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State of Washington

Final Cost-Benefit and Least Burdensome Alternative Analysis

Chapter 173-700 WAC
Wetland Mitigation Banking

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Wetland Mitigation Banking

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Executive Summary

The rule for compensatory wetland mitigation banking offers a clearly superior alternative to the existing method of concurrent mitigation. The new approach offers:

- Higher success rates in creating functional compensatory wetlands
- Economies of scale in construction/restoration of wetlands
- Lower replacement ratios as a result of more reliable success
- Reduced costs of permitting and regulatory oversight
- Reduced gap between wetland losses and associated mitigation

Where these values are quantifiable, wetland mitigation banking could provide net benefits of **$2.3 million per year**, as compared to current practice.

Quantitative analysis also indicates that avoiding impacts to existing wetlands is preferred to both concurrent mitigation and wetland mitigation banking. This supports the current priority of minimizing development impacts to existing wetlands, and counteracts concerns that mitigation banking creates an economic incentive to relocate all wetlands.

For these reasons, the option of wetland mitigation banking is financially and socially appealing to:

- Businesses and individuals undertaking mitigation.
- Investors and wetland bankers seeking to sell credits.
- The population and environment of Washington State as a whole.

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CHAPTER 1: Introduction

The Administrative Procedure Act – Chapter 34.05 Revised Code of Washington (RCW) – requires that, before adopting a significant legislative rule, Ecology must, "Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented." [RCW 34.05.328(1)(c)]

The authorizing statute created the Wetland Mitigation Banking (WMB) program through its directive in RCW 90.84.030, that "The department, through a collaborative process, shall adopt rules for (1) certification, operation and monitoring of wetlands mitigation banks." For this WMB rule implementing the statute, this means Ecology must estimate the impacts of the elements of the mitigation banking program over which it had control. These are impacts on individuals, businesses and the public, including changes in costs and changes in the value of services provided by wetlands in the state. Impacts are determined as compared to the current regulatory environment—the way wetland mitigation would occur in the absence of the rule—of concurrent mitigation (CM).

Ecology could not confidently separate the general statutory creation of WMB from the rule content defining specific compliance requirements. Therefore, Ecology evaluated the impacts of the program as a whole.

This document provides the public with an overview of the methods Ecology used to perform its analysis, and the most likely impacts found.

Participation in WMB

Usually, a rule imposes some new requirement on a set of individuals or businesses, and Ecology determines whether the expected benefits of the rule outweigh the cost of meeting the new requirements. This rule is different, because participation in WMB is a voluntary choice for developers seeking mitigation, who have the option of choosing WMB or the existing CM method. Moreover, without the rule, no further mitigation banks could be certified and used in a streamlined way, so mitigation banks entering the market under the rule are expected to do so only if it generates a nonzero profit for them.

It is arguable, however, the authorizing statute creates a WMB industry. While participation in any industry is voluntary, this rule has requirements the industry must comply with. This interpretation that the rule imposes costs on an existing industry is similar to the case of regulation of other industries in the state.

Consequently, Ecology does not believe the rule creates real compliance costs for developers seeking mitigation for unavoidable wetland impacts, after the expected purchase and sale of wetland bank credits occurs. Any party wanting to mitigate wetland impacts will only choose WMB over existing CM methods if banking is the less costly mitigation option for them (as opposed to CM, or even costly project adjustments, or cancellation, to avoid more wetland

impacts). Similarly, parties that create wetland banks to sell credits will only do so if it is profitable, and would not be able to create a mitigation bank under current rules. Some WMB participants may experience cost-savings by choosing WMB over existing CM methods in mitigation, or may generate profits by choosing to create and sell credits.

History

Wetland Services

Wetlands serve many important types of function for society—to flow and storage of water, to wildlife and ecology, and to people. In particular, wetlands play a vital role in:

- Flood protection and flood control
- Groundwater recharge and reliable flow of surface waters
- Water filtration and purification
- Erosion control
- Wildlife habitat
- Recreation
- Research and education
- Regional economic vitality

Wetlands provide some or all of these services simultaneously. Alone, any of these services can be of great value to the environment or to society, but taken together, they indicate that wetland areas can be highly beneficial, even as compared to other land uses.

Markets capture some of the values of wetland services, when wetland services are bought and sold. Some of these values, however, are difficult or impossible to capture in existing markets, and are excluded from market prices. For this reason, markets tend to undervalue wetlands.

Unconstrained markets typically omit certain types of values when pricing goods and services. Of particular importance to wetland valuation are the values of services that involve:

- Externalities
  An externality is a (positive or negative) impact on a third party that is not reflected in market transactions. For example, when a private wetland that provides flood protection for the surrounding area is sold, the price reflects only the value of the acreage to the buyer and seller—not the additional value to nearby homes and businesses.
- Public Goods
  A public good can be used or enjoyed by multiple individuals without diminishing the benefit any particular individual receives. For example,

wetlands used for research and education provide information that can be used by many individuals, and one person using that information does not reduce another's ability to use it.

Since the 1960s, the increasing awareness of this valuation problem has led to regulations that constrain the filling or draining of wetland that can occur typically with commercial, residential, or agricultural development. These regulations have especially attempted to preserve the many wetland services that are endangered by market undervaluation.

Wetland Mitigation

Wetland impacts require a permit from the US Army Corps of Engineers (Corps), in consultation with the US Environmental Protection Agency (EPA) and a state water quality certification or administrative order. These all require sequencing:

1. The developer must first try to avoid the impact altogether.
2. Barring (1), he must minimize the area of the impact
3. To the extent possible, impacts must be made temporary.
4. Finally, impacts that remain after the preceding three steps are termed "unavoidable" impacts, which must be offset by mitigation – the construction, restoration, enhancement or preservation of another wetland.

The Corps' stated goal is "no net loss" of wetlands, and its existing standard for achieving that goal is compensatory mitigation. The federal rule, *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*, shows a subtle compensatory mitigation hierarchy of wetland mitigation banking, in-lieu fees, and then concurrent mitigation (CM). The previous standard for achieving "no net loss" was CM, in which a developer is granted a permit for unavoidable impacts in return for a promise to create, restore or enhance other wetland acreage, either on the same development site itself or relatively nearby. The impact to the existing wetland and the creation of the new one happen (more or less) concurrently during site development. Sometimes the developer is allowed to pay for the preservation of some other already existing wetland as compensation for unavoidable impacts.

Wetland mitigation banking (WMB) changes the order of events. A developer, public agency, or entrepreneur performs mitigation first, whether in the form of creation, restoration, enhancement or, exceptionally, preservation of a wetland. The value of this wetland is stored as credits in a wetland bank. When a later development results in unavoidable wetland impacts, the developer responsible for that impact has the option of purchasing credits from the bank, instead of creating or restoring a wetland directly.

Mitigation Banking

The concept of mitigation banking has been around since the 1970s. In 1995, federal agencies released guidance on establishing, using, and operating mitigation banks. Recently there has been a renewed interest in mitigation banks as a regulatory tool, because mitigation banking creates economic incentives for restoring, creating,

enhancing and/or preserving wetlands, where otherwise little or no functional compensation would occur. These economic incentives provide opportunities to change developer behavior in ways that benefit both the developer seeking mitigation, and the public and environment that receive wetland services.

Mitigation banks typically involve the consolidation of many small wetland mitigation projects into a larger, potentially more ecologically valuable site. Further, mitigation banks create compensation prior to affecting a wetland at another site. This ensures the success of the mitigation before unavoidable damage occurs at another site. With proper implementation and guidelines, mitigation banking has the potential to:

- Increase ecological benefits.
- Save money for project applicants.
- Improve efficiencies in application and permitting processes.

The rule identifies the criteria necessary for implementing an environmentally sound banking system in Washington State.

Regulatory Baseline

Wetlands are regulated under many statutory authorities. Regulatory agencies from the federal, state and local governments all have an interest in overseeing wetland protection.

Under current regulatory programs, parties seeking permits for activities that affect wetlands must first avoid and then minimize those effects. Any remaining damage must be compensated for. Historically, the regulatory preference for compensation has been on-site creation, restoration, or enhancement of a wetland. These mitigation efforts have resulted in several smaller "postage stamp" wetlands that have had limited success in reaching full functional potential.

Under the rule, the sequencing of avoidance, minimization, and compensation still applies prior to using credits from any mitigation bank. However, in contrast to traditional mitigation activities, mitigation banking requires that compensation—restoration, creation, enhancement, and/or preservation—occurs before a site is affected by a project. Bank projects are in place prior to allowing unavoidable impacts by a project. WMBs are not, however, the only requirement for permitting of wetland impacts for development under the rule or Corps standards. Permitting of unavoidable wetland impacts and their mitigation take into account multiple aspects of a development project, and the procedure of avoiding and minimizing impacts to existing wetlands still holds.

Wetland credits are generated by this up-front activity, either at a self-owned sponsored wetland bank (generally public agency or large developer), or through entrepreneurial creation of wetland banks. Credits can then be used by the bank sponsor (to mitigate his own wetland impacts at other sites), or sold to another party to offset impacts to wetlands that occur in other locations. Credit sales may only occur after the bank has become functional in providing wetland services, or when sufficient financial assurance has been provided to do so, accounting for risks of wetland failure. Again, only impacts that

cannot be avoided or minimized are available for compensation through credits from a mitigation bank.

Changes under the Rule

The law, Chapter 90.84 RCW, Wetlands Mitigation Banking, provides no new authority for regulating wetlands other than wetland bank projects. Current sequencing practices of avoidance, minimization, and compensation still apply. However, the rule (WAC 173-700) focuses on procedures for certifying banks, as well as the process for implementing banks. Essentially, the rule oversees another tool in the regulatory toolbox for protecting wetlands.

Certification occurs under the rule at the state level, based on multiple site-specific components. These include things such as, surrounding area, water, land-use, development, ownership, financial, and management needs. The certification has the broad goals of establishing banks in locations appropriate to the local wetland impacts being mitigated, where they fit in with local zoning law and agricultural production, and where they will provide the long-term wetland services that credit purchasers pay for. These informing components are further discussed below, under Mitigation Bank Prospectus and Mitigation Banking Instrument.

Ecology analyzed the net benefit to the State of Washington, of replacing CM with WMB where practicable.

Analytical Format

The remainder of this analysis is organized into the following chapters:

- Benefits and Costs of the Rule (Chapter 2): Qualitative discussion of the likely benefits and costs arising from the rule, as compared to the baseline of CM.
- Quantified Costs and Benefits (Chapter 3): Methodology and results of quantitative analysis, where possible.
- Observations and Conclusions (Chapter 4)
- Least Burdensome Alternative Analysis (Chapter 5)

CHAPTER 2: Benefits and Costs of the Rule

The primary factors in the assessment of costs and benefits of wetland mitigation banking (WMB) over concurrent mitigation (CM) are discussed below. They are listed and described qualitatively in this chapter, along with a description of the way they are included in the analysis.

Description of Benefits

Assured Success

CM—where the wetland impact happens first, followed by construction or restoration—provides no guarantees that the mitigation will be successful, and the mitigation may not even be undertaken at all. In principle, the regulator could deal with unsuccessful efforts by requiring remedial action to ensure that there was some form of effective compensation for wetland impacts that have already occurred, but this is politically and administratively difficult, and rarely occurs.

Under WMB, few credits are released before construction of the new wetland is complete, and some credits are withheld from release until there is a record of accomplishment to provide reasonable confidence in success. This ensures that wetland impacts are offset mostly or entirely by functioning wetlands.

Method of inclusion:
In the numerical estimation, Ecology used known long-term success rates for CM and hypothesized long-term success rates for WMB.

Concentration of Expertise, Quality of Work

When there are many small-scale CM projects, much of it can be done by people with no particular experience in creating functional wetlands. Even when consultants are hired, they may not necessarily guarantee the future success of the wetland under CM. With larger wetlands constructed or restored under WMB, greater expertise in wetland creation can be used more efficiently to compensate for cumulative wetland impacts.

Moreover, because WMB requires wetland banks to be functional prior to their use in mitigation, there is incentive to use extensive expertise in their creation. Although less expertise may be cheaper, it can reduce or eliminate the expected gains of a mitigation bank by reducing the likelihood of creating a successfully functioning wetland.

Method of inclusion:
Qualitative, but also reflected in the increased likelihood of success under WMB in numerical estimation.

Compensation for Cumulative Piecemeal Impacts

Many wetland impacts are in small fractions of an acre. In such cases, a permit may be granted without requiring compensation because the cost of CM of a small area would be very large compared to the individual impact. This is because fixed costs of mitigation—for example the costs of bringing equipment to a site—are incurred whether the site is small or large, and the cost per acre of wetland mitigated is therefore higher at smaller sites.

Cumulatively, small, piecemeal impacts add up to significant total loss of wetlands across the state. Because WMB allows a developer to pay for credits in exchange for small wetland impacts, rather than fitting a compensatory wetland into the development plan (or failing to compensate for very small wetland impacts), WMB provides an economically viable way of compensating for these individual small losses.

Method of inclusion:
Qualitative.

Reduced Construction Costs

WMB allows for cost savings in two ways:

- First, though the work will tend to be of higher quality than under CM (see "Concentration of Expertise, Improved Quality of Work, above), for any given quality of work there are economies of scale achieved by building larger wetlands.
- Second, land development can drive up relative land prices in areas where unavoidable wetland impacts occur. While WMB does not allow the mitigation bank to be too far from the impact location, it is likely to be in a significantly more rural area where land is cheaper, on average, and specifically on land with lower market profit-earning capacity than a WMB, including existing wetlands for preservation or restoration.

Method of inclusion:
Ecology used estimates from studies of the cost of construction for variously sized and located wetlands, as well as actual CM costs, and WMB prices and construction costs.

Reduction of Temporal Loss

Under CM, the impact to the existing wetland and the creation of the compensatory wetland happen (more or less) concurrently during a development project. However, there is a lag between creation or restoration of a CM wetland and its actual functionality. Therefore, although the impact of the development is

eventually compensated, there is a time window during which wetland services are missing, and this gap is known as temporal loss.

WMB does not eliminate this loss, but it is likely to reduce it. Since the mitigation bank exists (or financial assurances are available to maintain its existence) before its credits are used for mitigation, the compensatory wetland is more likely to be functioning at the time that another wetland is impacted by development.

Method of inclusion:
In numerical calculations, Ecology applied estimated temporal losses under CM and WMB to estimates of wetland values that are missing during the gap between wetland impacts and compensatory wetland function.

Improved Regulatory Oversight

Regulatory agencies have limited budgets and staff time, making it difficult to adequately monitor the construction and maintenance of every small compensatory wetland around the state. This reduces the certainty with which Ecology can enforce current CM requirements over the long run, and ensure compliance. WMB allows agencies to focus their efforts on fewer areas, achieving higher compliance on the same enforcement budget.

Method of inclusion:
Qualitative.

Increase in Value from Relocation

The possibility of relocating wetlands from developed areas to rural districts under WMB (instead of CM on-site or nearby in the developed area) itself has social benefits and costs.

On the benefits side,[1] some wildlife functions of wetlands are better served by larger, contiguous areas than by piecemeal habitat. Whereas many species will not enter developed areas or thrive in them—making urban pocket wetlands less valuable as habitat for them—a mitigation bank can be sited to contribute to a wildlife corridor.

Method of inclusion:
In numerical calculations, Ecology included estimates of possible differences in the value of urban versus rural wetlands. In addition, Ecology used an approximate change in urban-to-rural value that was calculated in the literature based on numerous studies of wetland value.

[1] The costs side of the change in value due to relocation is discussed below, under Decrease in Value from Relocation.

Reduced Permitting Costs for Development

WMB "front-loads" the cost of obtaining necessary permits. Under CM, the permitting process can take well over a year, as regulators consider a site-specific mitigation plan to determine whether it provides adequate compensation for planned impacts. The process of establishing a bank is more extensive—in order to ensure that the wetlands created will be functional and useful. However, once the bank is established, getting approval to buy credits from the bank is faster for developers than going through the permitting process for a site-specific mitigation project. The time savings occur since the developer does not need to find and acquire a mitigation site, hire a wetland consultant for design or have agency review of the mitigation site design. It also involves far less uncertainty regarding the mitigation's success. This is a savings of both out-of-pocket expenses and time.

Method of inclusion:
Qualitative.

Improved Regulatory Coordination

Just as WMB front-loads developers' permitting costs, it concentrates and reduces the total costs incurred by regulatory agencies in overseeing a given amount of mitigation. Multiple agencies have a hand in approving wetland impacts, and there is some overlap in the information they require of developers. The WMB process brings together representatives of all the relevant agencies to consider the different aspects of the proposed bank in a coordinated fashion. Such coordination allows the agencies to provide higher quality oversight at less cost to the state and federal treasuries, which in turn means less cost to the state and national economy. Coordination is also a savings for developers who can deal with a single regulatory entity rather than with several, and who can avoid duplicate information requirements.

Method of inclusion:
Qualitative.

Description of Costs

For more in-depth analysis of compliance costs incurred by those businesses required to comply with the rule, see the associated Small Business Economic Impact Statement (Ecology publication #09-06-027).

Decrease in Value from Relocation

While relocation has habitat benefits for certain species, some desirable species can co-exist with relatively dense human settlement, as long as patches of habitat are provided for them. If WMB facilitates a significant shift of wetlands from urban to rural areas, it will undercut the possibility of such coexistence. Beyond wildlife, wetlands also provide water quality and quantity functions which depend

on their location in the landscape. Furthermore, there are direct uses of wetlands for recreation and education, which increase with proximity to people; these will be diminished by urban-to-rural relocation.

Method of Inclusion:
In numerical calculations, Ecology included estimates of possible differences in the value of urban versus rural wetlands. In addition, Ecology used an approximate change in urban-to-rural value that was calculated in the literature based on numerous studies of wetland value.

Mitigation Bank Prospectus

Prior to the certification of a bank, the rule requires the bank sponsor to create and submit a bank prospectus. The prospectus includes:

- Goals and objectives of the bank.
- Description of the location of the bank.
- Statement of how the bank meets watershed restoration needs.
- Rationale for site selection.
- Description of the general need for the bank.
- Site maps.
- Description of the existing conditions of the site, including:
    - Current land ownership
    - Zoning
    - Current land use
    - Liens or easements
    - Water Resource Inventory Area
    - Wetland types and classes
    - Other habitat
    - Water sources
    - Wetland functions
    - Risk analysis of bank success
    - Existing mitigation
- Conceptual site design, including:
    - Proposed types and size of wetlands
    - Habitats
    - Functions
    - Alterations to hydrology
    - Grading
    - Structures
- Figures illustrating the bank design.
- Proposed service area.

- Discussion of water rights context.
- Permanent protection mechanism.
- Long-term management and ownership plans.
- Potential impacts on agricultural land.
- Sponsor qualifications.
- Design team qualifications and expertise.

Ecology expects bank sponsors to incur costs for creating a banking prospectus, as based on the time commitment and level of expertise necessary to evaluate each element of the prospectus. Ecology expects that the size of the bank will be an important factor in the level of difficulty and expertise necessary to create the prospectus.

Method of inclusion:
Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative and less confident net benefit estimates if a credit was taken to represent multiple acres of wetland bank. Available data on both wetland banking credit costs, and the wetland services created by banks is largely reported per-acre, and Ecology chose not to extrapolate costs and benefits for credits representing more than one acre, as it would have increased uncertainty in the estimation, while producing less conservative estimates of both costs and benefits.

Mitigation Banking Instrument

The banking instrument describes how the site conditions, management, and credit availability and tracking will function in the wetland mitigation bank. This document describes in detail the short-run and long-run qualities and management of the bank, as well as how bank credits will be created and where they can be used.

The rule requires the banking instrument to contain more detailed information to what is in the mitigation bank prospectus:

- Goals and objectives of the bank.
- Site location information.
- Existing site conditions.
- Statement of how the bank meets existing watershed restoration needs.
- Detailed description of the proposed bank.

- Current land ownership.

The banking instrument must also include:

- Description of sponsor responsibilities for:
  - Construction implementation
  - Monitoring
  - Reporting
  - Maintenance
- Description of the service area of the bank.
- Potential number of credits generated, and description of the credits.
- Restrictions on credit use.
- Documented water rights.
- Evaluation of historic, cultural, and archeological resources of the site.
- Credit tracking and accounting procedures.
- Reporting requirements.
- Performance standards.
- Credit release schedule.
- Monitoring standards and reporting plan.
- Adaptive management plan and statement of the responsibility for contingency action.
- Financial assurances.
- Ownership arrangements and long-term management plan.

Method of inclusion:
Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank. Available data on both wetland banking credit costs, and the wetland services created by banks is largely reported per-acre, and Ecology chose not to extrapolate costs and benefits for credits representing more than one acre, as it would have increased uncertainty in the estimation, while producing less conservative estimates of both costs and benefits.

Construction and Financial Assurance

Depending on the current state of a bank's land, construction may be required to create wetlands that generate credits for use or sale. This can range from protection of existing, functional wetlands, to wetland restoration, to creation of entirely new wetlands.

Normally, Ecology would not consider full construction costs in its analysis, as they are generally the costs of doing business (creating a product to be sold – credits), rather than costs imposed directly by Ecology. However, because Ecology sets the standards for wetland banks, and defines and evaluates the number of mitigation credits the bank can produce, Ecology has included construction costs in its analysis. This generates a very conservative cost estimate. The rule's standards may impact the size of construction costs, or how construction is performed.

Moreover, Ecology requires financial assurance of construction costs for banks that obtain an early release of credits prior to completing construction. In light of this additional compliance cost, Ecology considered construction costs an important component of evaluating the possible decisions of bankers regarding whether to secure an early release of credits, or whether to incur financial assurance requirements.

Method of inclusion:
Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank. Available data on both wetland banking credit costs, and the wetland services created by banks is largely reported per-acre, and Ecology chose not to extrapolate costs and benefits for credits representing more than one acre, as it would have increased uncertainty in the estimation, while producing less conservative estimates of both costs and benefits.

Monitoring and Financial Assurance

The rule requires planning and implementation of performance standards, and scheduled monitoring and reporting of compliance. If bank credits are released before attaining all performance standards, the rule requires financial assurance for monitoring and maintenance expenses. Financial assurance is based on the future monitoring and maintenance costs for the operational life of the bank, and site-specific risks to the bank and surrounding areas that may require future funding to address.

Method of inclusion:

Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank.

Long-Term Management and Financial Assurance

The rule requires financial assurance for long-term management of the bank. Financial assurance is based on future costs of annual maintenance, and on expected inflation. It can be funded though contract mechanisms such as endowments or trusts, and must ensure an ownership transfer mechanism for the bank.

Method of inclusion:
Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank. Available data on both wetland banking credit costs, and the wetland services created by banks is largely reported per-acre, and Ecology chose not to extrapolate costs and benefits for credits representing more than one acre, as it would have increased uncertainty in the estimation, while producing less conservative estimates of both costs and benefits.

Financial Assurances

Ecology expects wetland mitigation bankers to choose behaviors with the highest long-run net benefit. In making decisions in light of financial assurance requirements, bankers face three options:

- Receive credits before construction is complete, and before performance standards have been attained, incurring up-front financial assurance costs for construction and monitoring.
- Receive credits after construction is complete, but before performance standards have been attained, incurring up-front financial assurance costs for monitoring.
- Wait to receive credits, until construction is complete and all performance standards have been attained, avoiding financial assurance costs for construction and monitoring.

In all of these cases, financial assurance costs for long-term management would still be incurred. The size of these assurances depends on site-specific attributes of the bank, as well as possible risks to long-term functionality and surrounding property.

Ecology assumed that bankers will choose the option with the highest present-value net benefit. This means, depending on expected credit prices and sales, bankers will choose the option that will bring the highest return in present value, accounting for the flow of future costs and revenues. For the SBEIS, however, Ecology analyzed the highest compliance cost scenario, in which all three forms of financial assurance are required.

Method of inclusion:
Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank. Available data on both wetland banking credit costs, and the wetland services created by banks is largely reported per-acre, and Ecology chose not to extrapolate costs and benefits for credits representing more than one acre, as it would have increased uncertainty in the estimation, while producing less conservative estimates of both costs and benefits.

Monitoring and Reporting

The rule requires wetland bankers to monitor and report on conditions at the bank. The bank instrument describes, in part, what variables will be monitored, and how they will be monitored and evaluated. The plans and protocols for monitoring the wetland bank, and the schedule for reporting site conditions are described in the banking instrument submitted by the banking certification applicant.

Monitoring and reporting includes, but is not limited to:

- Document baseline conditions after construction.
- Document development of the site.
- Document attainment of performance standards.
- Identify possible problems at the site.

These items document data and methodologies for bank quality evaluation over time, as based on data gathered at the site.

Method of inclusion:

Ecology used existing WMB credit prices in all WMB cost calculations, to represent the total present value costs of construction and compliance per acre. This present value price represents the discounted sum of all future cost flows. While credits are not always defined as acres, Ecology conservatively assumed that one credit represents one acre, as it would have generated less conservative net benefit estimates if a credit was taken to represent multiple acres of wetland bank.

Qualitative Conclusion

Based on the impacts of WMB that can only be evaluated qualitatively, Ecology found that they add a positive and possibly large benefit to any quantifiable impacts estimated in Chapter 3. These—exclusively positive—qualitative factors include:

- Concentration of expertise and quality of work
- Compensation for cumulative piecemeal impacts
- Improved regulatory oversight
- Reduced permitting costs of development
- Improved regulatory coordination

Moreover, use of WMB generates benefits both for those required to comply with existing wetland mitigation requirements, and for a society as a whole, because it values wetlands for the services they provide to the environment, wildlife, and people. This indicates WMB is likely to be an effective and appealing addition to existing mitigation options.

CHAPTER 3: Quantified Costs and Benefits

Ecology's quantitative analysis develops an estimate of costs per acre for a representative concurrent mitigation (CM) project, and an estimate of costs per acre for a wetland mitigation bank (WMB) designed to provide the same wetland function, as well as the benefits stemming from each project. It then calculates the net benefit (difference between benefits and costs) of each project. The difference between the results for the two mitigation techniques is the annual net benefit of using WMB rather than CM.

In an analysis of net benefits to Washington State, Ecology did not differentiate between cases in which a party seeking mitigation owns or sponsors its own bank, and cases in which parties seeking mitigation purchase credits from entrepreneurial banks. In a net benefits analysis, these cases are equivalent. For further analysis of the compliance costs associated with exclusively wetland bank creation and certification, see the associated Small Business Economic Impact Statement for the rule (Ecology publication #09-06-027).

Ecology developed a model to calculate the net benefit of the rule based on nine input variables. The model and the input variables used are described in this section.

Model Inputs

Ecology's model incorporates nine inputs, with values based on existing data, literature, and Ecology's experience with wetland mitigation. These inputs and value sources are:

Number of WA acres annually impacted by development

Value	Source
100 acres per year	Ecology's wetland mitigation database for years 2004 through 2007

Percentage of annual impacted acreage possibly mitigated by WMB

Value	Source
25 percent	Assumed. Based on goal of "no net loss" of existing wetland, and priority given to avoiding or minimizing wetland impacts from development. Since Ecology performed calculations based on per-acre/per-year values, the number of acres possibly mitigated by WMB only scales the overall results.

Replacement ratio

The number of acres required in mitigation to compensate for each acre of impacted wetland.

Value for CM	Source
1 to 6 acres	Existing mitigation ratios required for this form of mitigation (Ecology, et al., 2006)

Value for WMB	Source
1 to 5 acres	Rule language for WMB replacement ratios

Wetland construction success rate

Value for CM	Source
21 to 46 percent	Ecology analysis of CM projects found to be "successful" or "moderately successful" (Johnson, et al., 2002). The literature for CM nationwide indicates a success rate between 12 and 50 percent (see Brander, et al., 2006), and the Washington-specific success rate falls within this range.

Value for WMB	Source
70 to 95 percent	It is difficult at this time to determine long-term success rates of wetland banks. The literature indicates "higher" or "extremely high" success rates as compared to CM (see, e.g., Ecology, 2006; Environmental Law Institute, 2002; and Salzman & Ruhl, 2006).

Difference between urban and rural wetland values

Value	Source
1.1 percent urban-to-rural relocation loss	Based on a recent published meta-analysis of the comprehensive wetland values literature (Brander, et al., 2006)

Total value of wetland services

Value	Source
$23,600 to $1.7 million per acre	Ecology surveyed the wetland values literature, and summarized value ranges for each wetland function (see Appendix A). The overall value range for the *total* value of wetland services per acre is based on the viable combinations of individual function values. Total values were included where available.

Duration of temporal loss

Value for CM	Source
5 to 10 years	Assumed. Mitigation typically occurs at or around the time of wetland impacts, but functionality is delayed. Ecology generally evaluates project success after a 10-year monitoring period.

Value for WMB	Source
0 to 5 years	Assumed. The bank from which credits are purchased has already been constructed at the time of wetland impacts, but full functionality may be delayed depending on the age of the bank.

Discount rate for temporal loss

As services gained from mitigation are moved farther into the future, each year of delay reduces their present value (value in terms of today's dollars).

Value	Source
2.0 to 3.7 percent per year	Current inflation-adjusted bond rates for short-term I Bond and for 30-year US Treasury securities, averaged over the last 10 years (Treasury Department, 2008). These are rates at which a dollar could be invested now to retain the same purchasing power in the future, accounting for inflation and perceived risk.

Wetland creation and compliance costs

To maintain highly conservative estimates, Ecology used the costs to fully construct an acre of wetland, rather than the smaller costs of restoring or

preserving a wetland. Ecology expects bankers and bank sponsors to determine the best long-run profitable combination of land and creation or preservation of wetlands. However, Ecology was not able to identify a confident expectation of future created, restored, and preserved wetland banks, and chose the most conservative estimates of full construction costs. This does not indicate, however, that Ecology expects wetland banks to all be constructed in non-wetland locations.

For concurrent mitigation, creation and compliance costs included only the costs of design and construction implementation. For WMB, creation and compliance costs were based on existing wetland bank credit prices, which Ecology expects to reflect the present value of both short-run and long-run costs of design, construction, maintenance, monitoring, reporting, and other compliance costs incurred exclusively by banks.

Value for CM	Source
$23 thousand to $348 thousand per acre	Ecology surveyed costs of actual CM in the state, as well as literature estimates for "small" mitigation projects (see Appendix B). For this analysis, Ecology assumed that CM would involve constructing multiple small wetlands as compensation for the generally small individual impacts observed on Washington wetlands.

Value for WMB	Source
$42 thousand to $126 thousand per acre	The US Army Corps of Engineers Directorate of Civil Works 2006 Draft Environmental Assessment, Finding of No Significant Impact, and Regulatory Analysis for Proposed Compensatory Mitigation Regulation indentifies wetland bank credit prices for the Northwestern Corps Division within this range. Ecology assumed that credit prices reflect present values of bank construction, monitoring, reporting, and maintenance costs over the life of a bank.

Calculations

Ecology used the above input values to develop a set of possible outcomes for mitigation under CM and under WMB. Ecology then compared the possible ranges and distributions, as well as the most likely values under each mitigation method to determine the likely impact of making WMB available as an option. This section describes the calculations Ecology performed, and provides equations for each step in the calculation.

Acres Impacted and Created

Ecology first multiplied the number of acres of wetland impacted in Washington State annually by the percentage of those that is a likely candidate for WMB. This is the annual number of acres potentially mitigated by WMB.[2]

$$\frac{AcresPotentiallyWMB}{year} = \frac{AnnualAcresLost}{year} * PercentWMB$$

Ecology multiplied this number by the replacement ratio to determine the number of acres of wetland built annually.[3]

$$\frac{AcresBuilt}{year} = \frac{AcresPotentiallyWMB}{year} * replacementRatio$$

The number of acres of wetland built annually, multiplied by the success rate, is the number of actual functional acres built each year.[4]

$$\frac{FunctionalAcres}{year} = \frac{AcresBuilt}{year} * SuccessRate$$

Minus the number of acres initially impacted, this leads to the net increase or decrease in the number of wetland acres in the state—accounting for the wetland impacted, and the wetland built.[5]

$$\frac{NetChangeFunctionalAcres}{year} = \frac{FunctionalAcres}{year} - \frac{AcresPotentiallyWMB}{year}$$

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[2] Definitions: *AcresPotentiallyWMB* = number of acres potentially mitigated using wetland banking
AnnualAcresLost = number of acres in the state of Washington impacted by development
PercentWMB = percentage of impacted acreage that can potentially be mitigated by WMB

[3] Definitions: *AcresBuilt* = number of acres built to mitigate wetland impacts in Washington State
AcresPotentiallyWMB = number of acres potentially mitigated using wetland banking
ReplacementRatio = required number of wetland acres built for each acre impacted by development

[4] Definitions: *FunctionalAcres* = number of successfully functioning acres built in mitigation
AcresBuilt = number of acres built to mitigate wetland impacts in Washington State
SuccessRate = percentage of constructed acreage that succeeds in becoming functioning wetland

[5] Definitions: *NetChangeFunctionalAcres* = change in functional acres of wetland in Washington State, accounting for loss of wetland due to development impacts, and for wetlands built to mitigate those impacts
FunctionalAcres = number of successfully functioning acres built in mitigation
AcresPotentiallyWMB = number of acres potentially mitigated using wetland banking

Valuation of Wetland Impacts

Ecology determined the value of an acre of wetland, including the individual value of each wetland function. Ecology also determined the change in a wetland's value due to moving from an urban area to a rural area—for WMB—based on possible increases and decreases for individual functions. (Note that this value is zero for CM, since the compensatory wetland is often constructed on-site or near-site.)

To find the total value of the impacted area of wetland, Ecology multiplied the number of acres impacted by the per-acre wetland value. Note that because the value loss associated with destruction of a wetland occurs immediately (without lag), the present value of the annual number of acres impacted does not require any discounting.[6]

$$\frac{PVTotal\$Lost}{year} = \frac{Total\$Lost}{year} = \frac{AcresPotentiallyWMB}{year} * \frac{\$value}{Acre}$$

Similarly, to find the value of the annually constructed compensatory wetlands, Ecology multiplied the number of functional acres constructed each year, but multiplied it by one plus the urban-to-rural value change to account for relocation of wetlands under WMB.[7]

$$\frac{Total\$Built}{year} = \frac{NetChangeFunctionalAcres}{year} * \frac{\$value}{Acre} * (1+UR)$$

To account for temporal loss associated with the gap between wetland impacts and compensatory wetland functions, Ecology then discounted the value of the compensatory wetland acreage according to the annual discount rate and number of years of lag. This determined the total present value of functional wetlands annually constructed.[8]

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[6] Definitions: *PVTotal$Lost* = present value of wetland impacted
Total$Lost = value of wetland impacted
AcresPotentiallyWMB = number of acres potentially mitigated using wetland banking
$value = total value of wetland services to society and the environment

[7] Definitions: *Total$Built* = total value of compensatory wetlands constructed
NetChangeFunctionalAcres = change in functional acres of wetland in Washington State, accounting for loss of wetland due to development impacts, and for wetlands built to mitigate those impacts
$value = total value of wetland services to society and the environment

[8] Definitions: *PVTotal$Built* = present value of compensatory wetlands constructed
Total$Built = total value of compensatory wetlands constructed
r = annual discount rate
lag = number of years of temporal loss between wetland construction and functionality

$$\frac{PVTotal\$Built}{year} = \frac{Total\$Built}{year} * \frac{1}{(1+r)^{lag}}$$

The difference between the total present value of functional wetlands annually constructed under each mitigation strategy, and the total value of wetlands annually impacted by development, is the net annual change in the value of wetlands in Washington State.[9]

$$\frac{ChangePVTotal\$Value}{year} = \frac{PVTotal\$Built}{year} - \frac{PVTotal\$Lost}{year}$$

Construction and Compliance Costs

To account for the costs of construction and other compliance costs – and how they differ across variously sized projects – Ecology determined the per-acre construction cost of wetlands. Ecology multiplied this cost by the number of acres constructed annually to determine the annual cost of wetland construction.[10]

$$\frac{PVTotal\$ConstructionCost}{year} = \frac{Total\$ConstructionCost}{year} = \frac{\$ConstructionCost}{Acre} * \frac{AcresBuilt}{year}$$

Net Benefit of the Mitigation

Subtracting the annual construction cost from the net change in the total present value of wetlands constructed annually gave Ecology the net annual benefit to society as a whole of using the mitigation method—either WMB or CM, depending on which input parameters were used.[11]

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[9] Definitions: *ChangePVTotal$Value* = change in the total value of wetlands in Washington State
PVTotal$Built = present value of compensatory wetlands constructed
PVTotal$Lost = present value of wetland impacted

[10] Definitions: *PVTotal$ConstructionCost* = present value of construction and compliance costs associated with creation of compensatory wetlands, either concurrent or WMB
Total$ConstructionCost = construction and compliance costs associated with creation of compensatory wetlands, either concurrent of WMB
$ConstructionCost = present value cost of constructing an acre of wetland, and complying with any necessary regulatory elements such as the prospectus, bank instrument, standards, maintenance, monitoring, and reporting that generate a flow of costs over time.
AcresBuilt = number of acres built to mitigate wetland impacts in Washington State

[11] Definitions: *PVNetBenefitofMitigation* = present value of the net benefit of mitigation undertaken, accounting for changes in wetland values and costs of construction
ChangePVTotal$Value = change in the total value of wetlands in Washington State

$$\frac{PVNetBenefitofMitigation}{year} = \frac{ChangePVTotal\$Value}{year} - \frac{PVTotal\$ConstructionCost}{year}$$

Comparison of Net Benefits: Wetland Mitigation Banking vs. Concurrent Mitigation

Ecology then examined the overall range of impacts from each mitigation method, as well as its distribution (which values were more likely than others). By comparing the high, low, and central tendencies of WMB net benefits, to those of CM, Ecology calculated the range and most-likely net benefits of choosing WMB over CM.

Results

Ecology's quantitative analysis found two main results: First, that no initial wetland impact is preferable to either wetland mitigation banking (WMB) or concurrent mitigation (CM); Second, that WMB is highly preferable to CM as a mitigation option, both to those undertaking mitigation, and to society as a whole.

Ecology found that CM is expected to generate a median loss of $3.7 million annually (2009-adjusted dollars), while WMB is expected to generate a median loss of only $1.3 million each year. These results alone indicate that, in the most likely scenarios, the socially-preferred option of retaining and optimizing wetland values is avoiding any initial wetland impacts and maintaining healthy wetlands where they naturally occur.

At the median, the difference between the expected net benefits of WMB and CM is **$2.3 million annually**. This is the annual amount that Ecology expects Washington State to benefit from the rule.

When Ecology evaluated the model using median values for each of the inputs (see Model Inputs), the net benefit of WMB over the baseline of CM rose to over **$10.5 million annually**, and this number was not sensitive to changes in individual parameters.

PVTotal$ConstructionCost = present value of construction and compliance costs associated with creation of compensatory wetlands, either concurrent or WMB

Quantitative Conclusion

Ecology concluded that wetland mitigation banking (WMB) generates a net benefit when compared to the existing method of concurrent mitigation (CM), when accounting for all of the quantifiable costs and benefits. Ecology reached this conclusion based on the more conservative total estimate of $2.3 million annually in quantifiable net benefits to Washington State.

CHAPTER 4: Observations and Conclusions

Ecology separately calculated the qualitative and quantified net benefits of the wetland mitigation banking (WMB) rule, accounting for likely costs and benefits of a switch to WMB from the current concurrent mitigation (CM) method. Based on the combined qualitative and quantitative net benefits that Ecology finds to be likely under WMB (as compared to CM), Ecology concluded that the benefits of the rule will most likely exceed the probable costs.

On the purely qualitative (unquantifiable or difficult to accurately quantify) side, Ecology does not expect any costs to arise, leaving only benefits in the qualitative category of moving to WMB. These qualitative impacts include:

- Concentration of expertise and quality of work
- Compensation for cumulative piecemeal impacts
- Improved regulatory oversight
- Reduced permitting costs of development
- Improved regulatory coordination

The qualitative benefits of WMB—as compared to CM—only add to the positive net benefit found in Ecology's quantitative analysis as well.

Ecology's quantitative analysis of the costs and benefits of WMB over CM concluded that the most likely net benefit of the rule is an available **annual gain of $2.3 million to $10.5 million**.

Ecology concluded that overall—based on both positive qualitative benefits and positive quantitative net benefits—the rule offers a switch to mitigation through WMB that could create significantly large benefits for the state. Moreover, WMB is attractive to all parties involved, and is more likely to be undertaken than CM.

Finally, although Ecology's analysis showed that WMB is highly preferable to CM, Ecology underscores that the highest median net benefit from wetlands is achieved through preservation of existing wetlands and the maintenance of their functions in their current locations.[12]

[12] The "median net benefit from wetlands" refers to the value to society and the environment provided by wetlands in the state, accounting for the costs of wetland creation/maintenance, and the social and ecological services wetlands provide, but not accounting for the value of developments that displace them. The net benefit from a development project that impacts wetlands should include the combined net benefits of the project itself, as well as the net benefit (or cost) of the wetland impacts and mitigation.

CHAPTER 5: Least Burdensome Alternative Analysis

RCW 34.05.328(1)(e) requires Ecology to "determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection."

Alternative Content and Responses

Ecology considered alternatives to the rule's content during the rule development process. These alternatives, and reasons for not including them in the rule, are listed below.

No Financial Assurances

The authorizing statute creating wetland mitigation banks (Chapter 90.84 RCW) states that the benefits of wetland mitigation banking include, "the ability to provide compensatory mitigation in an efficient, predictable, and economically and environmentally responsible manner" (RCW 90.84.005(1)(f)). Ecology did not consider it to be economically or environmentally responsible to allow banks to benefit from credit release prior to completing required construction and performance standards, or prior to demonstrating the ability to maintain the bank in the long-term.

Not setting financial assurances (either those that are optional or those that are mandatory) could harm both the banker and the environment by allowing a bank project to:

- Be abandoned after investments and expenditures were made, prior to any revenues.
- Fail to provide the long-term wetland functions the bank credits represent, and for which developers have paid.
- Fail to mitigate wetland impacts in the state, or establish successful remediation through meeting performance standards.

Mandatory Financial Assurances

Ecology did not choose to include this option, as it places greater burden on those seeking to certify wetland banks. Inclusion of this option would create additionally disproportionate compliance costs for small businesses, which may not have access to the credit that larger businesses do, and therefore benefit from the choice (in the rule) to delay credit releases until construction, performance standards, or both are completed, to avoid financial assurance requirements.

Shorter Timelines for Certification

The authorizing statute creating wetland mitigation banks (Chapter 90.84 RCW) states that the benefits of wetland mitigation banking include:

- "[I]ncreased potential for the establishment and long-term management of successful mitigation by bringing together financial resources, planning, and scientific expertise not practicable for many project-specific mitigation proposals" (RCW 90.84.005(1)(b)).
- "[I]ncreased certainty over the success of mitigation and reduction of temporal losses of wetlands since mitigation banks are typically implemented and functioning in advance of project impacts" (RCW 90.84.005(1)(c)).

Ecology determined that shorter timelines than were determined by scientific experts to be appropriate for establishing and verifying successful banks (meeting performance standards), or appropriate for evaluating prospective bank sites and instruments would violate these principles.

Size Thresholds

Ecology did not include this option, as it places greater burden on businesses and individuals seeking to certify wetland mitigation banks. While size is one of many considerations in evaluating whether a banking site is appropriate, Ecology did not find it necessary to explicitly set size thresholds for banks. Moreover, size thresholds place additional restriction on urban wetland banks, which may be restricted by land use code, land prices, and available locations.

Conclusion

Based on research and analysis required by RCW 34.05.328(d)(e) the Department of Ecology determines:

There is sufficient evidence that the rule is the least burdensome version of the rule for those who are required to comply, given the goals and objectives of the law for Ecology to adopt the rule.

APPENDIX A: Source Literature for the Value of Wetland Services

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APPENDIX B: Source Literature for the Cost of Wetland Construction and WMB Credit Prices

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