by purchasing environmentally equivalent or greater protection from another point or nonpoint source. This may be advantageous for permittees facing high pollution control costs. Thus trading can be a cost-effective alternative to conventional approaches to achieving compliance with water quality objectives. Trading may also allow Oregon to achieve water quality improvements more quickly than would otherwise be possible.

Trading allows the Department of Environmental Quality (DEQ) and stakeholders to look at a watershed holistically, and to ask how efforts to improve water quality can be undertaken to best protect watershed health. This is important, since the best opportunities for improving water quality and watershed health are not always located at point source outfalls. There may also be ancillary benefits to trading such as the restoration of riparian areas and wildlife habitat.

Across the U.S., a variety of successful trading models exist, ranging from single-party, single transaction projects, to multi-party, multi-transaction programs. Some of these efforts focus on a single pollutant, while others focus on two or more. The following parameters are currently represented among existing or planned programs: ammonia, biological oxygen demand, dissolved oxygen, mercury, nitrogen, phosphorus, sediment, selenium, and temperature.

In Oregon, DEQ has authorized trading programs in the Tualatin involving dissolved oxygen and temperature¹. DEQ's experience identifying and pursuing these trades suggests that in Oregon, trading is most likely to occur as a site-specific custom solution to an unusually difficult compliance problem. It is not a panacea for permit holders looking for less expensive ways to comply with permit conditions. It is also not a silver bullet for solving environmental problems. However, DEQ recognizes that many permit holders face high costs to achieve environmental compliance and that where there are opportunities for achieving a greater level of environmental protection, trading may be an option worth pursuing. DEQ intends to encourage and support trading where it will result in a greater benefit to the environment than might be achieved via a conventional regulatory approach.

The purpose of this Internal Management Directive (IMD) is to provide a consistent framework within which trading opportunities can be pursued and implemented, and to

¹ These trades are authorized under permit numbers 101141-101144 to Clean Water Services. To view this watershed permit and associated documents, go to: <http://www.deq.state.or.us/wq/wqpermit/indvpermitdocs.htm>. The permit authorizes trading for oxygen-consuming parameters between the two treatment plants (point-point trading) as well as arranging for the creation of thermal load credits through riparian plantings (point-nonpoint trading).

identify key features of acceptable trades in order to promote trading, as well as to encourage the development of new kinds of trades.

DEQ's IMD is based in part on the 2003 Water Quality Trading Policy developed by the Environmental Protection Agency (EPA)², and is informed by DEQ's experiences to date with trading in Oregon. It replaces all previous guidance.

DEQ's IMD is meant to be a living document. It will be used to guide trading projects identified to date, and will be modified as necessary to allow DEQ to pursue additional trades that represent ways to better protect the environment at lower cost.

II. Trading Objectives

DEQ will consider trading an option when it can be done in a manner consistent with the provisions in this document, and when it accomplishes one or more of the following:

- A. Achieves early reductions and progress towards water quality standards pending development of Total Maximum Daily Loads (TMDLs) for impaired waters.
- B. Reduces the cost of implementing TMDLs through greater efficiency and flexible approaches.
- C. Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed.
- D. Reduces the cost of compliance with water quality-based requirements.
- E. Offsets new or increased discharges resulting from growth or expansion in order to maintain levels of water quality that support all designated uses.
- F. Achieves greater environmental benefits than those that would be achieved under existing regulatory programs. DEQ supports the creation of water quality trading credits that achieve ancillary environmental benefits, such as the creation and restoration of wetlands, floodplains and wildlife and/or waterfowl habitat.
- G. Secures long-term improvements in water quality through the purchase and retirement of credits for water quality improvements by any entity.
- H. Achieves multiple environmental and economic benefits, such as wetland restoration or the implementation of management practices that improve water quality and habitat.

²EPA's Final Water Quality Trading Policy may be viewed at:
<http://www.epa.gov/owow/watershed/trading/tradingpolicy.html>.

III. Water Quality Trading Program Policies

DEQ intends to authorize trading in a manner that is consistent with the Clean Water Act (CWA) and the Oregon Administrative Rules (OARs). Specific provisions for accomplishing this are listed below.

- A. **Legal Authority and Mechanisms.** The CWA provides authority for EPA, states and tribes to develop a variety of programs and activities to control pollution. DEQ is using its broad authority under state law to incorporate provisions for trading through various mechanisms. These include provisions for incorporating trading into permits and establishing provisions for trading in TMDLs or watershed plans. These provisions may incorporate or be supplemented by private contracts between sources or third-party contracts where the third party provides an indemnification or enforcement function.
- B. **Compliance with Current Regulations.** Water quality trading and other market-based programs should be consistent with the Clean Water Act (CWA) and with Oregon Administrative Rules. If DEQ elects to pursue cross-media trades, for example involving contaminated soil or sediment with impacts to water quality, DEQ will have to ensure that the trades occur in a manner that is consistent with the laws governing the various media, such as the Resource Conservation and Recovery Act (RCRA).

Sources and activities that are required to obtain a federal permit pursuant to Sections 402 or 404 of the CWA must do so. In the event a permitted facility wishes to participate in a trade or trading program, the proposed trade will be incorporated into that facility's permit.

- C. **Enforceability.** Trading should be authorized through an enforceable mechanism such as a permit, a Mutual Agreement and Order (MAO) or other means for ensuring accountability for trades.
- D. **Public Participation and Access to Information.** DEQ supports public participation throughout the development of water quality trading programs. Stakeholder involvement is necessary for program effectiveness and credibility. To insure adequate opportunity for public participation, permits incorporating trades should be considered to fall into Category IV under OAR 340-045-0027. As trading becomes more familiar to the public, permits incorporating trading may be deemed to fall into categories I, II or III. Complex trades such as those involving multiple sources or trades that are precedent-setting should be developed with an advisory process.

As trading is authorized in permits and trading plans are submitted to DEQ, these plans will be made available for public review and comment. In the interest of keeping stakeholders informed about trading in Oregon, DEQ intends to maintain

a web page with a designated contact person, current trading policy and information on trading activity in Oregon.

- E. Protecting Designated Uses. DEQ will not support any use of credits or trading activity that would cause an impairment of existing or designated uses, adversely affect water quality at an intake for drinking water supply or that would exceed a loading capacity established under a TMDL.
- F. Antibacksliding. Antibacksliding in the context of the Clean Water Act refers to the requirement that when a permit is renewed or reissued, the new effluent limitations, standards or conditions must be at least as stringent as the effluent limitations, standards, or conditions in the previous permit

The Department believes that the antibacksliding provisions of the CWA will be satisfied in water quality trading situations where a point source increases its discharge through the use of credits in accordance with limitations contained in an NPDES permit. Less stringent effluent limitations should be consistent with antidegradation requirements (see III G).

- G. Antidegradation. Antidegradation in the context of the Clean Water Act refers to policies which ensure protection of water quality where the existing water quality exceeds levels necessary to protect fish and wildlife propagation and recreation on and in the water. Oregon's antidegradation policy is found in Oregon Administrative Rule (OAR) 340-041-0026(1)(a).

DEQ has developed an Internal Management Directive regarding antidegradation policy implementation which may be viewed at <http://www.deq.state.or.us/wq/standards/AntidegPolicyDirect.pdf>.

The Internal Management Directive requires antidegradation reviews as part of all NPDES permit evaluations. If the proposed activity is not likely to result in such a lowering of water quality, then the activity is exempt from full antidegradation review.

In general, DEQ believes that trades and trading programs, by intent of this policy, will result in higher water quality, and that an in-depth antidegradation review would not be required when the trades or trading programs achieve a no net increase of the pollutant traded and do not result in any impairment of designated uses.

- H. Baselines for Water Quality Trading. A baseline in the context of water quality trading defines what is tradeable and what is not. The baseline for a particular source will depend on the relevant waterbody's water quality relative to state water quality standards, and on whether or not a TMDL has been established for that waterbody.

For trades that occur where water quality fully supports designated uses, or in impaired waters prior to a TMDL being established, the baseline for point sources should be established by the applicable water quality based effluent limitation, a quantified performance requirement or a management practice derived from water quality standards. In these scenarios the baseline for nonpoint sources should be the level of pollutant load associated with existing land uses and management practices that comply with applicable state or local regulations.

Once a TMDL has been approved or established by EPA, the applicable point source waste load allocation(s) or nonpoint source load allocation(s) in the TMDL will serve as the baseline for generating credits.

For temperature trades involving nonpoint sources, DEQ has decided that it is reasonable to allow point sources to generate trading credits by undertaking actions to reduce stream temperature ahead of when those actions would likely have happened without trading.

- I. **Creation and Duration of Credits.** In general, credits should be generated before or during the same period they are used to comply with a daily, weekly, monthly, seasonal or annual limitation or requirement specified in a permit. Credits may be generated as long as the pollution controls or management practices are functioning as expected.

The exception to this general expectation is temperature. DEQ has chosen to modify this policy to take into account the unique characteristics and benefits of a temperature trade involving the creation of shade. Shade creation via tree planting can take several years or longer, depending on soil and plant type, among other factors. Consequently, DEQ has elected to give credit once the trees are planted in accordance with an approved long-term maintenance plan, in recognition of the greater ecological value accrued by tree planting over a technology-based solution at an outfall. DEQ has also elected to require that extra planting be undertaken to compensate for the time it will take for shade to establish. Appendix B provides a detailed example of how credit for shade can be calculated.

- J. **Compliance and Enforcement Provisions.** Mechanisms for determining and ensuring compliance are essential for all trades and trading programs, and may include a combination of record keeping, monitoring, reporting requirements. Failure to comply with the monitoring and reporting requirements related to a water quality trading program authorized in an NPDES permit will be subject to the enforcement provisions in the Oregon Administrative Rules, Clean Water Act and 40 CFR.
- K. **Program Evaluations.** DEQ intends to report on trading activities in Oregon on the DEQ website. The purpose will be to provide updates on the status of trading in Oregon, to provide information to parties interested in trading and to notify the public of opportunities to comment on proposed trades.

- L. EPA's Oversight Role. DEQ intends to coordinate with EPA throughout development of trading programs to ensure consistency with the CWA. EPA has various oversight responsibilities under the CWA, including approval or establishment of TMDLs, approval of revisions to state or tribal water quality standards, review of NPDES permits and review of the state's water quality management plans. Where questions or concerns arise, EPA will retain oversight authority pursuant the CWA to review trades for consistency with the CWA.
- M. Dissolution of Credits. Unless otherwise approved, upon closure of any facility, any and all unused credits dissolve.

IV. Scope of Trades

A. When Trading May Occur. Trading may occur under a variety of circumstances, subject to a favorable evaluation of the potential environmental impacts and benefits. This evaluation must be done in advance of trading, as part of the case-by-case trading program approval process. The circumstances under which trading may occur are as follows:

1. Trading to Maintain Water Quality Standards. Trading may be used to maintain high water quality in waters that already meet water quality standards. For example, trading may be used to compensate for new or increased discharges of pollutants.
2. Pre-TMDL Trading in Impaired Waters. DEQ supports pre-TMDL trading in impaired waters to achieve progress towards or the attainment of water quality standards.

DEQ believes that pre-TMDL trading may be accomplished by individual trades that achieve a net reduction of the pollutant traded, or by watershed-scale trading programs that reduce loadings to a specified cap. The specified cap should be supported by baseline information on pollutant sources and loadings.

DEQ also supports pre-TMDL trading that achieves a direct environmental benefit relevant to the conditions or causes of impairment to achieve progress towards restoring designated uses.

DEQ is required to develop TMDLs for waterbodies that do not meet water quality standards. If pre-TMDL trading does not result in the attainment of applicable water quality standards by the time DEQ has scheduled the TMDL, DEQ will develop a TMDL. After a TMDL has been approved or established by DEQ, the reductions made to generate credits for pre-TMDL trading may no longer be adequate to generate

credits under the TMDL. This will depend on the remaining level of reduction needed to achieve water quality standards and, where applicable, the allocation of point and nonpoint source pollutant loads established by the TMDL. Trading agreements made prior to the development of a TMDL that are not consistent with TMDL requirements will have to be modified once a TMDL is approved. DEQ encourages stakeholders interested in pre-TMDL trading to contact DEQ as early in the TMDL development process as possible to ensure that the possibility of future revisions to trading agreements does not unduly reduce incentives for early actions where such interest and opportunities exist.

3. **TMDL Trading.** Trades and trading programs in impaired waters for which a TMDL has been approved or established by EPA should be consistent with the assumptions and requirements upon which the TMDL is established. DEQ may include specific trading provisions in the TMDL itself, in NPDES permits, in watershed plans and the continuing planning process. TMDLs can provide a useful framework for developing trades and for evaluating their impact.

DEQ does not support any trading activity that would delay implementation of a TMDL approved or established by EPA or that would, over time, cause the combined point source and nonpoint source loadings to exceed the cap established by a TMDL.

4. **Technology-Based Trading.** DEQ will not allow trades that would circumvent existing technology-based effluent limitations.
5. **Intra- and Inter-Plant Trading.** DEQ supports intra- and inter-plant trading that involves the generation and use of credits between multiple outfalls that discharge to the same receiving water.
6. **CWA § 401 Certification.** DEQ will consider trading in the context of hydroelectric dam re-licensing as a way to mitigate for the impact of dams, as well as being a way to protect and maintain designated uses.

- B. **Pollutants and Parameters That May Be Traded.** Consideration of trading opportunities will not be limited to particular pollutants. The EPA policy emphasizes trades involving nutrients and sediment. In Oregon, over 80% of the listings on the 303(d) list³ are for temperature. Fewer than 10% are for nutrients. While trades involving nutrients and sediments are encouraged, DEQ anticipates

³ Section 303(d) of the federal CWA requires each state to develop a list of water bodies that do not meet standards, and to submit this list to the U.S. Environmental Protection Agency (EPA) every two years. The resulting list is referred to as the “303(d) list”. It may be accessed at: <http://www.deq.state.or.us/wq/303dlist/303dpage.htm>

that the majority of opportunities for trading in Oregon will involve temperature. Appendices A, B and C contain sample protocols for quantifying such trades.

DEQ also supports cross-pollutant trading for oxygen-related pollutants where adequate information exists to establish and correlate impacts on water quality. Reducing upstream nutrient levels to offset a downstream biochemical oxygen demand or to improve depressed in-stream dissolved oxygen level are examples of cross-pollutant trading. Where the interdependency of pollutants is not quantifiable, cross-pollutant trading would only be allowable in situations where ecological benefits are clear and compelling.

DEQ has authorized a trading program involving BOD and ammonia that is consistent with this policy. Appendix B contains details regarding this program.

Though DEQ has not authorized trades involving nutrients at this time, Appendix C contains an example methodology for quantifying the pollutant reductions associated with such trades.

Regarding toxics with bioaccumulative capabilities, DEQ acknowledges the unique ecological risks and analytic challenges associated with such pollutants. However DEQ also recognizes that trading programs may provide incentives for reducing the presence of these constituents in the environment beyond what can be achieved through current regulations. Where this is the case, DEQ will consider such trades, on a case-by-case basis with EPA review and approval.

DEQ does not anticipate trades involving bacteria. Bacteria levels in water quality are measured because bacteria are a surrogate for disease-causing organisms that could threaten public health. For this reason, DEQ does not consider it reasonable to encourage trades involving bacteria.

- C. Potential Trades. In addition to the situations identified in Sections A and B above, DEQ has also identified the following potential opportunities for trading in Oregon.
1. Mitigation for the impact of dams and flow withdrawals. In situations where water quality standards are exceeded due to the impact of dams or flow withdrawals, trading could be used to mitigate these impacts. DEQ views the adoption of mitigation measures as preferable to simply removing designated uses, or to establishment of a subcategory of a use. Furthermore, trading may provide a tool for maintaining the use in other parts of the watershed. Therefore, when DEQ reviews a petition from an entity to change a designated use, it may consider opportunities for nonpoint source control as mitigation measures for the entity's impact.
 2. Sediment remediation. In waterbodies with identified sediment contamination problems, potentially responsible parties for cleanup sites

located in the watershed could contribute toward instream sediment remediation activities. This would be in lieu of cleaning up to better-than-ambient levels at contaminated sites. DEQ would view this alternative as acceptable when it could be demonstrated that the environmental improvement resulting from the alternative action is essentially equivalent to the environmental improvement that would result from remediating sediment to risk-based concentrations.

3. Stormwater treatment. In waterbodies with identified sediment contaminant problems, potentially responsible parties for upland as well as instream contaminated sites could contribute toward watershed-wide stormwater treatment. This would be in lieu of cleaning up to better-than-background levels on upland contaminated sites. DEQ would view this alternative as acceptable when it could be demonstrated that the environmental improvement resulting from the alternative action is essentially equivalent to the environmental improvement that would result from remediating sediment to risk-based concentrations.

D. Trading Models. There are a number of different models available for trading. The most appropriate model for a given situation will depend on a number of factors. These factors include but are not limited to: pollutant(s) to be traded, size and hydrodynamics of the trading area, number and type of sources involved, pre-existing regulatory framework and stakeholder preferences. The following examples are provided to illustrate the range of situations that could develop in Oregon. DEQ may elect to consider other models as well.

1. Single “Buyer”. Under this model, a permitted facility may obtain credits from one or more point or nonpoint sources. An example of this type of trade is the temperature trade that DEQ has authorized in the permit for Clean Water Services (CWS). Under this permit, CWS is allowed to offset its excess thermal load via riparian shading and flow augmentation. This type of trade is sometimes referred to as a mitigation trade.

The “single buyer” model also includes situations in which a single permittee with multiple outfalls discharging to the same watershed is allowed to trade credits between outfalls. Again, the CWS permit is an example of this type of trade. It allows CWS to trade BOD and ammonia between its two treatment plants that discharge to the Tualatin River.

2. Multi-Party/Closed Market. Under this model, there are multiple parties involved in purchasing and selling credits. Trading is restricted to point sources specifically named in permits and trading documents authorizing the program, and to pre-approved nonpoint sources.

To date, this model usually involves a specific group of NPDES permit holders, for example a group of municipal wastewater treatment plants

subject to a TMDL. In such closed markets, the facilities covered by the program trade among themselves and are individually and collectively in compliance so long as total loadings remain below the overall cap. Participants may explicitly buy and sell credits on the closed market, or may make decisions about additional treatment options and not actually exchange credits or monies.

Multi-party/closed market programs may involve exclusively point-point trades. An example of such a program is Connecticut's Long Island Sound program for nitrogen. This trading program is being implemented under a general permit covering 79 POTWs. These programs can also be predominantly point-point, such as North Carolina's Neuse River program for nitrogen. In this program, 20 dischargers are covered by a general permit but purchase wetland restoration credits under certain situations. Other multi-party/closed market programs establish both point-point as well as point-nonpoint trading options from the outset. An example is Colorado's Cherry Creek program for phosphorus. Information on this trading program may be found at:
http://www.cherrycreekbasin.org/cc_operation.asp

3. Multi-Party/Open-Market. These programs are similar to the Multi-Party/Close-Market systems except that participation is not restricted to specific sources. Eligibility may be established by other factors, such as location within the trading area, need for credits, and ability to create credits relative to applicable trading baselines. Some believe these models are most suitable for situations where stakeholders are working to maintain good water quality, or in pre-TMDL waterbodies.

There are several advantages to this model. The open market helps maximize incentives and rewards for early action by entities that can create credits. Environmental improvements can be accelerated by allowing participation by third parties. These third parties may include organizations able to facilitate the development of partnerships, resulting in projects of greater size or number than might have occurred otherwise. They may also include environmental organizations or individuals that step in to buy and retire credits. Examples of multi-party/open market systems include those being developed for the Kalamazoo River in Michigan and the Conestoga River in Pennsylvania. Information on these and other trading programs may be found at:
<http://www.epa.gov/owow/watershed/trading/tradingactivities.html>

V. Proposing Trades

- A. Process for Proposing a Trade or Trading Program. A permit holder interested in exploring whether or not trading would be a viable way to achieve compliance with their permit should notify DEQ that they are interested in doing so. It will be

incumbent on the permit holder to demonstrate that the proposed trade will result in an equivalent or better level of environmental protection than would be achieved via a conventional approach to achieving permit compliance, and that proposed trades are consistent with DEQ trading policy. If proposed trades raise issues that cannot be resolved with reference to DEQ's IMD on water quality trading, the issues may be referred to the appropriate staff and/or managers at DEQ Headquarters.

- B. Criteria for identifying acceptable trades. DEQ has established the following criteria for identifying potentially acceptable trades:
1. The trading partners and trading credits to be generated, are located in the same watershed, as defined by a TMDL, watershed management plan, or other DEQ-approved designation.
 2. The impact of the proposed trades can be quantified. DEQ anticipates that most trades will happen within the context of an approved TMDL, though the existence of a TMDL is not a necessary pre-condition for trading. In the absence of an approved TMDL, there should be sufficient information to quantify the proposed trade(s) and its anticipated environmental impacts.
 3. Trading partners are prepared to provide reasonable assurance that the proposed action(s) will be implemented. For point source credits, NPDES permit provisions will provide such assurances. For nonpoint source credits, examples of reasonable assurance include but are not limited to: performance bonds, memoranda of agreement, and third party contracts.
 4. For trades within watersheds for which TMDLs have been developed, trades are consistent with the overall loading cap(s) for the designated waterbody.
 5. For trades involving one or more point sources, the point source(s) is/are operating at or better than technology-based limits. Point sources are not allowed to go below their technology-based standard when they participate in trading, and they must be in compliance with the technology-based standard below they are allowed to trade.
 6. Trading programs should be designed so that trades lead to improvements in water quality. To ensure this, the modeling done to support the TMDL and develop Water Quality-Based Effluent Limits should also be used to define the conditions under which trading may or may not occur, as well as the extent to which it may occur under a particular set of conditions. Modeling assumptions and results should be clearly described in documents describing trading programs, such as permit evaluation reports.

7. Consideration of trading opportunities will not be limited to particular pollutants. However, the Department does not anticipate trades that involve bacteria. The subject of pollutants and parameters that may be traded is covered in more detail in IV.B.
8. A trading partner may generate tradable credits for taking actions only when those activities are not statutory requirements, subject to the applicable trading baselines described in Section III.H. For agricultural areas, this means restoration and/or maintenance of riparian vegetation above and beyond the minimum requirements of SB1010 Agricultural Water Quality Management Area Plans will qualify for water quality trading credit. For areas governed by the Forest Practices Act, this means restoration and/or maintenance of riparian vegetation above and beyond requirements of the Forest Practices Act.

VI. Incorporating Trades into Permits

- A. Approaches to Incorporating Trades into Permits. DEQ will consider the following approaches to incorporating trading trades into NPDES permits as applicable and appropriate:
 1. General conditions in a permit that authorize trading and describe appropriate conditions and restrictions for trading to occur.
 2. The use of alternate permit limits or conditions that establish restrictions on the amount of a point source's pollution reduction obligation that may be achieved by the use of credits if trading occurs.
 3. Authorization of trading within the permit, contingent upon the submittal of an acceptable plan by the permitted source to pursue trading. The plan will be subject to public review and comment, and when it is finalized, it will be incorporated into the permit as a permit modification.

In a basin for which a TMDL has been completed, permit limits may be developed using the same model that was used to set wasteload allocations.
- B. Units of Trade. Clearly defined units of trade are necessary for trading to occur. These may be expressed in terms of energy or mass per unit of time as appropriate to the pollutant to be traded, and consistent with the time periods that are used to determine compliance with permit conditions or other regulatory requirements.
- C. Quantifying Credits and Addressing Uncertainty. Standardized protocols should be defined as part of permit issuance, to quantify pollutant loads, load reductions, and credits. These are needed to account for the generation and use of credits in permits and discharge monitoring reports in order to track the generation and use of credits between sources and to assess compliance. DEQ has developed general approaches for quantifying credits associated with trades involving thermal load,

oxygen demanding substances BOD/ammonia, and nutrients. These are described in Appendices A, B and C respectively. DEQ will continue to develop such protocols as additional trades are identified.

DEQ has identified three different approaches for dealing with uncertainty. These are discussed below along with appropriate applications of each.

1. Trading ratios. The use of greater than 1:1 trading ratios is appropriate between point and nonpoint sources. Such trades are often accomplished through the BMPS, the impact of which is inherently variable. For example, the amount of pollutant reduction that will occur as the result of installing a vegetative buffer will depend on the amount of pollutant delivered to the buffer, the nature of the soils present, the amount of rainfall, and the density, type, age and health of the vegetation itself. For such BMPs, DEQ will elect to use trading ratios to account for the uncertainty associated with them. Appendix C gives examples trading ratios for BMPs to reduce nutrient loading to streams.

Trading ratios may also be used to account for differences in environmental impacts based on distance and hydrological ties to the waterbody of concern where reductions need to show up. For example, a source located a long distance from the waterbody of concern may need to implement greater pollutant load reductions in order to achieve the same benefit as a source located near the waterbody. A trading ratio would be used to account for this, by defining how much greater the pollution reduction would need to be for the source located a greater distance from the waterbody.

2. Margins of Safety. Margins of safety are an appropriate means for dealing with negative circumstances that have a reasonable likelihood of occurring within a particular permit cycle. As an example, though NPDES permits are written for a five year period, DEQ considers it appropriate to have a margin of safety that would take into account natural disturbances that might occur on average about once in ten years, such as a ten year drought.
3. Monitoring of surrogates. When the water quality parameter that a trade is intended to impact is itself inherently variable, DEQ may elect to monitor a surrogate. An example of a water quality parameter that is inherently variable is stream temperature. It varies with weather as well as with the amount of flow in the stream, and these impacts to stream temperature can overwhelm, at least temporarily, the impact of efforts to reduce stream temperature via riparian planting and shading. Therefore, in a temperature trade that involves shade creation via riparian planting, DEQ may elect to require the permit holder to initially monitor plant survival and later on, shade density in lieu of stream temperature.

In situations where DEQ elects to monitor a surrogate, DEQ may also require monitoring in order to establish the accuracy of the surrogate in representing the parameter for trading purposes in particular, and for achieving the water quality goal for the parameter in general.

- D. Consistency with Standard Methods. Where methods and procedures (e.g., sampling/testing protocols, monitoring frequencies) pertaining to NPDES permits are specified by federal or state regulations, DEQ will continue to use these methods where applicable for measuring compliance for point sources that engage in trading. DEQ believes this is necessary to provide clear and consistent standards for measuring compliance and to ensure that appropriate enforcement action can be taken.
- E. Compliance and Enforcement Provisions. All trades will be subject to reporting requirements, consistent with other permitted activities. Sources who fail to comply with reporting requirements will be subject to enforcement provisions in the Oregon Administrative Rules and the Clean Water Act.

Extreme weather conditions or other circumstances beyond the control of the source will be handled in a manner consistent with DEQ guidelines for enforcement.

- F. Public Notice, Comment and Opportunity for Hearing. Notice, comment and opportunity for hearing must be provided for all NPDES permits. NPDES permits and fact sheets will describe how baselines and conditions or limits for trading have been established and how they are consistent with water quality standards.

Appendix A Sample Protocol for Temperature Trading

Overview

Sources that wish to pursue temperature trading will need to submit plans to DEQ explaining how these trades will be implemented. The purpose of this Appendix is to provide sample methodologies that may be used in these plans for quantifying two different types of temperature trades. These two types of temperature trading include shade (achieved via riparian restoration) and flow augmentation. The following is provided for each type of trade:

1. Methodology for determining magnitude of credit
2. Duration of credit
3. Trading ratio, if applicable
4. Methodology for establishing compliance

Trades Involving Shade

1. Methodology for Determining Magnitude of Shade Credit.

The magnitude of the credit will depend on the amount of shaded stream surface that is shaded. The following equation may be used for evaluating the impact of shade:

Heat load offset by shade =

$$\text{Area of Stream Shaded} \times \text{Increase in Shade Density} \times \text{Solar Insolation Rate}$$

Here is some explanation of the terms in this equation.

- Area of Stream Shaded = Average Stream Width x Stream Length
- Increase in Shade Density = Shade Density After Planting – Initial Shade Density. Shade density will be measured via a solar pathfinder, densiometer or alternate method as long as adequate justification is provided.
- Solar Insolation Rate. The Department of Energy publishes solar insolation rates for different parts of the country. The solar insolation rate used to evaluate the impact of shade should correspond to the so-called critical period, usually August.

This calculation will have to be done for each riparian restoration project undertaken to offset a particular thermal load, and then a total for all the projects will have to be determined.

2. Duration of Shade Credit

The duration of the shade credit should be based on consideration of local conditions and alternatives to shade. More specifically, the duration of the credit should be determined as follows:

- i. The time difference between active vs. passive establishment of shade. In other words, how long will it take the trees to grow if they are planted vs. if they are just allowed to establish on their own?

- ii. If the answer to the above question cannot be determined with reasonable certainty and/or existing vegetation is sufficient to prevent establishment of significant, shade-producing vegetation, the duration of the shade credit shall be equal to the amount of time that an equivalent technological solution would be expected to remain in place. For example, the planning horizon for a major plant upgrade involving the installation of refrigeration equipment would be 20 years.

3. Trading Ratio for Shade

To compensate for the fact that the heat load offset by shading will take a number of years to establish, the Department has decided that at the end of 20 years, the heat load offset by shading should be two times the actual excess thermal load. This assumes that the duration of the credit is 20 years.

4. Methodology for Establishing Compliance for Trades Involving Shade

For the first five years after a trade is authorized, compliance will be established with respect to plans that should be submitted by the permit holder demonstrating how trading will be implemented. This includes but is not limited to: a planting plan, a monitoring plan to assess plant survival and a maintenance plan that will promote plant survival and reduce the impact of invasive species.

It is anticipated that once shade is established, efforts to demonstrate compliance will shift from showing that an adequate number of plants are getting planted and are surviving, to showing how much shade they are producing. The amount of shade created by riparian restoration efforts may be calculated according to the equation in Methodology for Determining the Magnitude of Shade Credit. The permit holder will be required to submit an annual report summarizing the results of its credit trading activities for the previous year.

It is anticipated that shade measurements will not be the primary tool used to demonstrate compliance for at least the first five years from the date of permit issuance.

Trades Involving Flow Augmentation

1. Methodology for Determining Magnitude of Credit for Flow Augmentation

Modeling used to develop the TMDL can be used to develop empirical equations that relate instream flow to temperature. These equations can then be used to determine how much thermal credit can be given for a particular rate of flow augmentation.

2. Duration of Credit for Flow Augmentation

The credit will be in effect for as long as the source chooses to practice flow augmentation.

3. Margin of Safety

DEQ may elect to require sources wishing to practice flow augmentation, to propose a margin of safety to account for uncertainty in flow availability or the impact of flow augmentation.

4. Establishing Compliance: Flow Augmentation

The source should provide records showing the amount of flow or flow rights purchased, and then show how much cooling was achieved using equations developed for this purpose.

Re: guaranteeing that water rights purchased or leased long-term translate into more water in the stream, work done by the Oregon Water Trust establishes some precedents in this area. Their process, which is described in their website at <http://www.owt.org/owtiwra.html>, is to purchase or lease water rights from senior water right holders and then transfer those water rights to the Oregon Water Resources Department. The “policeman” for keeping the water in the stream is an employee of WRD, the watermaster. It is important to note that the older the water right, the easier it is to require that water to remain in the stream.

Oregon Revised Statute 537.348 authorizes the lease or purchase of water rights for instream uses. It can be viewed at:

<http://www.leg.state.or.us/ors/537.html>

Appendix B Sample Protocol for Inter and Intra-plant BOD and Ammonia Trading

Under an inter/intraplant BOD⁴/ammonia trading scheme, sources may be allowed to shift loads of oxygen-demanding substances between treatment plants as well as within a particular treatment plant.

To insure that BOD/ammonia trading between plants does not result in water quality standards violations, modeling should be done to determine allowable daily and weekly mass loads under a variety of conditions. These conditions should include, at a minimum:

- Instream flow
- Instream DO levels
- Month of the year
- River temperature

The modeling should also be used to determine the point of maximum impact to water quality, and how this may vary over time.

BOD/Ammonia Trade: Establishing Compliance

When a permit holder elects to trade BOD/ammonia between treatment plants, they should report it on their monthly DMR (Discharge Monitoring Report) form and use the formulas provided in the permit to demonstrate that they are in compliance (or not) with their permit.

⁴ BOD stands for Biochemical Oxygen Demand and is considered to be a measure of the “strength” of a wastewater. It is a measure of the amount of oxygen consumed by microorganisms as they decompose organic material present in the sample. BOD includes carbonaceous biochemical oxygen demand (CBOD) and nitrogenous oxygen demand (NBOD). CBOD is a measure of oxygen consumed by heterotrophic bacteria, or bacteria that consume organic carbon as food. NBOD is a measure of oxygen consumed by autotrophic bacteria, or bacteria that oxidize ammonia to nitrites and nitrates. NBOD is often determined indirectly by measuring nitrogen-containing materials such as ammonia.

Appendix C Sample Protocols for Trades Involving Nutrients

Overview

Note: This appendix is excerpted from the “Resource Guide to Watershed-Based Trading” developed for DEQ in October 2000.

Nonpoint sources wishing to generate tradeable nutrient credits may do so via the adoption of BMPs. Three examples of BMPs are discussed here. They are:

- Grassy Swales
- Vegetative Buffers
- Livestock Exclusion (Fencing)

Grassy swales are channels shaped or graded to have a gentle slope and covered with a dense growth of vegetation. They provide a stable conveyance and encourage runoff to infiltrate into the soil, thus reducing pollutants and decreasing runoff velocity. They are typically used in urban settings around residential and industrial developments, as highway medians, and in agricultural settings.

A vegetative buffer is a strip of vegetation separating a water body from a land use that could act as a nonpoint source of pollution. Vegetated buffers prevent the direct flow of runoff into surface waters. They improve overall bank stability, decrease erosion, and decrease nutrient pollutant loadings. When runoff flows into a buffer, pollutants settle out, adsorb to the soil, and are taken up by vegetation, or infiltrate into the ground.

Vegetated buffers typically contain a heterogeneous mix of cover, including herbaceous and woody species. They are typically used in agricultural, recreational, logging, and open space settings.

The appropriate vegetative makeup of the buffer will vary across the state and by ecosystem type. Staff from the local DEQ, ODFW or SWCD office can provide suggestions as to the type of vegetation and species that are best suited to the site. However, in general, a multi-storied forest of native species is recommended. A wider buffer will increase contact time between runoff and vegetation, and likely increase its effectiveness.

Livestock exclusion involves putting up a barrier, typically a fence, to exclude livestock from riparian areas and allow recovery of riparian vegetation. This can result in securing the banks, lowering stream velocity, trapping suspended sediment, decreasing erosion, and decreasing temperature. In addition, this practice also eliminates direct pollutant loadings from manure deposition in the stream. This BMP is typically used in agricultural settings.

The BMPs listed above reduce the loading of multiple pollutants. Therefore, you may receive credits for more than one pollutant when you implement one BMP. The types of credits available for each BMP are listed in Table 1.

Table 1: Available Credits by BMP

Type of BMP	TP	TN
Grassy Swale	X	X
Vegetative Buffers	X	X
Fencing	X	X

The factors and coefficients listed in this Appendix should be used. If other values can be justified, they can be used subject to review and approval by DEQ.

Table 2: Ratios for the Three Eligible BMPs

Eligible BMP	Suggested Ratio
Grassy Swales	2.5
Planting Riparian Buffer Vegetation	2.5
Fencing of Stream Riparian Areas	2.8

Computations: Grassy Swales

The grassy swales calculations are the simplest and most straightforward of the three BMPs. A simple pollutant load model is used to estimate the baseline load, and an effectiveness factor is applied to determine the reduction achieved.

Data Requirements

You'll need to collect two key pieces of data for grassy swales calculations:

- Your land use areas tributary to the stream, in acres
- Average annual precipitation at your location, in inches *

Calculations

There are four steps to calculating the pollutant reductions from using grassy swales as a BMP:

1. Calculate the annual amount of precipitation that produces runoff:

$\text{Runoff-producing precipitation} = \text{average annual precipitation} \times \text{factor from Figure C-1.}$

Find your location on Figure C-1 at the end of this Appendix and use the percentage from that figure to reduce your average annual precipitation.

2. Calculate the average annual storm runoff for each land use:

$\text{Storm runoff} = 3,630 \times \text{runoff-producing precipitation} \times \text{runoff coefficient} \times \text{land use area}$

Runoff coefficients can be found in Table C-1 at the end of this Appendix. The value 3,630 allows you to convert inches-acres to cubic feet. The resulting storm runoff value is in units of cubic feet per year.

3. Calculate the baseline pollutant load for each pollutant-land use combination:

* For average annual precipitation for your location, contact your local county extension office, your local newspaper, or visit the Oregon Climate Service website: <http://ocs.ore.orst.edu/>

$$\text{Baseline pollutant load} = 0.00006245 \times \text{storm runoff} \times \text{pollutant concentration}$$

Storm runoff was calculated in Step 2 and pollutant concentrations are given in Table C-2. The value 0.00006245 allows you to convert ft³-mg/L to pounds. The resulting load value is in pounds per year for each pollutant.

4. Calculate the pollutant load removed by this BMP:

$$\text{Pollutant load removed} = \text{Baseline pollutant load} \times \text{effectiveness factor}$$

The baseline pollutant load was calculated in Step 3. The effectiveness factors for this BMP are given in Table 3.

Table 3: Percent Effectiveness of Grassy Swales BMP

Parameter	TP	TN
Effectiveness, %	20	35

Computations: Vegetative Buffers

The calculations for vegetative buffers are similar to those used for grassy swales.

Data Requirements

You'll need the following data for vegetative buffers calculations:

- **Your land use areas tributary to the stream, in acres**
- **Average annual precipitation at your location, in inches***

Calculations

As in the grassy swales calculations, there are four steps to calculating your credit for using vegetative buffers as a BMP.

1. Calculate the amount of annual precipitation that produces runoff:

$$\text{Runoff-producing precipitation} = \text{average annual precipitation} \times \text{factor from Figure C-1.}$$

Find your location on Figure C-1 at the end of this Appendix and use the percentage from that figure to reduce your average annual precipitation.

2. Calculate the average annual storm runoff:

$$\text{Storm runoff} = 3,630 \times \text{runoff-producing precipitation} \times \text{runoff coefficient} \times \text{land use area}$$

* For average annual precipitation for your location, contact your local county extension office, your local newspaper, or visit the Oregon Climate Service website: <http://ocs.oce.orst.edu/>

Calculations

As in the previous two BMP credit calculations, there are multiple steps to calculating your credits if you select fencing as your BMP. The first four steps are related to TSS pollution reductions that occur as vegetation is restored along the riparian corridor. Those reductions are added to the reductions calculated in Steps 6 through 10, which are related to pollution reductions directly resulting from excluding livestock from the stream.

1. Calculate the amount of annual precipitation that produces runoff:

$$\text{Runoff-producing precipitation} = \text{average annual precipitation} \times \text{factor from Figure C-1.}$$

Find your location on Figure C-1 at the end of this Appendix and use the percentage from that figure to reduce your average annual precipitation.

2. Calculate the estimated average annual storm runoff:

$$\text{Storm runoff} = 3,630 \times \text{runoff-producing precipitation} \times \text{runoff coefficient} \times \frac{\text{land use area}}{\text{area}}$$

Runoff coefficients can be found in Table C-1 at the end of this Appendix. The value 3,630 allows you to convert inches-acres to cubic feet. The resulting storm runoff value is in units of cubic feet per year.

3. Calculate the baseline TSS load:

$$\text{Baseline pollutant load} = 0.00006245 \times \text{storm runoff} \times \text{TSS concentration}$$

Storm runoff was calculated in Step 2 and TSS concentrations are given in Table C-2 at the end of this Appendix. The value 0.00006245 allows you to convert cubic feet to pounds. The resulting load value is in pounds per year.

4. Calculate the TSS load removed by this BMP:

$$\text{Pollutant load removed} = \text{Baseline pollutant load} \times \text{effectiveness factor}$$

The baseline TSS load was calculated in Step 3. The effectiveness factor for TSS for this BMP is 60%.

5. Calculate the annual pollutant deposited by livestock manure for TN, TP and bacteria:

$$\text{Annual pollutant deposition} = \text{head} \times \text{avg weight} \times \text{pollutant deposition rate} \times \frac{365 \text{ days/yr}}{\text{days/yr}}$$

Pollutant deposition rates are found in Table C-3 at the end of this Appendix.

7. Calculate the baseline pollutant load from livestock manure that is delivered to the stream:

This step assumes certain values for a) the percent of pollutant that is delivered to the stream from each zone, and b) the percent of time livestock spend in each zone. You should use your own values for these percentages if you have more accurate data. Repeat this step for each TP and TN.

From the riparian zone:

$$\text{Baseline pollutant load} = \text{pollutant deposition} \times 100\% \text{ delivery} \times 28\% \text{ time distribution}$$

From the near-upland zone (within 1/4 mile of the stream):

$$\text{Baseline pollutant load} = \text{pollutant deposition} \times 20\% \text{ delivery} \times 36\% \text{ time distribution}$$

From the far-upland zone (beyond 1/4 mile of the stream):

$$\text{Baseline pollutant load} = \text{pollutant deposition} \times 10\% \text{ delivery} \times 36\% \text{ time distribution}$$

The pollutant deposition values were calculated in Step 6. The resulting baseline pollutant load values are in pounds/year. Approximately half of the nitrogen will be lost to the atmosphere through ammonia volatilization, so apply a 50% field loss factor to your estimates of TN pollutant load.

8. Calculate the reduction in pollutant load from livestock manure:

Repeat Step 7, but assume a 0% time distribution for the riparian zone (reducing the load from that zone to zero), and a 50% time distribution for each of the upland zones. The difference in pollutant load between Step 7 and Step 8 equals the reduction in pollutant load from livestock manure. Repeat this step for TP and TN.

9. Calculate the baseline TSS pollutant load from sediment caused by livestock:

This calculation assumes that 60% of the soil entering the creek will become TSS. It also assumes that the livestock spend 28% of the time in the riparian zone ($0.60 \times 0.28 = 0.168$). If you have more accurate data, you should recalculate this factor.

$$\text{Baseline TSS load} = \text{head} \times 1\text{ft}^3/\text{animal}/\text{day} \times 0.168 \times 87.4 \text{ lbs}/\text{ft}^3 \times 365 \text{ days}/\text{yr}$$

The resulting TSS load is in pounds per year. The potential reduction in this pollutant is equal to the baseline value.

10. Calculate the baseline TP pollutant load from sediment caused by livestock:

$$\text{Baseline TP load} = \text{baseline TSS load} \times 0.4$$

The baseline TSS load was calculated in Step 9. 40% of the TSS load is assumed to be phosphorus attached to the soil particles. The resulting TP load is in pounds per year. The potential reduction in this pollutant is equal to the baseline value.

11. Total all the potential pollutant reductions:

Add each of the TN and TP reduction values calculated in Steps 8 and 10 to get the total pollutant reduction from this BMP.

Table C1: Runoff Coefficients By Land Use

Land Use	Runoff Coefficient
Urban	0.59
Logging	0.22
Agriculture	0.25
Industrial	0.68
Open Space	0.14

Table C2: Pollutant Concentrations Typical for Indicated Land Use

Land Use	TSS, mg/L	TP, mg/L	TN, mg/L
Urban	64.00	1.000	6.500
Logging/post clear-cut	38.00	0.015	0.034
Agriculture (Crops)	8.93	0.210	2.620
Agriculture (Grazing)	3.90	0.480	4.200
Industrial	102.00	0.380	1.530
Open Space	58.00	0.160	0.690

Table C3: Pollutant Deposition Rates for Beef Waste

Component	Units	Feeder, yearling – 750 to 1,100 lb – High Forage Diet	450 to 750 lb	Cow
N	Lb/day/1000#	0.31*	0.30*	0.33*
P	Lb/day/1000#	0.11*	0.10*	0.12*
* Include the units for pollution deposition rates when computing the annual pollutant deposition (e.g. <u>0.33 lb/day</u>) 1000 lb				

Figure C1: Percent of Annual Precipitation that Contributes to Runoff

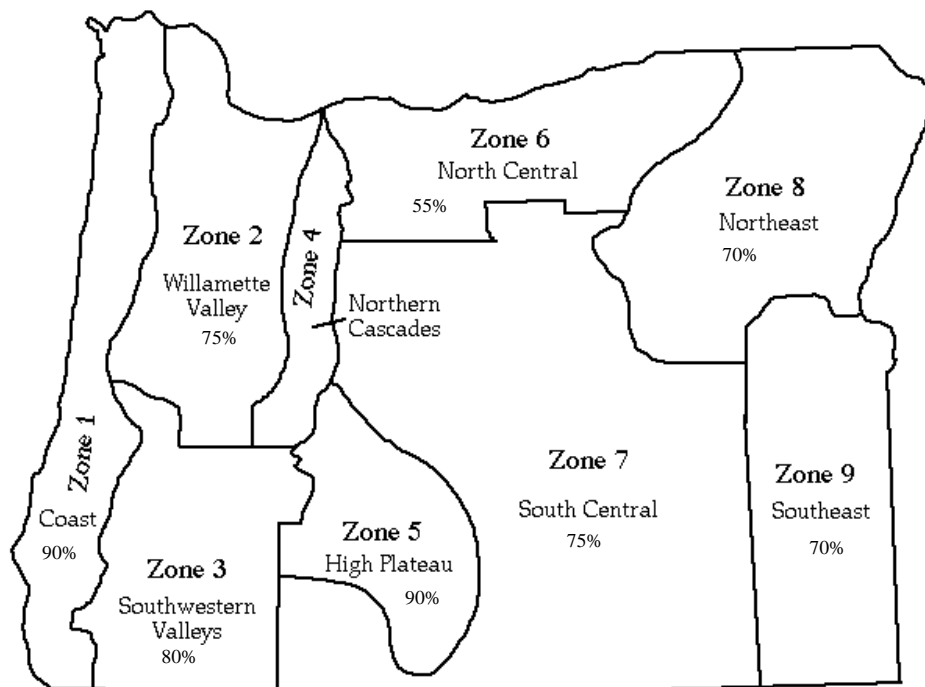


Figure C2: Regional Designations for the Stream Temperature Model