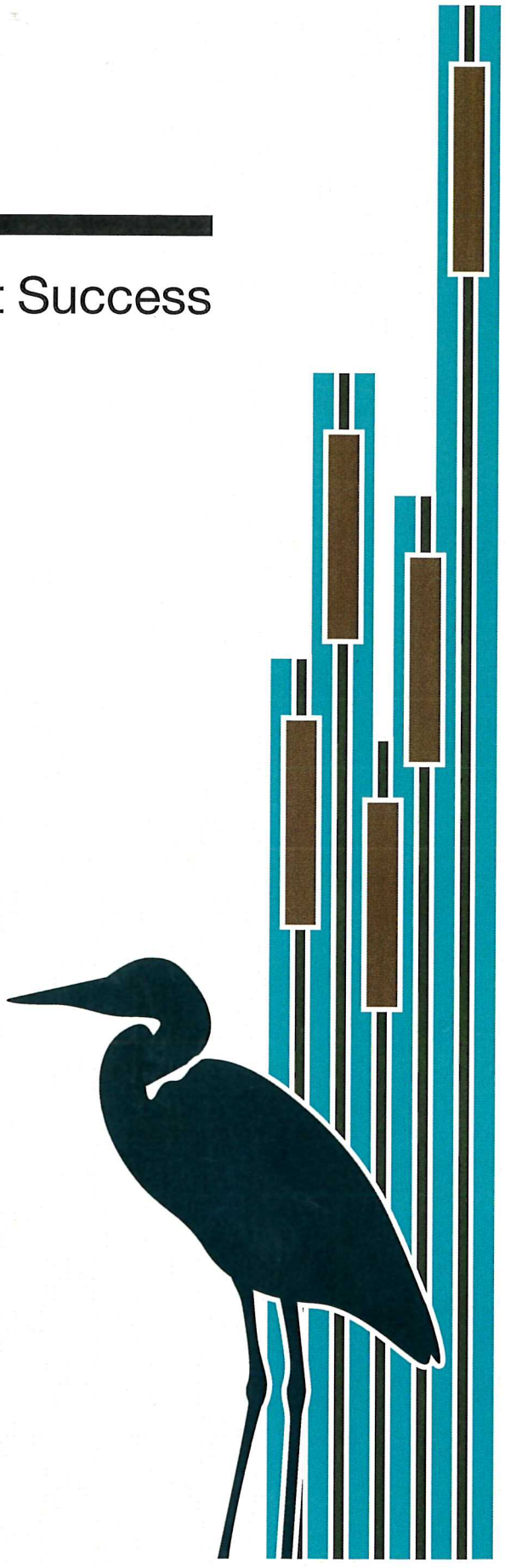
Wetland Mitigation in the Green River Valley

5 Essential Strategies for Project Success



CITY OF AUBURN WASHINGTON

EPA United States Environmental Protection Agency

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1.0 INTRODUCTION

This guide was developed as a part of the Auburn Wetland Mitigation Assessment (AWMA) Project, which was conducted by the City of Auburn, Washington, with funding provided by a Regional Wetlands Program Development Grant from the U.S. Environmental Protection Agency (EPA).

The AWMA Project was designed as a 'snapshot in time' evaluation of compensatory wetland mitigation sites that were permitted and constructed in the City of Auburn between 1990 and 2010. The purpose of the project was to assess the effectiveness of the City's wetland mitigation efforts during that time, based on current ecological conditions at the subject sites. The basic design of the AWMA Project was to look at the wetland mitigation sites created in the City over the past 20 years to determine whether they are currently ecologically successful, and to determine whether the sites continue to meet the regulatory performance standards established at the time of plan approval. An additional goal was that the study would hopefully reveal something about the relationship between the regulatory performance standards that were established at the time of permit approval, and how well the site is performing today.

A total of 26 compensatory mitigation sites within the City of Auburn were evaluated as part of the AWMA Project. Each of the 26 sites evaluated in the study was classified by the City as falling within one of two regulatory status categories- active sites and completed sites. Active sites included those sites still within the post-construction monitoring period required under the terms of the City permit requiring the mitigation. Completed sites were those sites previously determined by the City to have successfully achieved the performance requirements established under the terms of the approved final mitigation plan, and were no longer required by the City to be monitored by the project proponent.

The field study for the project was conducted by Soundview Consultants, LLC, during the summer of 2011. The results were reported in a report entitled Auburn Wetland Mitigation Assessment Project (Soundview, 2012), referred to herein as the Soundview Report. The Soundview Report documents over 4,000 field data and baseline information points collected for 26 wetland mitigation sites, and evaluates each site's compliance with mitigation performance measures established for it at the time of final mitigation plan approval. This involved the evaluation of a collective total of over 300 performance measures established for the 26 sites. While a large amount of data was collected for each site, there is more information than could be analyzed within the time and resource constraints of with this project. It is anticipated that the Soundview Report will not only serve as a launch point for additional future studies regarding wetland function in Western Washington, but that the data published in that report will

itself offer additional opportunities for further investigation and analysis. Based on the recommendations in the Soundview Report, our additional review of the data presented in the report, and anecdotal knowledge obtained from City staff who have worked with the sites over the years, five (5) broad strategies have been identified that we believe are key to the success of any compensatory wetland mitigation project in the Green River Valley. While all five (5) strategies are relevant to compensatory mitigation projects in any location, this report discusses the strategies in the context of the findings of the AWMA Project, and their specific applicability to sites the Green River Valley within the City of Auburn.

The five (5) essential strategies discussed in this guide are applicable to the community of professionals involved in designing and constructing compensatory mitigation projects. The strategies are necessarily broad, and therefore can, and in most cases should (in our opinion) be implemented by multiple players in the wetland mitigation process, including:

- Site owners, project proponents and their agents, and others that propose the construction of wetland mitigation sites as part of a comprehensive mitigation strategy for development-related wetland impacts (this group is collectively referred to in this document as Project Proponents);

- Wetland professionals, landscape architects, engineers, and others who design compensatory wetland mitigation projects (collectively referred to hereafter as Mitigation Site Designers);

- State and local agency scientists and planners that are involved in reviewing, approving, and monitoring compensatory wetland mitigation projects (hereafter referred to as Regulatory Agencies); and last, but by no means least,

- The professionals that construct, maintain, and conduct on the ground monitoring of wetland mitigation sites (collectively referred to in this document as Implementers).

The goal of this guide is to provide a set of 'core' strategies that can be used by those involved in the design, review, construction, maintenance, and monitoring of wetland mitigation sites. In preparing this guide, we were determined that it should be a ready refresher for compensatory wetland mitigation 'old salts', as well as providing as an easy to read informational overview for those new to working with wetland mitigation projects in the Green River Valley. To this end, we have organized the information in this document in what we believe to be a straightforward, intuitive, and user-friendly manner, and we have incorporated additional information features to supplement the five (5) essential strategies presented on the following pages. Specifically:

- Each strategy is organized in a logical easy to read 'What-Why-How' structure;

- Each strategy includes specific recommendations for implementation that are clearly labeled, numbered, and shown in shown in boldface type so that they stand out. The recommendations constitute the 'How' to accomplish the strategic 'What';

- An Acronyms and Abbreviations section has been included in Section 4;

- Special topics, additional information, and where appropriate, notes of caution, have been included throughout the document in shaded call-outs designed to draw the reader's attention; and

- Resources for obtaining additional information and references to selected references have been provided to allow the reader to obtain more detailed information regarding specific issues summarized in this guide.

The presentation of each of the five (5) essential strategies on the following pages employs the following format:

STRATEGY #: [Strategy Statement] – Each strategy is presented as an action-oriented statement that reflects the desired strategy outcome.

➲ **What the study found** – This section discusses the data and conclusions contained in the Soundview Report that suggest that the issue or consideration addressed by the strategy was a key factor in the performance of mitigation sites that were evaluated in the AWMA Project.

➲ **Why the strategy is important** – This section briefly discusses the general relationship of the strategy to wetland mitigation, and identifies the potential mitigation project benefits to be gained by employing the strategy and/or the potential undesirable mitigation site consequences of not employing the strategy.

➲ **How to put it into Practice** – This section provides information regarding how to incorporate the strategy into a wetland mitigation project and provides specific recommendations for actions to implement the strategy.

A principal resource used to identify, select, and summarize our recommended implementation actions for each strategy is the two-part Wetland Mitigation in Washington State (Ecology, 2006a and 2006b). We find these documents to be a particularly valuable source of wetland mitigation information, and recommend

that it is a 'must have' document for anyone involved in a compensatory wetland mitigation project in Washington State. Copies of both Part 1 and Part 2 can be accessed at the Washington Department of Ecology website via the following URL:

http://www.ecy.wa.gov/programs/sea/wetlands/mitigation/guidance

2.0 SUCCESSFUL WETLAND MITIGATION: 5 ESSENTIAL STRATEGIES

Based on the data and findings in the Soundview Report, five (5) overarching issue areas were identified as key considerations for successful wetland mitigation projects in Auburn. These include:

- Mitigation Site Location
- Mitigation Objectives and Performance Measures
- Invasive Plant Control
- Mitigation Site Management and Oversight
- Project Organization and Recordkeeping

On the following pages, each of these considerations have been re-stated as an actionable strategy applicable to future compensatory wetland mitigation projects in the Green River Valley and beyond. While the selection of these strategies and the associated implementation recommendations for this guide were based on City of Auburn-specific data, and the examples used to illustrate the need for and benefit of these strategies are taken from mitigation projects permitted by and located within the City of Auburn, we believe that these strategies are applicable to compensatory wetland mitigation projects located anywhere.

Before You Begin...

Keep in mind that this document focuses on mitigation in the context of physical sites that were required to follow the "Avoidance Hierarchy" for impacting wetlands as part of the wetland mitigation sequencing process.

- **Avoid -** Demonstrate that the proposal is the alternative with the least adverse impact.
- **Minimize -** Reduce potential impacts on wetland function and area.
- **Mitigate/Compensate -** Only use if all reasonable and practical alternatives have been explored and exhausted. Methods of mitigation include: Restoration (Re-establishment and Rehabilitation), Enhancement, Establishment (Creation), and Preservation.

For more information on wetland sequencing, see Ecology, 2006a.

STRATEGY 2.1:

SELECT AN ECOLOGICALLY (AND ECONOMICALLY) APPROPRIATE SITE FOR MITIGATION

Historically, regulatory agencies in Washington State have required that the mitigation site selection process first look at on-site mitigation before proposing mitigation elsewhere in the watershed. More recently, some regulatory agencies have identified a preference for a watershed approach to mitigation site selection that looks beyond the project site to replace impacted wetland functions and values in the drainage area or watershed. Whether located on-site or off-site using the watershed approach, site selection is a critical early step in the wetland mitigation process. Choosing an appropriate site can immediately give a mitigation project a 'leg up' on establishing the target wetland functions. Conversely, it can be very difficult and expensive to try and overcome the limitations of an ecologically unsuitable site after the fact, and likely be an exercise that is not very productive.

➲ What the Study Found

While the Soundview Report noted that the majority of wetland mitigation projects they reviewed were "generally meeting their regulatory requirements", it also found that several projects were having "limited ecological success". The report found that for the latter group, the lack of ecological success was often associated with several factors, including inappropriate site selection. The researchers found that the sites used for some of the underperforming wetland mitigation projects resulted in conditions that restricted the development of protective upland buffers, and did not provide for corridor connectivity.

The Soundview team noted that one of the most significant examples of inappropriate location occurred where wetland mitigation was incorporated as part of a development's stormwater facility, and where ongoing periodic maintenance prevented the establishment of ecological complexity. Further, they found that ecological success was often also low when buffers were immediately adjacent to development, commenting that "Many of the buffers were landscaped, mowed and manicured, for aesthetic boundaries to parking areas. The continuous landscaped maintenance eliminates any and all native vegetation screening of noise and light to the outlying wetland area" (Soundview, 2012).

On the other hand, the Soundview researchers found that better ecological success was observed when mitigation sites were adjacent to larger, undeveloped tracks or other mitigation sites that provided an

opportunity for establishment of a more complex and diverse set of wetland functions.

➲ Why Mitigation Site Selection is Important

Mitigation site selection is important to ensure that mitigation efforts are ecologically successful and compatible with surrounding land uses, and to ensure that the wetland functions are established and sustained to achieve the required regulatory outcome in Washington State of 'No net loss' in wetland functions and values.

Locating wetland mitigation sites in highly urbanized areas often limits the functions provided by a site. Wetland mitigation sites that are surrounded on all sides by industrial development typically provide far less wetland function to the watershed than those with surface water and vegetative corridor connections to downstream areas within the watershed. To ensure no net loss, mitigation efforts need to focus on replacing the impacted functions and values. For example, it may be possible to mitigate for impacts to water quality or hydrologic functions in an on-site depressional wetland located on a more developed site. The on-site wetland may have the capacity to store hydrology and improve water quality, while wildlife habitat functions are not as compatible with highly urbanized areas, and may need to be mitigated in a different location within the watershed.

When taking a watershed approach to wetland mitigation site selection, it is often difficult to find an off-site mitigation area if on-site mitigation potential does not exist. In the past, off-site mitigation involved acquiring property or finding a private landowner within the same watershed who was willing to allow a mitigation area to be located on their property. Today there numerous mitigation banks in the region and some jurisdictions have in-lieu fee policies in place to provide off-site mitigation opportunities within the same watershed where the impact occurred. Both approaches to off-site mitigation can provide for a mitigation site location in a less developed area of the watershed where functions and values can be more effectively replaced and the concept of no net loss of functions and values can be achieved.

Additionally it has been our experience that wetland mitigation sites and Right-of-Way and utility easement areas

Did You Know...

Obtaining groundwater and other hydrologic data will **significantly increase** the probability of a successful mitigation project.

For better planning in the design phase of wetland mitgation, you will want to consider conducting:

- Shallow groundwater monitoring;
- Downstream hydraulic analysis; and
- Other forms of hydrologic data collection.

are not compatible. Examples of this were identified while conducting the AWMA Study. The study noted two different mitigation sites in particular that were located within maintained right-of-ways (ROW), one was a City of Auburn street ROW, and the other was within a maintained power line corridor easement. Both mitigation sites were located in harms way where maintenance crews that were unaware of the mitigation areas inadvertently mowed over the planted vegetation. This type of inappropriate site selection not only affected the functions and values provided by the mitigation areas, but also cost a significant amount of money to replace damaged mitigation site vegetation, and to bring the mitigation project back into regulatory compliance.

➲ Putting It Into Practice

Prior to selecting a wetland mitigation site, the general goals and objectives of the mitigation project need to be identified, consistent with the overall goal of mitigation to compensate for losses and degradation to wetland area and functions that will occur (or have occurred) at the wetland impact site. This generally involves an analysis of the existing functions and values provided by both the impact site prior to being impacted, and then comparing those with the projected functions and values that the mitigation site will provide after the site is constructed, wetland hydrology is present, and viable wetland plant communities are established.

A number of state and federal agencies have developed and published site selection guidance tools and guidance documents that are available at no cost and can be accessed online. In reviewing and using a number of these, we find two of these tools to be particularly useful, and use of these resources is listed below as an implementing recommendation (**Rec**) for this strategy.

Rec 2.1A **Utilize mitigation site selection tools developed and published by state and federal agencies to ensure that an appropriately comprehensive approach is used to evaluate and select a site.**

One such tool is the set of analysis charts and worksheets provided in the resource publication Selecting Wetland Mitigation Sites Using a Watershed Approach (Hruby et al., 2009).

A second helpful tool is the wetland mitigation checklist published in Appendix J of the guidance document Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Ecology, 2006b).

(cont'd)

Rec 2.1B **Avoid locating wetland mitigation sites in Right of Way areas, or easement areas legally established for utilities, access, or other uses that are not compatible with wetland uses in perpetuity.**

Incompatible uses may result in the damage to the mitigation site as in the examples mentioned earlier, or at the very least may not allow for the wetland mitigation site to successfully establish wetland functions (*Figure 2.1.1*). Both of these situations can require replanting, additional site maintenance, and the potential for extended monitoring period requirements, all of which add costs to the mitigation project.

Figure 2.1.1

Over half of this wetland mitigation site, which also does double-duty as a stormwater pond for the adjacent development and parking lot, is covered with invasive plant species, such as reed canary grass endemic to the Green River Valley (Photo credit: *Soundview Consultants).*

➲ Additional resources and sources of information:

Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans. http://www.ecy.wa.gov/programs/sea/wetlands/mitigation/guidance/

Selecting Wetland Mitigation Sites Using a Watershed Approach. https://fortress.wa.gov/ecy/publications/summarypages/0906032.html

STRATEGY 2.2:

ESTABLISH CLEAR FUNCTIONAL OBJECTIVES AND PERFORMANCE MEASURES FOR THE MITIGATION SITE

Compensatory wetland mitigation projects vary greatly in size and complexity, but the purpose of such projects, and the basic mitigation concepts, methods, and activities for each site are similar. Goals, objectives, and performance standards form the foundation of the mitigation plan, and each element of a mitigation plan (design features, performance standards, etc.) should relate back to the stated goals and objectives. Ensuring this relationship occurs throughout the plan is important; both for establishing a course of action that is most likely to accomplish the mitigation goals of the project, and for providing a means by which to assess whether the mitigation site is making progress toward achieving those goals.

➲ What the Study Found

For the 26 wetland mitigation sites assessed as part of the AWMA Project, the Soundview study team determined that a total of 333 performance standards had originally been established at the time of final mitigation plan approval. The Soundview Report addressed two basic questions that the study team asked for each of the 333 performance standards, 1) Was the performance standard completed? and 2) Was the performance standard appropriate for the mitigation action?

The study found that there was wide variation both in terms of the number of performance standards established for each site, and the degree to which performance standards were found to have been both completed and appropriate for each mitigation action. The number of performance standards established for each mitigation site ranged from 2 to 32, with a median value of 10 performance standards per site. While not all performance standards could be assessed for completion due either to the nature of some standards or the limitations of the rapid assessment technique used in the study to characterize the sites (i.e. a standard that necessitated evidence of inundation or saturation during specific time frames was typically not evaluated), the study found that for those performance standards that could be evaluated, the majority of sites (77 percent) had completed or met most of their performance standards, but fewer sites (15 percent) of the mitigation sites had completed/met all of their performance standards.

At the individual performance standard level, the study found that for those standards that could be evaluated (a total of 308 performance standards for all 26 mitigation sites), 216 performance standards (65 percent) were found to have been completed/met, while 92 performance standards (28 percent) were found not to have been completed/met. However, the report noted that the majority of standards determined not to have been completed (75 percent), received this determination because they are assessments of a condition that is scheduled for some future time (i.e. a standard to be assessed at year 5 of the monitoring period, but at the time of the field assessment, the project was only in year 3).

2011 City of Auburn Wetland Mitigation Assessment:

Figure 2.2.1 - Performance Standard Achievement Rates for Mitigation Sites

While 77% of mitigation sites whose performance standards could be evaluated completed or met most of their performance standards, only 15% of the mitigation sites had completed or met all of their performance standards (Soundview, 2012).

With respect to the question of whether the performance standards that had been established were appropriate, the study found that only 190 of the 333 performance standards (57 percent) were determined as appropriate (i.e. were achievable, measurable and generally reflective of the mitigation objectives established for the site). An "Appropriate" vs. "inappropriate" determination was made for each performance standard by the Soundview team using best professional judgment. Inappropriate performance standards were those determined by the team either not to be feasible (i.e. un-achievable growth rates or invasive species standards), or not a true measure of performance (i.e. the stated performance standard was really more of a construction specification such as "fencing and signage installed").

The Soundview Report also noted several findings with regard to the quality or usefulness of the established performance standards for assessing mitigation site performance. The study team noted that "the second most prominent type of performance standards were found to be vague, non-quantitative statements based strictly on ecological or functional processes" (Soundview, 2012). These types of performance standards accounted for 48 of the total standards assessed, and typically were presented as vague statements, such as:

"Plant a wide variety of native evergreen and deciduous trees and shrubs to provide plant structural diversity" and *"Replace an existing reed canary grass, buttercup Palustrine Emergent Marsh with a mixed sedge/rush intermittently-ponded increment and a shrub/scrub forested physical and visual wetland buffer between the proposed development and the remainder of the wetlands on the west portion of the property."* (Soundview, 2012).

Finally, an additional set of performance standards noted by the study team were those that required a combined outcome such as: *"Year Two: 80 percent or greater annual survival rate, with 10 percent maximum non-native, invasive plant species. Inundation present from at least early March to late May for at least fourteen consecutive days in years of average rainfall, in wetland creation areas"* (Soundview, 2012). Such combined performance standards can be difficult to assess, and may pose challenges for a reviewer to determine whether or what portions of the standard have been met.

Did You Know...

Some of the most important functions provided by wetlands include:

- **Water quality functions**, such as sediment and toxicant removal;
- **Hydrologic functions**, such as flood flow attenuation and erosion control;
- **Fish and wildlife functions**, such as movement corridors for terrestrial mammals, production or organic matter, habitats for invertebrates and amphibians, birds, mammals, and fish; and
- **Cultural functions**, such as aesthetic and passive recreation opportunities especially important to urban areas.

Figure 2.2.1 - Wetlands in Auburn Environmental Park provide many water quality, hydrologic, habitat, and cultural functions (Photo credit: *City of Auburn).*

➲ Why Establishing Clear, Functional Objectives and Performance Standards is Important

Wetland mitigation goals, objectives, and performance standards are the primary means for measuring the regulatory and ecological success of a mitigation site after its construction. The Wetland Mitigation Guide in Washington State – Part 1, lists the action of "improving mitigation performance standards so that they are meaningful, achievable, and enforceable" as one of the primary ways to improve compensatory wetland mitigation (Ecology, 2006a).

Establishing clear functional (functional in the context of wetland functions) objectives for a mitigation site is important because the mitigation objectives are the desired outputs of the mitigation site after is has been constructed and its target vegetation communities, hydrology, and habitats have become established. It is these outputs that drive the design effort and determine the mix and relationship of mitigation site features (i.e. the physical design).

Performance standards on the other hand, are measurable criteria for determining if the functional objectives are being achieved, or if the physical elements of the mitigation site are performing or maturing such that the site is on track to provide the desired functional outputs within a specific period of time (typically by the end of the required monitoring period).

Performance standards document a desired condition or value or increment of change to be observed for a specific element of the mitigation design (Elzinga et al. 2001 as cited in Ecology, 2006a). As a result, they are typically used by those monitoring a wetland mitigation site (including regulatory agencies) as a way to determine of the site is successful, or is on track to be successful in the future. To ensure that all parties (present and future) who will use the performance standards for assessing the performance of the site understand the purpose and intended meaning of the performance standard, it is important that the standards established are clear, specific, and measurable. Additionally, to ensure that the performance measures established for a mitigation site are appropriately reflective of the site's ecological performance, it is important that the performance standards relate to the functional objectives of the site, and that they are realistic and achievable.

➲ Putting It Into Practice

The development of mitigation goals, objectives, and performance standards should be based on compensating for the identified ecological impacts of a project or action on a wetland site, and should at a minimum work in concert to achieve the national and Washington State 'No net loss' goals for that project/action.

Wetland mitigation goals describe the outcomes for, and represent the primary purpose of the mitigation project. Functional objectives identify what will be required to meet the project goals. Performance standards are those standards by which the project is measured to determine whether the performance objectives, and ultimately, the mitigation goals, are being met. Performance standards should be quantifiable, achievable, and relevant terms and conditions that are necessary to meet the project goals and objectives. It is important to remember that project goals, functional objectives, and performance standards are all interrelated ingredients of a mitigation plan.

Rec 2.2A **Understand the nature and extent of wetland impacts associated with the proposed project or action, and the nature and amount of off-setting new wetland function that is required to meet the regulatory standard that applies to the site (at a minimum, the standard of 'No net loss' will apply for mitigation projects in Washington State).**

It is important to note that determining off-setting wetland function is often not simply a matter of determining wetland impact areas and calculating a wetland creation/enhancement area requirement by applying regulatory replacement ratios. 'No net loss' in the context of wetland function may (and likely on some level will) require consideration of additional factors that will ultimately play into what goals and objectives should be established for the site (i.e. if flood storage is one of the wetland functions impacted by a project or action, then it would be appropriate to identify (and quantify) the amount of flood storage function that the wetland mitigation site will provide.

Rec 2.2B **Use (and be able to document) a structured, logical process to develop goals, objectives, and performance standards for the mitigation site that compensate for the identified wetland impacts.**

One way to accomplish this is by answering the following series of questions originally published

Did You Know...

Wetlands provide **measurable** direct and indirect functions that are important to fish habitat. Within the Green River and its fish-bearing tributaries, known and/or presumed fish distribution include:

- **Salmon**, including Chinook (King), Coho (Silver), Chum, Pink (Humpy), and Sockeye (Red);
- **Steelhead**
- **Trout**, including Cutthroat, and Rainbow; and
- **Bull Trout** (Dolly Varden).

*Figure 2.2.2 - A school of steelhead juveniles (*Photo credit: *NWCouncil via Flickr).*

(cont'd)

by Mary Ossinger for the Washington State Department of Transportation in 1999.

They are designed to address site design and performance considerations by first identifying the broader mitigation site goals, and then progressively working down to the more specific questions of which functional elements should be included and how should they be measured.

1. What functions do I want the site to perform?
2. Of those, which functions will the site have the opportunity to perform?
3. Of those, which functions can be achieved given my design constraints?
4. Of those, which functions are critical to the overall success of the compensatory project?
5. Of those, which functions can be evaluated through a known monitoring method that I am capable of implementing (considering time and budget constraints)?
6. Of those, which can I define with a performance standard that is both: 1) a meaningful and measurable benchmark of success, and 2) achievable on my site within my designated monitoring period?
7. Of those, which functions could I expect to achieve after implementing maintenance and contingency plans if the monitoring shows that the performance standard is not being met? (Ecology, 2006b, which adapted from Ossinger, 1999).

Rec 2.2C **Performance standards should relate to one or more functional objectives for the site, and should be realistic, specific, and measurable.**

A simple test when developing mitigation performance measures is to ask yourself these four questions:

1. Can the proposed standard **really** be achieved?
2. What is going to be measured?
3. How is it going to be measured?
4. Why does it need to be measured?

The guidance document, Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Ecology, 2006b), provides additional information about (and examples of) how to write meaningful performance standards for your mitigation project.

STRATEGY 2.3:

DEVELOP AND IMPLEMENT A COMPREHENSIVE INVASIVE PLANT MANAGEMENT PLAN

Invasive or noxious species are non-native plants that have been introduced to the native environment. Generally speaking, discussions about non-native species occurring in wetlands in Western Washington focus on plants but non-native animals also do exist in the wetlands of the Pacific Northwest. Non-native plants have been introduced to Western Washington primarily as ornamentals and for agricultural purposes. Some of the most prolific and problematic non-native plants found in the Green River Valley are reed canary grass (*Phalaris arundinacea*), Japanese knotweed (*Polygonum cuspidatum*), poison hemlock (*Conium maculatum*), and Himlayan blackberry (*Rubus armeniacus*) each of which comes with their own set of challenges to control and eradicate from wetlands and associated buffer areas.

➲ What the Study Found

The Soundview report noted that 7 of the 26 sites were affected by invasive species. The report discussed invasive species as risk factors, how invasive species affected regulatory success, how invasive species affected ecological success, and mitigation measures that resulted in control or eradication of invasives either on purpose or on accident.

Invasive species (primarily reed canary grass) tended to be a common risk factor among all mitigation projects because of the proximity or ubiquitous presence of this species within the study area; however, not all action areas were at risk from the reed canary grass, due to intensive management activities prior to implementation of the mitigation action. Many of the mitigation projects included excavation of soils and creation of an open water component, which tended to suppress invasive plant growth (*Figure 2.3.1*). However, other projects that were implemented adjacent to areas dominated by invasive species retain a continuous seed source for encroachment of invasive plants under viable conditions.

The AWMA study results showed that all mitigation sites had achieved or were achieving some level of regulatory success. The performance standards that were considered not complete were typically due to some future anticipated level of performance, meaning that the year for applying the performance standard is in the future and could not be evaluated at the time of the study. However, in some cases the performance standards were noted as currently being met despite the standard having additional years remaining for evaluation. Three mitigation sites were not successful due to a dominance of invasive species coverage in the action area.

Ecological performance was assessed during the field assessment where over half of the mitigation projects in the study were observed as having moderate to high complexity. The complexity value was an evaluation of the action area and adjacent wetland, and took into consideration, non-wetland area habitat connections. When mitigation actions were larger, ecological integrity was lifted and a measure of ecological success was observed. Dominance of invasive species, predominately observed as reed canary grass (*Phalaris arundinacea*), in or adjacent to, the action area was a common denominator for projects receiving a low complexity score.

Figure 2.3.1

Native vegetation is becoming well-established in both the wetland and buffer of this mitigation site, which included large ponds in its design (Photo credit: *Soundview Consultants).*

➲ Why Invasive Plant Control is Important

Non-native species often outcompete desirable native species, disrupting the balance and diversity of native plants and animals that occur naturally in the environment. The King County noxious weed control board has identified over 100 noxious or invasive species in King County alone. Pursuant to RCW 17.10.010, the state of Washington defines noxious weeds as a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices. The State of Washington divides noxious weeds into the following three classes:

1. Class A consists of those noxious weeds not native to the state that are of limited distribution or are unrecorded in the state and that

pose a serious threat to the state;

2. Class B consists of those noxious weeds not native to the state that are of limited distribution or are unrecorded in a region of the state and that pose a serious threat to that region;

3. Class C consists of any other noxious weeds.

Invasive species found within King County and the Green River Valley are widespread and pose a legitimate threat to diversity of wetland and sensitive area ecosystems. Sites historically disturbed through agricultural practices and development represent lands at the greatest risk of being dominated by invasive species (*Figure 2.3.2*). Once an invasive species seed source or seed bank is present in an area, effectively controlling the species becomes increasingly difficult.

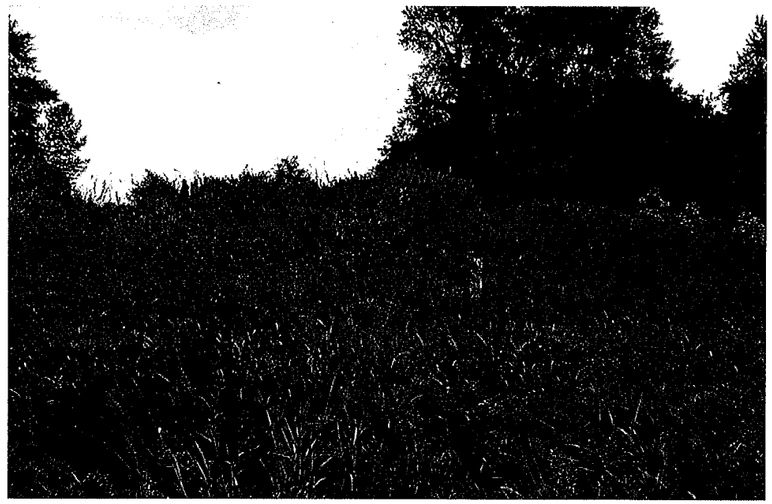

Figure 2.3.2

Reed canary grass overruns the buffer of this mitigation site, a former farmland property (Credit: Soundview Consultants).

➲ Putting It Into Practice

Best Management Practices (BMP) for controlling invasive species varies depending on the species you are working with. Feasible and practical methods need to be implemented based on funding and available resources. King County's preferred approach for weed control is Integrated Pest Management (IPM). This approach involves selecting from a range of possible control methods to match management requirements of a specific site. The goal is to maximize effective control and to minimize negative environmental, economic, and social impacts.

The detailed model for this approach can be found on King County's noxious weed website at: http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds.aspx.

Where eradication of the invasive species is not realistic, control strategies must strike a balance between ecological impacts of allowing invasive species to spread and the economic realities of control measures. Not all control methods are practical, effective, economically feasible, or environmentally sound for every situation. It's recommended that landowners and land managers consult most recent science or refer to invasive species websites.

Control programs can include manual, mechanical, chemical, biological and cultural components. Landowners and land managers should evaluate their site, the life cycle characteristics of the invasive species and the best available science to determine which control method or combination of methods will be most effective and economical. Refer to the focus topic box on p. 21 for general information on the various control mechanisms that can be used to control the most common invasive species found in and adjacent to wetlands and streams in the Green River Valley.

Integrated Pest Management, as defined by RCW 17.15, is a coordinated decision-making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet programmatic pest control objectives. The elements of the King County Noxious Weed Control Board's IPM plan include:

- Preventing noxious weed problems;
- Monitoring for the presence of noxious weeds and weed damage;
- Treating noxious weed problems to reduce populations using strategies that may include biological, cultural, mechanical, and chemical control methods - always considering human health, ecological impact, feasibility, and cost-effectiveness;
- Minimizing the use of chemical pesticides by offering information on alternative control methods and educating property owners who choose to use chemical controls on correct use; and
- Evaluating the effects and efficacy of noxious weed control treatments (King County, 2011).

The following recommendations for invasive plant control are specific to reed canary grass, but are generally applicable to all mitigation sites in that pre-construction removal and post-construction control are important mitigation site activities that will play a large role in the ultimate degree of success for a wetland mitigation site.

Rec 2.3A **Reed canary grass (RCG) is likely the most common invasive species here in the Green River Valley. To prepare a wetland mitigation site dominated by RCG where no standing water exists use the following treatment that involves a combination of mowing and herbicide treatment to give RCG the one-two punch.**

Mow or cut the reed canary grass in late summer when standing water is not present in the RCG dominated wetland. Then hire a herbicide applicator who is licensed to apply herbicide in aquatic areas. Have the licensed applicator develop a spray plan that includes follow up treatments as necessary. Install mitigation plantings in the fall. Use follow up spot spray treatments and cut/mow around plantings as necessary.

Rec 2.3B **Be sure to have a plan and to budget funding for managing invasive non-native plants that includes the active control of reed canary grass for each year of the monitoring period. Over the life of the monitoring period, you will save money by staying on top of this fast-growing pest.**

DO NOT under any circumstances let reed canary grass get out of control during the maintenance period as significant plant loss will result from competition and/or efforts to go and regain control of the area.

➲ Additional Resources and Sources of Information

King County Noxious Weed Website
http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds.aspx

United States Department of Agriculture Website
http://www.invasivespeciesinfo.gov/plants/controlmech.shtml

Focus Topic: Plant Pests in the Green River Valley & How to Get Rid of Them

The following strategies are widely used and accepted by agencies and wetland professionals to control and erradicate common invasive species found throughout the Puget Sound Region:

Reed Canary Grass (*Phalaris arudinacea*)

(Photo credit: *City of Auburn*).

Reed canary grass (RCG) is a cool season perennial, typically found in wetlands, that spreads by both seeds and rhizomes, and creates dense, tall monocultures that crowd out low growing species. Invasion of RCG typically occurs at disturbed sites where soils are exposed and light availability is high. RCG is both drought and flood tolerant, which makes it extremely difficult to control. Growth rates of reed canary grass peek twice during the growing season, once in late spring and again in late summer. It is one of the first plants to emerge in the spring, enabling it to shade out native species that typically do not emerge until later in the spring. Once established RCG primarily spreads from vegetative shoots arising from shallow rhizomes, which can extend over 10 feet per year and form a thick impenetrable mat below the soil surface. Few native species of vegetation can survive indefinitely within a monotypic stand of RCG.

Until recently, regulatory agencies within Washington State shared a widely accepted policy where 10% maximum aerial coverage was often the performance standard to be met during monitoring. However, it was found that many otherwise ecologically successful sites could not meet this standard. This was especially the case when RCG had widespread coverage on adjacent sites and upstream corridors. In recent years, regulatory agencies have implemented a more flexible policy for reed canary grass coverage that evaluates each site area on a case by case basis so that the standards make

sense, are realistic, and are achievable. (DOE, Corps, EPA 2006)

There is no immediate "fix" that will control reed canary grass over a single growing season, but much can be accomplished over a period of 2 to 3 growing seasons. Continued monitoring, maintenance, and follow up treatments are essential in preventing reinvasion. The following is a list of BMPs are typically used to control RCG:

- **Mechanical Control** involves mowing or cutting reed canary grass several times per growing season. It should be noted that mowing alone will not kill RCG, in fact it actually stimulates growth. Initial mowing efforts using tractors or mowers can be effective in preparing a site for planting dense fast growing native species such as willows, cottonwoods, and alders. Once an area is planted with native tree and shrub species RCG can be controlled using line trimmers at least three times per growing season. The best times to perform this type of RCG control is in early June, late July, and late September. If done over the course of several growing seasons fast growing native species will have an opportunity to establish and grow to heights above reed canary grass.

- **Chemical Control** involves the use of herbicides to control large stands of RCG. When used in combination with mowing, a mitigation site can effectively be prepared for mitigation plantings, and lay the groundwork for reduced efforts needed to control RCG until mitigation plantings are established.

  Only aquatic approved herbicides are allowed in and adjacent to wetlands and streams, and should not be used in areas inundated with standing water. Glysophate (Rodeo) has been proven to be effective to control RCG. Glysophate is a non selective herbicide that kills or injures most all plants so care shall be taken not to overspray, especially during follow up treatments after mitigation plantings have been installed. Only certified aquatic herbicide applicators are allowed to apply herbicides in and adjacent to wetlands and streams. Please contact your City or County environmental staff, or the Washington State Department of Ecology before using herbicides within critical or sensitive areas.

- **Biological Control** – There are no known biological control agents for reed canary grass.

- **Manual Control** and pulling or stomping areas of RCG. Hand pulling will work for smaller infestations, but for larger areas where historical agricultural areas have gone fallow, hand pulling is not a practical alternative.

  Stomping or trampling stands of RCG can be effective when groups of people walk through an area dominated with RCG. Like cutting or mowing, stomping should be done at least three times a year in early June, late July, and late September. Stomping RCG areas any less than three times a year has virtually no effect. This technique is useful in areas with mitigation plantings, greatly reducing the risk of damaging plants from the use of string trimmers. This technique can also be used in combination with cutting with string trimmers where stomping is done immediately adjacent and around plantings, and crews come behind with string trimmers and cut RCG that exists further from plants. Volunteer groups can be used to do this, greatly reducing maintenance costs.

Japanese Knotweed (*Fallopia japonica*)

(Photo credit: *U.S. Fish and Wildlife Service/ Northeast Region*).

The following information on Japanese knotweed control has been largely summarized from the BMPs found on the King County Noxious Weed Website (King County 2012).

Japanese knotweed is a creeping perennial. Knotweed has an extensive network of rhizomes spreading at least 23 feet from the parent plant and penetrating more than 7 feet into the soil, making it difficult to control once established. Japanese knotweed typically starts growth in April, but can start later depending on whether or not it is growing at higher elevations. Japanese knotweed reproduces by seed and vegetatively by rhizomes and roots. Its ability to reproduce vegetatively allows Japanese knotweed to reproduce rapidly. Rhizomes and root fragments can be dispersed by flooding and erosion, and by man-made dispersal by transporting material that contain fragments. Cut and broken stems can re-sprout and each node of the plant is able to produce roots and new plants. Seeds remain viable for up to 15 years. Knotweed canes die back after the first frost and go dormant through the winter. New plants can develop from the dead plants from the previous year.

Because of Japanese knotweed's extensive root system control on a landscape level requires long term planning and follow up treatments. Due to its ability to reproduce downstream, it is necessary to start at the upper reach of Japanese knotweed infestations. The following of list of BMPs are typically used to control Japanese knotweed:

- **Manual and Mechanical Control** is possible through cutting, mowing, pulling, digging, and covering. Even with an intensive control regimen, effective control generally includes treatments with approved herbicide applications. Repeated cutting tends to produce numerous small shoots that make future stem injections more difficult. Cut stems close to the ground twice a month or more between April and August, and then once a month or more until the first frost, over a period of 3 to 5 consecutive years. Try to keep stems from growing taller than 6 inches. Do not allow cut, mowed, or pulled stems to enter waterways.

  Digging up as much root as possible in August over at least 3 consecutive years can work for small isolated patches. Beginning after a week after initial digging begin looking for new sprouts and uproot them making sure to pull as much of the root as you can each time. DO NOT compost. Be sure to search at least 20 feet away from the original patch center.

  Cover small isolated patches with heavy duty geo-textile fabric or black plastic. Cover material needs to be left in place for a period of 3 to 5 growing seasons. Before covering, cut stems to the ground and cover to a point extending at least 7 feet beyond the outside stems. Watch for holes in the fabric and check the perimeter for new growth. Every two to four weeks stomp re-growth under covering material and clean debris.

- **Chemical Control** using herbicides should only be applied at the rates and for the site conditions and/or land usage specified on the label. Variations in chemical applications include foliar spray, wick wipe, cut and pour, and stem injections. Herbicides with the active ingredient glysophate, dicamba, and imazapyr are variably effective in controlling knotweed wither separately or in combination.

  The best practical time to for chemical applications is when the patches are 3 to 6 feet tall, but shorter plants may not have adequate leaf surface to absorb and translocate enough chemical to be effective. A spring herbicide application or cutting will allow for an effective height and growth stage later in the year. Foliar applications will require two or more years of applications. Please contact your City or County environmental staff, or the Washington State Department of Ecology before using herbicides in and adjacent to wetlands and streams.

Himalayan Blackberry (*Rubus armeniacus*)

(Photo credit: *FolioRoad* via *Flickr*).

The following information on Himalayan blackberry control has been largely summarized from the BMPs found on the King County Noxious Weed Website (King County 2012).

Himalayan blackberry can reproduce through root and stem fragments and by seed. Plants generally flower in spring and ripen in mid to late summer. Seeds can remain viable in soils for a period of several years. Himalayan blackberry control in critical or sensitive areas needs to be conducted to minimize soil disturbance to the maximum extent possible. Soils that are disturbed need to be stabilized to prevent erosion and sediment transport. The following is a list of BMPs are typically used to control Himalayan blackberry:

- **Manual Control** generally consists of hand pulling and uprooting the rootball, which is easier for younger plants. This practice works best after a rain or in loose soils especially in the understory of a forested area. Cleared areas should be replanted and mulched with native vegetation and an approved seed mix.

- **Mechanical Control** involves the use of tractors, mowers, and weed whackers. Cutting should be done several times a year over the course of several growing seasons, and care needs to be taken to avoid soil compaction and erosion on wet sites. The most effective time to cut blackberry is when the plants begin to flower. During this stage the reserve food supply in the roots has nearly been exhausted, and seeds have not yet been produced.

- **Biological Control** involves the use of animals such as goats or chickens that forage on blackberry bushes and seeds. The use of goats especially is not selective and care needs to be taken to protect

native species of plants in and adjacent to the area.

- **Chemical Control** involves the use of herbicides should be applied per the manufactures directions and recommended uses or applications. When working in critical or sensitive areas herbicides should only be applied by a certified aquatic herbicide applicator. Please contact your City or County environmental staff, or the Washington State Department of Ecology before using herbicides in and adjacent to wetlands and streams.

Poison Hemlock (*Conium maculatum*)

(Photo credit: *Eva the Weaver* via *Flickr*).

Poison hemlock can be toxic to people and animals. It contains toxic alkaloids that can be found in all parts of the plants but is most concentrated in unripe seeds. Poison hemlock affect the nervous system and symptoms include burning sensation in the mouth, nausea, vomiting, confusion, respiratory depression, and muscle paralysis. Death, when it occurs, is usually rapid and is caused by respiratory paralysis.

Poison hemlock is a biennial plant that typically lives for two years. The first year it forms a basal rosette. The second year it develops flowering stems and produces about a thousand seeds per plant. Seeds generally spread by human activities, animals, water, vehicles, or through soil movement.

Use these recommended BMPs to control poison hemlock on your property (Klickitat County Weed Board 2011):

- **Mechanical Control** involves digging up small infestations, making sure to remove the tap root. Cutting or mowing is not an effective control measure as the plants will resprout. Dispose of dead plant material in the trash.

- **Chemical Control** generally involves the use of glysophate, which can be very effective in controlling large infestations. Always follow label instructions before applying any herbicide. Applying herbicides in and adjacent to wetland and stream areas needs to be carried out by a certified aquatic herbicide applicator. Please contact your City or County environmental staff, or the Washington State Department of Ecology before using herbicides in and adjacent to wetlands and streams.

- **Follow Up** treatments may be required for seedlings and resprouts. Plant grasses and other desirable vegetation to prevent further weed establishment at the site.

  Remember that toxins will remain potent in dried plant material. Do not store in areas where livestock or children can eat the dead plants.

ACTION!

STRATEGY 2.4:

PROVIDE CONSISTENT AND PROACTIVE MANAGEMENT FOR THE MITIGATION PROJECT

If a proactive approach is taken early in the mitigation planning process there is an increased probability that any potential problems will be detected early, and as a result, not become bigger problems later. As a mitigation project moves from the planning and regulatory approval phase into construction, and then ultimately into the monitoring period, a proactive mindset among those involved in the project will provide a good platform for an adaptive management approach for the project if issues arise and contingency plans need to be implemented.

➲ What the Study Found

The Soundview Report noted that there were few copies of written communications, meeting notes, telephone records or other documented communications between the City of Auburn and project proponents in the City's mitigation records. This suggests that there may be an opportunity to improve communication and feedback systems between the City (and regulatory agencies generally) and project proponents and their agents, so that all parities involved in compensatory mitigation are 'on the same page' in terms of knowing the status of the project, key next steps, identifying and addressing site performance issues that are reported in annual monitoring reports, etc.

Before You Begin...

Keep in mind that your wetland mitigation project in the Green River Valley may require coordination with these agencies and organizations:

- **Federal -** U.S. Army Corps of Engineers, Federal Emergency Management Agency (FEMA), U.S. Environmental Protection Agency, National Marine Fisheries Services, and U.S. Fish and Wildlife Service.
- **State -** WA State Department of Ecology, Department of Fish and Wildlife, and Department of Natural Resources.
- **Local -** King or Pierce County, and the permitting department of the city or town where your project is located.
- **Tribal -** Muckleshoot, Puyallup, and Duwamish Tribes.

➲ Why Using Proactive Management Strategies for Designing Mitigation Plans is Important

Proactive management of a project should be the responsibility of everyone involved in a wetland mitigation project, from proponents, to designers, to reviewers. An important part of the mitigation planning process is to ensure that all parties involved know what to expect as the project moves forward. This starts with the proponent having realistic goals for a development site and understanding what impacts are likely to be allowed (with mitigation), and which are not. The designer or wetland professional often plays the middle man in this process in making sure that project proponents do not have unrealistic expectations of what can be accomplished on a site with environmental constraints. During this phase of the process, agencies need to make sure that the designer and proponent are clear about the regulatory agency's interpretations of current regulatory requirements, and that the project proponent understands what actions will be required, and what the timing of those actions is likely to be. This is important because wetland science is often not black and white, and one person's interpretation of what is allowed or required may be different than another person's.

Practicing a proactive management approach from the inception of a project through the end of the monitoring period allows for an adaptive management approach if the need arises. Adaptive management is a systematic process in which modifications to a compensatory mitigation plan including monitoring, maintenance, and contingency plans, are made based on what has or has not been effective (Ecology, 2006a). An adaptive management approach can be especially important when conditions change that are unforeseeable and unavoidable. Unforeseen issues that have arisen for some mitigation sites in the City of Auburn include beaver activity (*Figure 2.5.1*), changes in water regime after mitigation site construction, and encroachment of invasive species from adjacent sites. It is important then when issues like this arise and pose a challenge for a mitigation site, that everyone involved be engaged, communicative, solution-oriented, flexible and practical, to resolve the issue and keep the project on track to achieve regulatory and ecological success.

Figure 2.5.1

Beaver activity has impounded the stream in this mitigation site increasing the depth, area, and duration of inundation on the site (Photo credit: *Soundview Consultants).*

➲ Putting It Into Practice

Being proactive and taking an adaptive management approach is important in keeping projects on track during the monitoring and maintenance period. It is not uncommon for unavoidable issues to arise during the monitoring and maintenance period which generally lasts anywhere from 3 to 10 years for a compensatory mitigation site. During this time it is important for project proponents to be proactive in keeping regulatory agencies apprised if and when conditions change, regardless whether the change in conditions is from natural or man-made causes. Additionally, agency staff have a good deal of technical expertise that can be of great assistance in trying to resolve issues or problems.

Changing conditions can occur over long periods of time or they can change overnight. In the City of Auburn, numerous mitigation projects have been affected or impacted from both man-made causes (i.e. filling and grading on off-site properties, illegal dumping, etc.) and natural causes (i.e. beaver activity, and encroachment of invasive species, etc.). In both instances it is ultimately the responsibility of the project proponent to notify the regulatory agencies when changes like this occur. If a proactive approach is not taken and the regulatory agencies are not notified, the risk of additional financial obligations for the project proponent greatly increases.

Proactive mitigation site management also means active engagement with the site. Both proponents and agencies should perform regular, periodic inspections of the site to ensure it is performing well, and that no unanticipated changes in conditions are allowed to remain unaddressed for an extended period of time.

Rec 2.4A **Both proponents and agency representatives should perform regular, periodic inspections of the mitigation site to ensure early detection of any potential issues or problems.**

Rec 2.4B **Proponents should notify regulatory agencies as soon as they become aware of potential issues or problems at a mitigation site so that a coordinated and timely approach for addressing the problem can be implemented.**

Rec 2.4C **Agencies should endeavor to be proactive in communicating with wetland mitigation proponents regarding site requirements, schedules, milestones and next steps, financial security status, and other issues that proponents need to be aware of so that they can understand and plan for activities that are needed to meet regulatory requirements.**

Did You Know...

A large area of land in the Green River Valley is located within the Special Flood Hazard Area (100-year floodplain) designated by FEMA.

Consult your local department of planning and development **early** in the permitting process to determine if your project is located within a regulated floodplain.

STRATEGY 2.5:

IMPLEMENT A SUSTAINABLE PROJECT ORGANIZATION AND RECORDKEEPING SYSTEM

Problems with project organization and recordkeeping systems can greatly impact and affect efficiency and consistency when dealing with monitoring and tracking long range mitigation projects. By maintaining a database and having a recordkeeping and tracking system, wetland practitioners and regulatory agencies alike are much better equipped to be able to readily determine the status of a mitigation project and help make sure the project stays on track.

➲ What the Study Found

The Soundview report identified a number of challenges they encountered in the course of collecting information for the Auburn study that were related to file management and recordkeeping, these included:

- Prior to the study, the City of Auburn did not have a comprehensive system in place for monitoring wetland mitigation projects. Upon undertaking the AWMA Project, the City of Auburn developed a database and file system for wetland mitigation projects that can be expanded to include future projects. Additionally, the City created feature layers for its wetland mitigation monitoring sites and entered them into the City's Geographic Information System (GIS), thereby allowing for mapping and analysis of the sites.

- The City used historical file-naming conventions during project review and approval, which in some cases produced file names that were repetitive (same or similar names for different projects) and confusing. For example, the City's South 277th Street Capital Improvement Project, which had wetland impacts and required compensatory mitigation, was implemented in several phases, and required approval through multiple agencies (City, County, and WSDOT). In this case, compensatory mitigation was phased over multiple years and at a variety of locations, each using a variation of the same name and project number or combination thereof. This phasing of the project over time accumulated many similar documents with similar data and specifications. This made tracking each project phase, mitigation site, and action very difficult.

- Information was not centralized for projects that were quantifiably large in scale, phased or distributed to more than one compensatory mitigation area. Information for these complex projects tended to be scattered throughout a variety of reports and individual development review files. In addition, amendment documents, emails and permits were not easily tracked; whereas construction plans were typically clear, detailed, and error-free.

- For the sites evaluated in the study, little documentation was found in the City files to demonstrate completion of mitigation monitoring requirements for sites that had been closed out and were considered complete.

➲ Why Implementing a Sustainable Project Organization and Recordkeeping System is Important

Project organization allows all parties involved in a wetland mitigation project to track the status of the project from project concept to project design, through the project review phase, and ultimately to the end of the monitoring period. This allows project proponents and reviewers alike to maintain a history of the evolution of the project, and helps to ensure that all requirements have been met prior to final approval of the project. Good project recordkeeping provides an information trail for someone who may become involved with the project or have an interest in learning more about the mitigation site in the future, and more readily allows others to pick up the project file and determine what the impacts were, understand what the approved mitigation measures included, see the history of the mitigation activities, know the current status of the project, and be aware of any project specific milestones that may need to be met in the future.

Good project organization and recordkeeping helps to ensure that the proponent receives timely agency reviews of proposed mitigation design documents and feedback on required monitoring reports, and at the same time it allows agency site managers and reviewers to ensure that project milestones are met and mitigation areas are on track for achieving their functional objectives. Timely and regular correspondence between everyone involved in the mitigation project plays a key role in ensuring mitigation requirements are met, and minimizing costs for project proponents. This includes the cost of maintaining financial assurances, which are in place to protect the environment and provide agencies financial resources to ensure the success of a mitigation project should the responsible party be unable or unwilling to do so. In recent years, it has become increasingly difficult for many proponents to find financial backing for long term mitigation assurances, making it that much more important to maintain good records of financial

assurance requirements and to keep the project on track for releases of financial assurances as scheduled.

➲ Putting It Into Practice

The importance of maintaining a complete record of project information cannot be overly stressed. Essential information to keep in project files include baseline information on pre-disturbance site conditions, delineation Reports with wetland and stream categories and classifications, the APPROVED Final Mitigation Plan, and As-Built Plans. Additional information that is helpful to have on file includes reports used for mitigation planning such as grading and drainage plans, hydrologic assessments, geotechnical reports, etc. Correspondence between involved parties, which helps to illustrate the succession of the project from beginning to end, is another important set of information to have on file. Having all of this information in the project file allows anyone to be able to quickly pick up the project, and know its history and/or current status. In addition historical information is helpful in developing contingency plans if they are necessary.

Rec 2.5A **Maintain a complete, well-labeled file of all information developed in association with the wetland mitigation project, including: pre-project (baseline) site information, delineation reports, permitting documents, correspondence records, meeting minutes, permitting documents, background documents, and financial estimates and expenditure records.**

Mitigation project recordkeeping and file organization can be further enhanced by including a series of timelines that can be checked-off or dated when each item is complete, due dates, design elements and goals that can be confirmed, amendments to mitigation plans, letters of confirmation at each milestone, etc.

Rec 2.5B **Use a Geographic Information System (GIS) to maintain, map, and analyze, and communicate information associated with the wetland mitigation site.**

Geographic Information System (GIS) mapping is another important tool to make a part of project organization and record keeping, which can yield tremendous benefits. GIS allows mitigation

(cont'd)

practitioners and agencies to have some spatial awareness of the location and distribution of features within a mitigation site, and manage much larger amounts of information for multiple mitigation projects across a broad region. Maintaining a GIS database, allows reviewers to overlay aerial photos and other feature layers that readily show the overall conditions of the mitigation site and surrounding watershed. GIS databases also lend themselves to analysis and modeling activities, which can be used show changes in conditions over time, trends in the types of mitigation constructed, and the relative successes and failures across an area.

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4.0 ACRONYMS AND ABBREVIATIONS

AWMA	Auburn Wetland Mitigation Assessment
BMP	Best Management Practice
Corps	United State Army Corps of Engineers
DOE	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
IPM	Integrated Pest Management
PWS	Professional Wetland Scientist
RCG	Reed Canary Grass
RCW	Revised Code of Washington
ROW	Right of Way
SAMP	Special Area Management Plan
SR	State Route
WSDOT	Washington State Department of Transportation