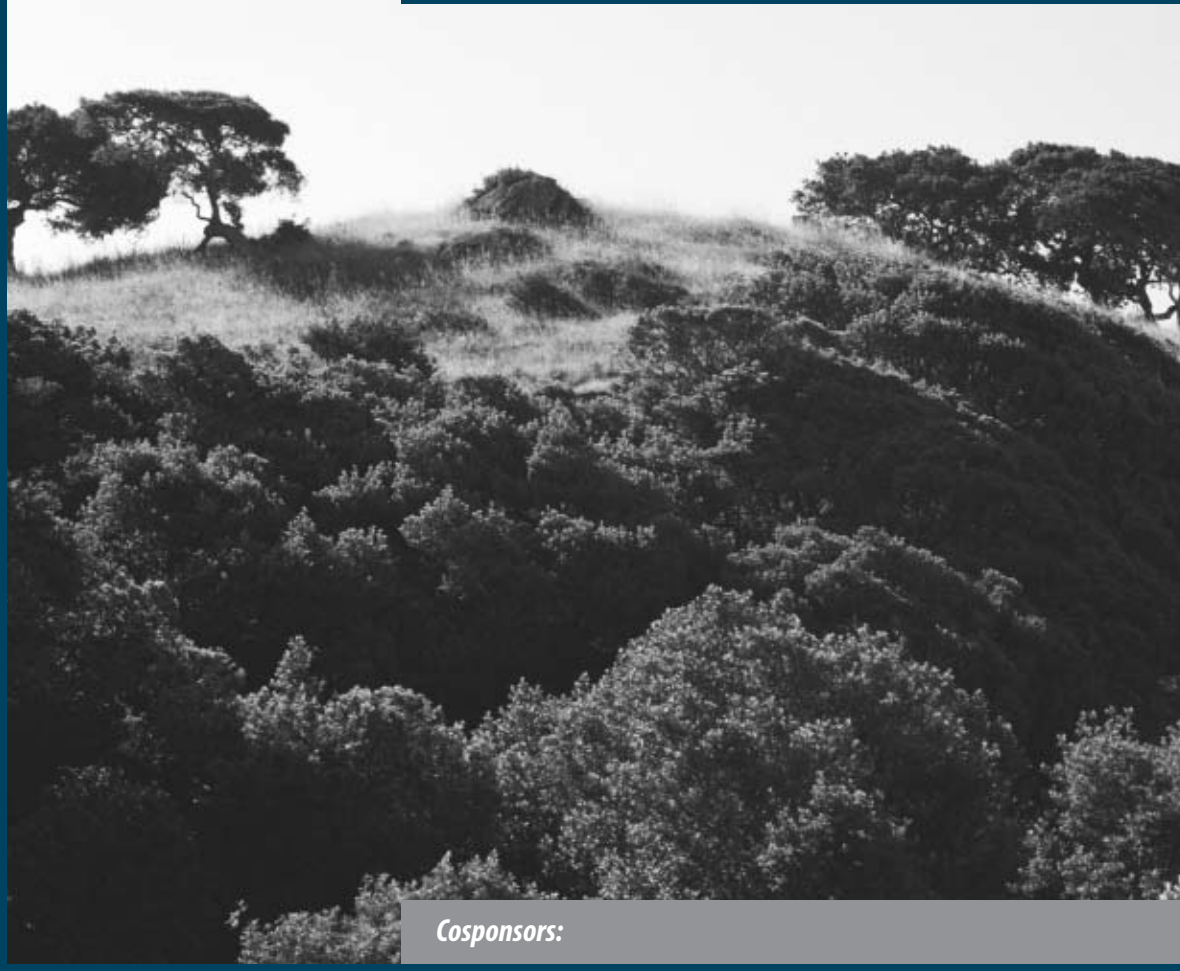
National Symposium on Compensatory Mitigation and the Watershed Approach

Symposium Report



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National Symposium on Compensatory Mitigation and the Watershed Approach

Symposium Report

May 19 – 21, 2004

Conservation and Resources Center

Washington, DC

Prepared by the

Environmental Law Institute

September 2004

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Acknowledgements

The *National Symposium on Compensatory Mitigation and the Watershed Approach* was sponsored by the Federal Highway Administration, NOAA National Marine Fisheries Service, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and USDA Natural Resources Conservation Service. Environmental Law Institute staff on the project included Jessica Wilkinson, Roxanne Thomas, Zach Lamb, and Maria Placht.

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National Symposium on Compensatory Mitigation and the Watershed Approach

ISBN No. 1-58576-088-9. ELI Project No. 0422-02.

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National Symposium on Compensatory Mitigation and the Watershed Approach

On May 19-21, 2004, the first *National Symposium on Compensatory Mitigation and the Watershed Approach* was held in Washington, DC. The symposium was sponsored by the Federal Highway Administration, NOAA National Marine Fisheries Service, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and USDA Natural Resources Conservation Service. The Environmental Law Institute (ELI) organized and facilitated the event and conducted background research in support of the symposium. The event brought together a diverse group of individuals from federal and state government, non-governmental research organizations, academia, and others to discuss compensatory mitigation and the watershed approach.

Background

In 2001, several studies were released that sought to address the status of federal compensatory mitigation in the United States. In May 2001, the General Accounting Office (GAO) released a report entitled, "Wetlands Protection: Assessments Needed to Determine Effectiveness of In-Lieu-Fee Mitigation," and in June 2001, the National Research Council (NRC) released its study, "Compensating for Wetland Losses Under the Clean Water Act."

In December 2002, the federal wetland agencies released two policy documents that were intended to address compensatory mitigation conducted under §404 of the Clean Water Act. The U.S. Army Corps of Engineers (Corps) issued a revised Regulatory Guidance Letter (RGL),[1] which replaced an earlier RGL released in October 2001. The revised RGL was developed with input from a variety of federal agencies and was intended to improve compensatory mitigation implemented under the Clean Water Act in support of the Administration's "no net loss of wetlands" goal.

The RGL was part of the National Wetlands Mitigation Action Plan (MAP),[2] also released in December 2002, by the Corps and the U.S. Environmental Protection Agency (EPA), in conjunction with the Departments of Agriculture, Commerce, Interior, and Transportation. The primary purpose of the plan is further achievement of "the goal of no net loss by undertaking a series of actions to improve the ecological performance and results of wetlands compensatory mitigation under the Clean Water Act and related programs." The plan was designed to provide the participating federal agencies with a roadmap for developing a number of guidance documents, conducting research, and undertaking other activities through the year 2005. The MAP lists 17 action items that are intended to improve the effectiveness of compensatory mitigation under §404 of the Clean Water Act. Following the release of the Mitigation Action Plan, a federal interagency team, the Mitigation Action Plan Workgroup (MAP Workgroup), was formed to coordinate work on the action items outlined in the plan.

One of the MAP action items calls for the interagency workgroup to identify criteria for making compensatory mitigation decisions within a watershed context by 2005. Specifically, the MAP directs the agencies to develop guidance to encourage placement of mitigation where it would have the greatest benefit and probability for long-term sustainability. The guidance will provide a framework for decision-making that can be used in conjunction with existing watershed plans or tools.

This watershed symposium was designed to provide the MAP workgroup with direction and input on

[1] U.S. Army Corps of Engineers. Regulatory Guidance Letter No. 02-2. 24 Dec. 2002 <http://www.usace.army.mil/inet/functions/cw/cecwo/reg/RGL2-02.pdf>.

[2] "National Wetlands Mitigation Action Plan." 4 Feb. 2004. <http://www.mitigationactionplan.gov/>.

watershed-based planning tools and resources that could be utilized for the purposes of making compensatory mitigation decisions under §404 of the Clean Water Act. The desired outcomes of this 2 1/2-day symposium were:

- Identify/clarify what science says about making compensatory mitigation decisions in a watershed context;
- Clarify the essential steps of the ideal watershed-based approach to compensatory mitigation;
- Identify the most important criteria used by existing watershed-based planning tools/resources to analyze priorities and restoration options;
- Discuss the potential use of these watershed-based planning tools/resources in a regulatory context; and
- Discuss the level of information necessary to effectively utilize these watershed-based planning tools/resources in a regulatory context.

Compensatory Mitigation in a Watershed Context

In 1996, the U.S. Environmental Protection Agency defined the watershed approach as "a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow."[3] It is this definition of the watershed approach that was relied upon for the purposes of the symposium.

Prior to the symposium, the MAP Workgroup provided the participants with their early vision of the "Logical Steps" of a watershed-based approach to compensatory mitigation. In these early stages, the MAP Workgroup anticipated that watershed-based planning tools/resources developed for the purposes of guiding compensatory mitigation under §404 of the Clean Water Act would include the following "Logical Steps":

1. **Landscape assessment** of how the watershed works in terms of its functional and structural elements (e.g., by ecoregion or hydrogeomorphic [HGM] setting, possibly including the development of wetland landscape profiles);
2. **Historical assessment** of what aquatic resources have been lost in the watershed (resource types, acreage);
3. **Assessment of remaining aquatic resources** (types, acreage), including an inventory of aquatic resources for the project watershed and an assessment of those resources using a rapid wetland assessment method;
4. **Analysis of priorities and restoration options,** based on expert opinion. The options and priorities should be based on consideration of the watershed's aquatic resource functional needs, as well as the ecological and management opportunities that exist to restore degraded aquatic resources, including wetlands. Ideally such an analysis would rely upon the use of GIS analysis or another decision support tool;
5. **Determination of where, when, and how much** aquatic resources need to be restored.

The MAP Workgroup, with the assistance of research conducted by the Environmental Law Institute, also tentatively identified 18 examples of watershed-based planning tools/resources that could serve as models for developing criteria and a framework for identifying the most beneficial and sustainable mitigation sites in a watershed. Representatives of these 18 initiatives comprised the bulk of the speakers over the 2 1/2-day symposium.

[3] U.S. Environmental Protection Agency. 1996. "Watershed Approach Framework." 18 Mar. 2004. <http://www.epa.gov/owow/watershed/framework/ch2.html>.

Watershed Symposium Report

This report is intended as a representative record of the issues discussed at the watershed symposium. It can serve as a resource for those interested in making compensatory mitigation decisions under §404 of the Clean Water Act in a watershed context. It can also serve as a foundation for federal and state agencies and others to encourage placement of mitigation where it would have the greatest benefit and probability for long-term sustainability.

Overarching Themes

The symposium was not meant to poll stakeholders or to yield consensus-based directives for the agencies. However, several recurrent themes emerged that warrant mention.

- The MAP Workgroup is not proposing that watershed *plans* be developed everywhere. They are trying to outline a "logic" that regulators and others can use to guide compensatory mitigation decision-making in a watershed approach.

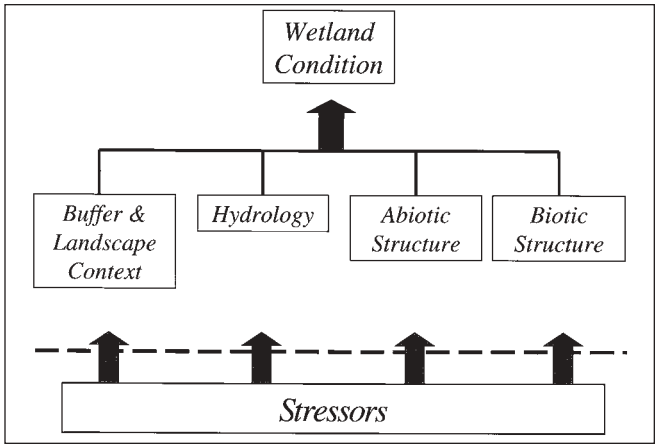


FIGURE 1: California Rapid Assessment Method (CRAM) Conceptual Framework

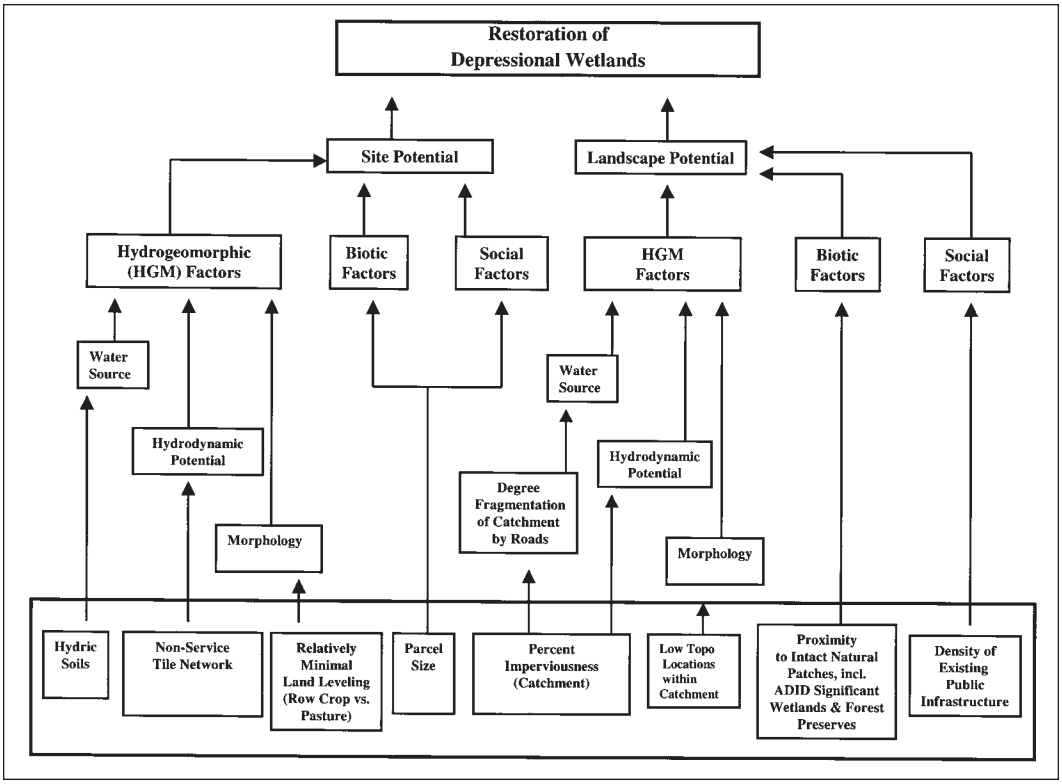


FIGURE 2: Depressional Wetland Restoration Projects for the Blackberry Creek Watershed: A Conceptual Model

- The "Logical Steps" or "Common Elements" should be viewed not as a step-wise process, but as one that is iterative and simultaneous.
- The MAP Workgroup should develop guidance that includes "Common Elements" to guide mitigation planning and design within a watershed context, rather than what should be in a watershed plan. The contents of a plan cannot be prescribed because they will need to be regionalized based on local circumstances, development pressures, and the stakeholders involved.
- The MAP Workgroup must clearly define what they mean by making compensatory mitigation decisions in a watershed context. To some practitioners and regulators this might mean making site-specific decisions within the boundaries of a watershed. The guidance should relate to making decisions at the site- or landscape-level based on an understanding of condition, function, and integrity not only in the wetland, but in the watershed surrounding the wetland.
- The MAP Workgroup should develop categories of criteria. These categories should be flexible enough to allow for local adaptations. Different criteria should be developed depending on the scale being considered. Example criteria should be provided in the context of a framework. Two such frameworks were offered *(See Figures 1 and 2)*.
- Participants felt that three levels of decision support tools would help to guide watershed-based decision-making. The three levels would require varying degrees of data and effort. They are: 1) Geospatial tools, such as GIS-based landscape models; 2) Checklists, rapid assessment, site-specific tools; and 3) Site-specific tools, such as intensive surveys.

An audio recording of the symposium, PowerPoint presentations, and links to many of the policy and technical documents discussed in this report are available through the Environmental Law Institute's web site at: <http://www.eli.org/research/watershedsymposium.htm>. Other policy documents related to federal wetlands mitigation can be accessed through the web sites of the National Wetlands Mitigation Action Plan <http://www.mitigationactionplan.gov>, U.S. Environmental Protection Agency's Wetlands Division <http://www.epa.gov/owow/wetlands>, and the U.S. Army Corps of Engineers' Regulatory Program <http://www.usace.army.mil/inet/functions/cw/cecwo/reg/index.htm>.

In the following summary of the presentations and facilitated discussions, points made by participants are summarized and attributed where appropriate by a parenthetical citation of the person's surname. The meeting facilitators have summarized the comments of participants based on notes and audio recordings of the discussion. ELI apologizes for any misrepresentation of the speakers' meaning or intent.

Background, Purpose and Desired Outcomes

The first day of the symposium was devoted to opening remarks offered by Mark Sudol, Chief of the U.S. Army Corps of Engineers' Regulatory Branch; introductions; a presentation on the background, purpose, and desired outcomes of the 2 1/2-day meeting; a review of what the science says about a watershed approach to regulatory decision-making; a discussion of possible "Logical Steps" of a watershed-based approach to compensatory mitigation; and the first of three sessions on criteria used by existing watershed-based programs to analyze priorities and restoration options.

Day two included two additional sessions on criteria used by existing watershed-based programs to analyze priorities and restoration options and presentations on the use of watershed-based planning tools and resources in a regulatory context. The final day of the symposium was devoted to two panel discussions on the challenges faced by federal field offices in making compensatory mitigation decisions in a watershed context and a wrap-up and closing statement offered by Mark Sudol of the Corps and John Goodin of the U.S. Environmental Protection Agency's Wetlands Division.

Bob Brumbaugh, from the Corps' Institute for Water Resources (IWR), and John Goodin, from EPA's Wetlands Division, discussed the background, purpose, and desired outcomes of the 2 1/2-day symposium. They stated that the Mitigation Action Plan has continuously engaged the federal agencies over the last year and a half. Much work went into the formulation of the plan, and much work remains in maintaining its progress. The current administration recently renewed its commitment to wetlands; this was a commitment not only to the no-net-loss goal, but also a commitment to increase wetlands acreage through government programs and initiatives, including the Clean Water Act (CWA) and non-regulatory wetland conservation initiatives and partnerships at local, tribal and state, and federal levels. This commitment is a tribute to staff at all levels of government and demonstrates that wetlands protection is an issue of prominence.

Context of the Symposium

The goal of the MAP is to improve the effectiveness of compensatory mitigation, working towards the achievement of no net loss and, where possible, providing technical and other guidance that will support wetland restoration. The MAP contains 17 action items that the federal agencies want to implement by 2005. These actions can be separated into four categories that address various studies' findings and recommendations (e.g. 2001 National Research Council report, GAO's In-Lieu Fee study, some work by ELI, IWR-spearheaded compilations of mitigation success):

1. Improving compensatory mitigation accountability, e.g. tracking and measurement and assessment;
2. Clarifying performance standards, e.g. moving beyond simple stem counts as a way of identifying whether or not a mitigation project is succeeding;
3. Improving data collection and availability; and
4. Integrating compensatory mitigation into a watershed context, the focus of this symposium.

Under this last theme, the MAP Workgroup is developing three "precursor" documents that will lead to guidance in 2005 on making compensatory mitigation decisions in a watershed context. They include:

1. Guidance on the uses of on-site vs. off-site and in-kind vs. out-of-kind mitigation;
2. Guidance on the use of vegetated buffers as a potential component of compensatory mitigation; and
3. Guidance on the appropriate use of preservation for purposes of compensatory mitigation.

Many groups have been conducting mitigation in a watershed context on an ad hoc basis for some time, but few have translated the science behind their efforts into a practical application of §404 permitting or into identification of good restoration sites. The objective of this symposium is to identify criteria for making compensatory mitigation decisions in the watershed context.

The guidance document will seek to "encourage placement of mitigation where it would have the greatest benefit and probability for long-term sustainability" and help decision-makers "utilize the watershed-based planning tools/resources already developed." The target audience of the 2005 guidance includes regulators and mitigation providers who are identifying sites to place restored wetlands on the landscape and people concerned with watershed issues in general, i.e., watershed stakeholders. Many local watershed organizations lack a comprehensive understanding of the watershed and where wetlands would be most effective in the landscape.

Many opportunities and linkages exist to help the development of this guidance. Several sources of funding are available through traditional programs, particularly for wetland restoration conducted in a watershed context to advance multiple objectives. For example, in 2003, the Clean Water Act State Revolving Loan Program provided $1.7 billion, EPA's non-point source program provided $238 million in grants, and the agency provided $30 million in grants for targeted watershed areas. Future opportunities and linkages include source water protection, nonpoint source management, Total Maximum Daily Loads (TMDL), National Estuary Programs, essential fish habitat, and state and local planning.

In many ways, the stars are aligned to support the movement to making compensatory mitigation decisions in a watershed context. The technology is available (e.g. geographic information systems), there is significant political will and public awareness, the scientific community is recognizing the role of wetlands and providing a solid knowledge base for these efforts, new partnerships are forming between federal, local, state and tribal groups, and new financial opportunities are available.

Purpose of the Symposium

Most people are interested in the quality of their watershed, and there is a lot of information out there that can help inform watershed-scale decisions. However, often there is no identified method that helps inform how these decisions are made. At present, decisions tend to be site-specific (not generalized to watershed), and watershed solutions depend on site-specific problems and issues, physical attributes, socio-economic attributes, and the values of those in the watershed. This symposium is designed to help shape a logic that will inform regulatory decisions in a watershed context. The purpose of the event is to provide the MAP workgroup with direction and input on criteria that could be included in a framework for decisions on a watershed basis.

Desired Outcomes

The MAP Workgroup has articulated five desired outcomes for the symposium. They are:

- Identify and clarify what science says about making compensatory mitigation decisions in a watershed context.
- Clarify "Logical Steps" of watershed-based approach to compensatory mitigation. The "Logical Steps" developed in advance draw upon work conducted by Joy Zedler.
- Identify the most important criteria used by existing watershed-based planning tools/resources to analyze priorities and restoration options. We are here to learn from presented initiatives.
- Discuss the potential use of these watershed-based planning tools/resources in a regulatory context.
- Discuss the level of information necessary to effectively utilize these watershed-based planning tools/resources in a regulatory context.

Questions & Discussion

Wold asked why the MAP was developed and the Workgroup formed. Brumbaugh and Goodin replied that the MAP was formed through a staff-generated initiative. After the National Research Council report was released, agency staff worked together over several months to put together a draft plan that addressed the report's concerns. The precursor to the Workgroup was the White House Wetland Working Group, which met in the mid-1990s to establish mitigation banking and in-lieu-fee guidance. The MAP Workgroup was formalized during the development of the Corps' mitigation RGL and the Mitigation Action Plan.

Martindale noted that, as a representative of the regulatory staff, people should keep in mind that there are different levels and different target audiences for this guidance. Regulators consider several permit actions at any given time and have a limited amount of time for doing so. It is not generally possible for a project manager to put together a watershed plan before issuing a permit. In most cases there is no watershed plan in place and there isn't going to be a watershed plan in place. The MAP Workgroup should keep in mind the process that regulatory staff undergo when issuing a permit. Brumbaugh responded that the NRC report recognized that many places will not have a watershed plan in place. The MAP Workgroup is not proposing that watershed plans be developed everywhere. Instead, they are trying to outline a "logic" that regulators and others can utilize for making compensatory mitigation decisions in a watershed approach. It will involve working with stakeholders and conducting outreach, both of which are emphasized in the NRC report. This symposium is designed to identify the criteria that might be used to guide this approach. The guidance will try to provide model tools and criteria that could be used with or without plans or with informal plans to help regulators make decisions.

Hall added that regulatory agencies cannot continue to exist without a watershed framework to help guide decision-making. The watershed approach can also guide more than decisions about where to locate mitigation. For example, the Jacksonville District has divided Florida into 28 watersheds. Watershed profiles are being developed for each watershed. Resources will be reallocated to the watersheds with the most activity. Criteria for making watershed-based decisions are needed in a command and control regulatory program. Another participant noted that information transfer is important to informed decision-making. Information flow and organizing information is essential for regulators.

Collins suggested that two very separate questions were being discussed. One question related to how to make more efficient decisions in regulatory context and the other relates to the theoretical and scientific logic of this process. The watershed scale provides a scale at which these two questions can converge. Sudol added that the issue is more than just how to make regulatory decisions faster; it is also about making regulatory decisions better. In other words, how to make decisions based on documented environmental information, better information and analysis, and using more information, such as screening tools.

Wold stated that in Eugene, Oregon, the city's program considers projects that make the most sense ecologically, and then tries to seek buy-in from state agencies. Within agencies that have both a regulatory branch and a planning branch, the planning branch is usually supportive of their initiatives, but the regulatory staff often have difficulty moving towards a better regulatory framework. Integrating regulatory and planning approaches is a challenge.

Schaftlein added that on the administrative side, vast amounts of money and energy go into producing environmental documentation for one reviewer. Instead of the money going to consultants to repeat the process on similar projects nearby, the funds should be channeled to multi-disciplinary experts that can review projects as a team.

What does the science say about a watershed-based approach to regulatory decision making?

This session was designed to address the first Desired Outcome: Identify and clarify what science says about making compensatory mitigation decisions in a watershed context. Presentations were given by Barbara Bedford and Richard Sumner, followed by a question and answer session.

Barbara Bedford
Cornell University

Bedford's presentation emphasized what she thinks is essential to a watershed approach. The transition to making compensatory mitigation decisions in a watershed context will necessitate thinking about multiple scales. She gave credit to some of the scientists she felt have made significant contributions to the field, including Tom Winter, a hydrogeologist who focuses on wetlands in landscape, and Eric Preston, who works on cumulative impact assessment. Bedford's presentation also focused on the following questions: What are the appropriate units? What is the appropriate scale for watershed assessment? What is the relationship of function to location? Are there any other landscape considerations that we should think about?

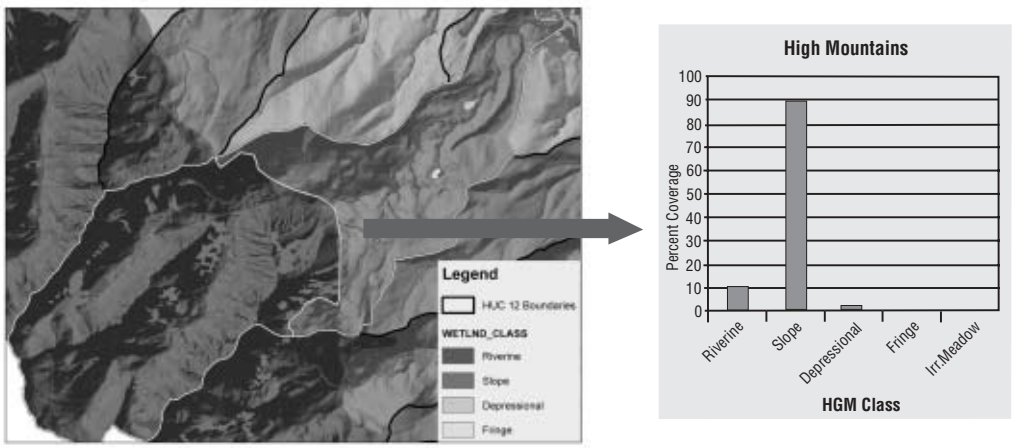
The essential components of EPA's definition of the watershed approach include:

- The watershed approach is a "coordinating framework," not a recipe book.
- The watershed approach entails focusing on the highest priority problems and recognizes that, because funding and time are limited, there must be some prioritization.
- The watershed approach must consider both hydrologically defined geographic areas and ground and surface water flow.

Bedford first addressed the question of where wetlands should be put in the watershed. For many years, Bedford thought about watersheds in terms of pieces that were spatially related to each other. She suggested that wetlands must be considered in cross-section. Both surface and subsurface water flow must be considered.

Wetlands are determined by a set of complex environmental "gradients," such as water level fluctuation, plant limiting nutrients, pH, etc. These gradients determine which type of wetland is likely to develop. When considering wetland restoration in the watershed context, we must also think about what controls the gradients. The basic tenet of landscape ecology is that spatial position matters; what is going to go on in a wetland is a function of what is adjacent to it and what is going on below the surface. Analyzing the water budget of a wetland tells us not only what the chemistry and the type of the wetland it is likely to be, but also whether the wetland is going to have an effect on downstream waters.

Understanding wetlands in the context of their associated ground water flow systems is essential to assessing the cumulative effects of wetlands on water quality, groundwater flow, and stream flow over large areas. These are the basic wetland functions that we care about, in addition to habitat.



- An individual profile is the composite of many wetalnds, which likely have different levels of functioning and condition
- Wetland profiling complements and provides a context for site-based approaches

FIGURE 3: Links Between Landscapes and Wetlands

Winter has developed what he refers to as 24 "type settings," which are combinations of physiography and climate. His data support his claim that these regions behave similarly hydrologically. Bedford presented slides from Winter's work to demonstrate the point that groundwater must be considered. In addition, she stressed that it is important to understand the hydrogeologic setting, which is broader than the concepts of wetland function advanced by Mark Brinson and HGM. Hydrogeologic setting encompasses all of the watershed characteristics that control the chemistry and the flow of surface and groundwater to a wetland.

The specific characteristics of hydrogeologic setting include climate and wetland position in the landscape (high in the watershed, low in the watershed, adjacent to a stream, "isolated" from a stream). A basic concept in hydrogeology is the concept of the nested groundwater flow systems. Position in the watershed is extremely important in terms of how the wetland affects downstream water chemistry.

One can determine where particular types of wetlands can and cannot develop based on the geologic characteristics of hydrogeologic setting (surface topography, land surface slope, thickness and permeability of the soils). The chemical, spatial, and physical characteristics must also be considered.

Bedford addressed the question of what is the appropriate unit. She suggested that watershed, ecoregions, and political boundaries are all appropriate. Watersheds are important because water is the primary consideration of the Clean Water Act. But watersheds boundaries can be very difficult to define and the boundaries are not fixed. Ecoregions are relevant because they tell us about fundamental characteristics that influence water chemistry in a particular reach. Both probably should be considered.

As to the question of what is the appropriate scale, Bedford responded that there is no one appropriate scale. Multiple scales must be considered. Fewer than six is probably the most appropriate number of scales. The project-scale and watershed scale must be considered. In the context of the watershed approach when more than one wetland is under consideration, the landscape level should be considered.

Bedford addressed the question of what the relationship of function is to location. She stated that wetland function cannot be considered without considering location. Surface water and ground water interact throughout the landscape. Location doesn't just mean adjacent to a shopping mall, it also means where wetlands sit in surface and groundwater flow systems.

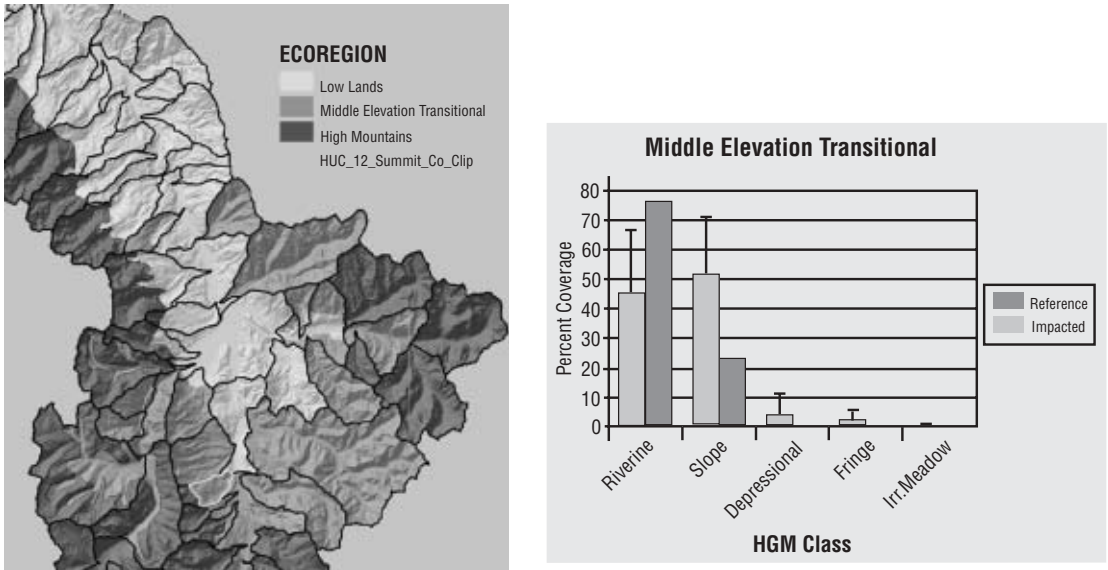


FIGURE 4: A Second Example

In a 1999 paper, Bedford proposed putting together a "landscape profile." This includes a consideration of where wetlands have been lost in order to guide the prioritization of restoration.

Richard Sumner
U.S. Environmental Protection Agency

Sumner's presentation offered a model for how to use science to guide compensatory mitigation decisions in a watershed context. He stated that assessment should occur at multiple scales. The Synoptic Approach gathers information at the regional scale that helps decision-making at the project scale. It allows the user to look at large areas and conduct a comparative risk assessment *(See Appendix: N-1).* This approach can be used to prioritize areas and guide additional planning. Regulators can look at these maps and see the risks to different resources, such as biodiversity and water quality. At smaller scales, additional assessment factors are introduced. The three scales that should be considered are:

- Political unit – This is where all watershed planning should start, since that is where decision-making happens;
- Ecoregions/hydrogeologic settings – Ecoregions existing within political units should be known because criteria will be roughly the same for each ecoregion; and
- Watershed – The watershed scale must be examined in order to conduct hydrogeologic modeling and to guide adaptive management.

If criteria are developed, there must be something to compare them against in order to measure success. Reference sites are needed for each of the three scales outlined. Reference conditions can be assessed easily. For each domain, a simple profile should be created *(See Figures 3 and 4).* The reference watershed selected should be minimally disturbed and should be in the same ecoregion as the disturbed watershed that is being referenced. The "natural" watershed becomes the reference profile. In the impacted watershed, you will see a shift from the reference.

1. Project site (e.g., proposed for fill) is a wetland that is typical of the wetland landscape profile depicted for the broader wetland planning area.....**2**
1. Site is a wetland that is a-typical of the wetland landscape profile (not natural).....**Low risk**

2. Site is a wetland of a particular HGM class that is common relative to the wetland landscape profile.....**3**
2. Site is a wetland of a particular HGM class that is historically diminished or rare relative to the wetland landscape profile.....**4**

3. Site is a wetland that is in good ecological condition.....**4**
3. Site is a wetland that shows degradation caused by minor disturbance.....**4**
3. Site is a wetland that shows significant degradation caused by major disturbance.....**Low risk**

4. Site is a wetland of a particular HGM class that is complex in structure and "DTR" ... .**High risk**
4..Site is a wetland of a particular HGM class that is simple in structure.....**5**

5. Site is located within a watershed that is (relatively) ecologically and hydrologically intact.....**Low risk**
5. Site is located within a watershed that is experiencing rapid unplanned environmental change attributed to urbanization, agricultural conversation or other resource development .....**Uncertain risk**
5. Site is designated within a ***planned*** highly urbanized or otherwise engineered landscape.....**High risk**

Risk = Probability that mitigation project will meet goals

FIGURE 5: Wetland Hydrogeomorphic Key for the Evaluation of Compensatory Wetland Mitigation Projects

The goal of compensatory mitigation is to avoid creating or restoring a wetland that is atypical from the reference profile. The profile will give the relative distribution and abundance of wetland types within the watershed by HGM class, which is important because each class provides a certain function. The U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) can create these types of profiles for a fee. With this information, one can create a checklist – or wetland hydrogeomorphic key – for evaluating compensatory mitigation projects *(See Figure 5)*. This approach seeks to ensure that mitigation provides the right HGM-type in the right place, in accordance to the

profile. The Oregon Division of State Lands has written this process into their rules.

Function and Condition

Each wetland is generally considered as an individual system and is characterized individually. Wetlands perform functions collectively across the landscape. In addition to function, wetland condition must be evaluated, i.e., whether a wetland is healthy or not. Fennessy et al. (2004) state: "The link between function and condition lies in the assumption that ecological integrity is an integrating 'super function' of wetlands. If condition is excellent (i.e. equal to reference condition), then the functions of that wetland type will also occur at reference levels."[4]

Condition can be evaluated using rapid assessment forms or using information from other more intensive assessments (Index of Biological Integrity (IBI), HGM, etc.). Reference information can then be used to make decisions about individual projects and their condition, and that information can be put into a watershed context.

Existing wetland "gems" should first be identified using a rapid assessment method at the watershed scale. The priority should be to save these sites or make them bigger/better by expanding them out along corridors and patches. A map should be created to show possible conditions using a conceptual model *(See Figure 2 above)*. In this example, the modelers began with a stream layer, since streams connect wetlands, and identified where gems are relative to streams. They also included the location of gems relative to floodplains, hydric soils, and other resources. The connections form a "green infrastructure." Human disturbances or land uses must also be embedded in the map. Integrating the existing land use/land cover map may be more important than hydrogeologic setting. An example of the resulting map is from the Blackberry Creek Watershed Alternative Futures Analysis project *(See Figure 6)*. Regulators can use this map to identify where mitigation would have the highest probability of long-term sustainability. Some places are already using these types of methods, such as Advanced Identifications, Special Area Management Plans, West Eugene, etc.

The Alternative Futures approach presents alternative scenarios for the watershed, which allows for the evaluation of the hydrologic and habitat implications of the different futures. Conventional and conservation-oriented templates are used to develop models of the watershed under different scenarios. In the Blackberry Creek example, the model shows that if appropriate mitigation is placed wisely, there will be beneficial environmental results. Existing uses of this approach have found that the costs are reasonable.

Questions and Answers

Dan Smith stated that Sumner's presentation focused on site-specific assessments. We need to develop an assessment that integrates across the entire

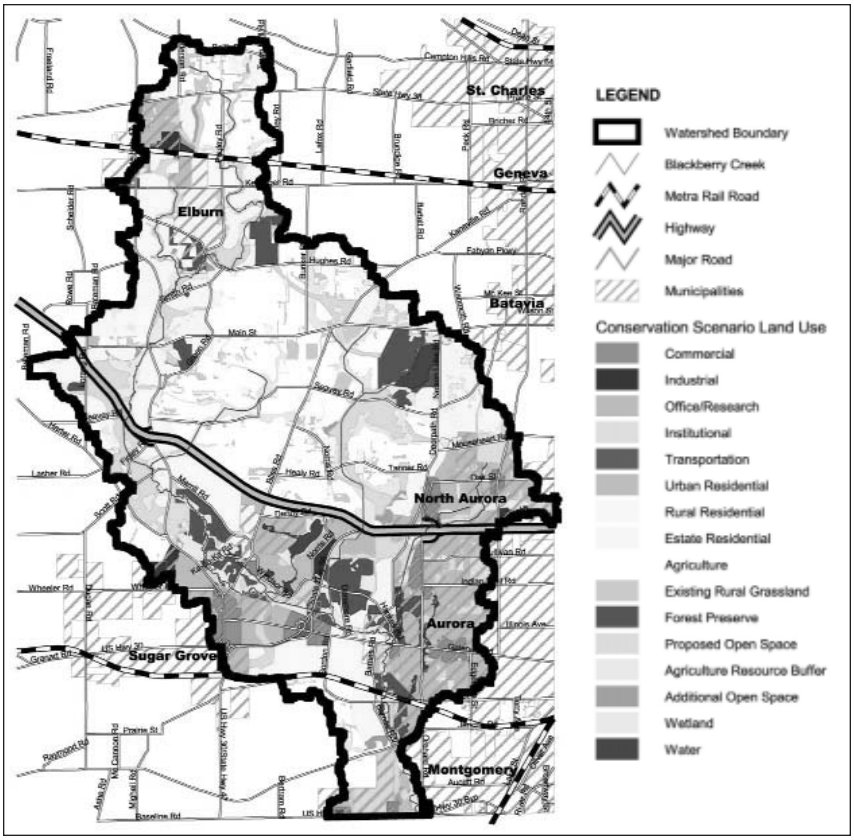


FIGURE 6: Conservation Scenario

[4] Fennessy, M. Siobhan, Amy Jacobs, and Mary Kentula. "Review of Rapid Methods for Assessing Wetland Conditions." EPA/620/R-04/009 (2004). U.S. Environmental Protection Agency, Washington, D.C.

watershed or landscape and then focuses down on the site level. Sumner responded that Stein and Collins would address this issue in their presentations. However, landscape indicators can be captured in a site-specific assessment by looking at disturbance features in surrounding areas. A lot of policy at the federal and state level requires an evaluation of function.

Stein suggested that the difference between function and condition is one of semantics. Smith's point about scale relates to how conditions at the site influence conditions at the landscape level and vice versa. To make decisions in a watershed context, we need to be able to move back and forth between the site and landscape scales. Sumner added that land use/land cover data are used as a surrogate for landscape data because the pattern of human disturbance has an overwhelming effect on what is occurring in the wetland.

Ainslie stated that wetland profiling is helpful, but asked how to develop a historic profile. Sumner responded that you can use a paired watershed approach and focus in the same ecoregion, basin, or planning area. Ainslie added that if NWI is used as a base for a landscape profile, you must acknowledge that it provides a recent, rather than a historic, snapshot. Sumner responded that the first challenge is determining what wetland class is being considered, which can be gleaned from HGM guidebooks. Bedford added that some locations have good reference and others do not. But if mitigation is located in the right hydrogeologic setting and the right HGM class, you will get a "gem." Also, state natural heritage programs are a good resource for identifying "gems."

Sumner asked Brazil about Arkansas's landscape assessment tools and maps. He asked what his experience has been in bringing large-scale geographic information systems (GIS) data to the level of a practitioner. Brazil answered that the question goes back to location. In Arkansas, they are currently developing several tools that will integrate this information. As long as there are data to input, the information can be depicted, evaluated, and used to communicate the information to the regulatory or non-regulatory community. The data can show where to mitigate, where the cumulative impacts are, what kind of wetlands there are and where they have been. The tools give people implementing the program a lot more power to guide logical, defensible decisions. The Corps has integrated prioritization and restoration data from their program into their maps, which are used to locate mitigation banks and document Corps decisions.

Collins stated that there is tension at the watershed and regional scale to cover more and more area with the same amount of money and resources. This leads to making large assumptions about functions and habitat conditions. In order to gain the support of the scientific community and be defensible, we must show quantitative data that relate to rapid assessments. Finally, in the Bay Area, they have access to photos from the gold rush era that have allowed them to assess historical ecology.

Gersib expressed concern that Bedford's presentation focused too much at the wetland level and not at the landscape level. In Washington State, it has become important to focus on the role of wetlands in ecological processes, combined with human influence and physical features of the landscape. They have also learned that they cannot focus only on spatial scale, but must also consider temporal scales, such as historic setting, future build-out, and how processes change over time.

Sumner stated that when wetlands are considered in a watershed context, you end up planning the whole watershed. This requires building partnerships with groups outside of the traditional wetlands programs. He suggested that you should start with wetlands, identify gems within green infrastructure, develop an open space plan, and create patterns. Monitoring and assessment should be used to compare maps of what you think have determined to be priorities with maps that depict the change in processes through time.

Gersib stated that the Clean Water Act is the driver, but if you are trying to recover natural systems, science dictates that our scope cannot be limited to aquatic resources. We need to figure out how to integrate Clean Water Act goals and other planning efforts instead of relying upon the Act to drive ecosystem restoration.

Wold stated that in the Willamette Valley, The Nature Conservancy and the Natural Heritage Program have been able to reconstruct historical ecology using general land office survey notes. These have also been helpful in identifying "gems" and filling in the patches. Bedford added that these survey notes are available for many states.

Cole stated that he uses HGM and pays a lot of attention to function, rather than condition, which may be problematic. However, it would be a mistake to lose the idea of function and depend only on indices that assess condition. Sumner responded that HGM is a powerful classification system because it is a functional classification system. It allows you to see what functions should be attributed to a wetland in good condition. Once that has been determined, you have a reference for other wetlands in the same class and ecoregion, which saves time in assessing condition. Another participant responded that HGM has largely been used to assess structure and not function. Structural characteristics must be considered and functional processes should be rated. Sumner discussed an EPA program that allows users to look at reference sites and conduct detailed monitoring and assessment to determine the beneficial uses that can be applied within that particular system.

Hall raised several issues. He agreed that the hydrological cycle should be considered, but from the perspective of a regulator, he must acknowledge that the Clean Water Act primarily addresses surface water. Other laws and regulations may take other components of cycle into consideration. In addition, although this new process will encourage the development of priorities for placing mitigation, planning is controlled at the local and state level. With regard to the discussion about function vs. condition, he suggested that we find a way to blend them. The Corps currently focuses only on function and although they identify measurements of function, they don't utilize them well. As for the scale issue, Hall advocated the use of GIS because it allows analysis at multiple levels. Another advantage to this watershed approach is that it can be used to support permit denials and can bring predictability, tools, and resources that will allow people to see where they are more likely to secure permit approval.

Bedford stated that individual permit evaluators can work within a broader context than that provided through the review of individual permits. For example, permit evaluators at the Adirondack Park Agency in New York use a GIS-based system that provides them with information on other permits that have been granted in the watershed, where wetlands and streams are located, etc. GIS is paving the way for this kind of analysis and impact assessments for watersheds. In the future, these kinds of resources will be more available to permit evaluators.

Stallman stated that at the county level, public perception to loss of wetlands is important. Mitigation must be located close to the impacts to compensate for loss of functions. She also stated that on a county level, as you go up in hydrologic unit codes (HUCs), HGM curves change, which can work to the advantage of developers applying for permits to modify the landscape. She asked if this situation is similar in other areas. Tiner responded that this happens in other regions as well. The more sub-basins you have the more diversity you add. From a mitigation standpoint, if you are mitigating for wetlands in a particular area, the lowest sub-basin level should be used for your profile. Sumner added that as you go up in scale you cross ecoregional boundaries. As a benchmark, you should stay within the same domain.

The "Logical Steps" of a watershed-based approach to compensatory mitigation

This session was designed to address the second Desired Outcome: Clarify the "Logical Steps" of a watershed-based approach to compensatory mitigation. It was followed by a question and answer session and a facilitated discussion. In their discussions, Ken Potter and Eric Stein sought to present the proposed "Logical Steps" and other approaches to watershed-based decisions; present "Common Elements" of watershed-based decision making; discuss application of "Common Elements" in the absence of a formal watershed plan; provide examples of watershed-based decision-making process; introduce potential barriers to implementation of watershed-based decision making; and identify tools to support watershed-scale decision making.

Stein and Potter stated that at the *Third Stakeholder Forum on Federal Wetlands Mitigation* in Portland, Oregon, Joy Zedler gave a presentation. Her points were the genesis of the "Logical Steps" that the MAP Workgroup provided to the symposium participants in their conference materials *(See "Purpose and Desired Outcomes").*

The NRC report stated that "site selection for wetland conservation and mitigation should be conducted on a watershed scale in order to maintain wetland diversity, connectivity, and appropriate proportions of upland and wetland systems needed to enhance the long-term stability of the wetland and riparian systems." The MAP responded by putting forth 17 points that can be grouped into four categories: integrating compensatory mitigation decisions into a watershed context; improving compensatory mitigation accountability; clarifying performance standards; and improving data collection and availability. Stein and Potter's presentation focused on the first category.

At the national level, the challenges are many. The first goal is to determine how to identify the best opportunities for mitigation and restoration. The second is to determine how to establish linkages and connections between sites. Finally, the MAP Workgroup must determine what can be realistically accomplished. In other words, how a watershed approach to compensatory mitigation can be adopted in areas with or without existing watershed plans. Although scientific concepts are a very useful foundation, they need to be applicable in everyday operations.

The long-term goal is a paradigm shift *over time.* This kind of change may take years or decades. The MAP Workgroup's task is to encourage and facilitate the shift. If successful, people will internalize the watershed context in mitigation decision-making. HGM is a good example of a paradigm shift. HGM and related work has influenced the way we think about wetlands, mitigation, and function-based language.

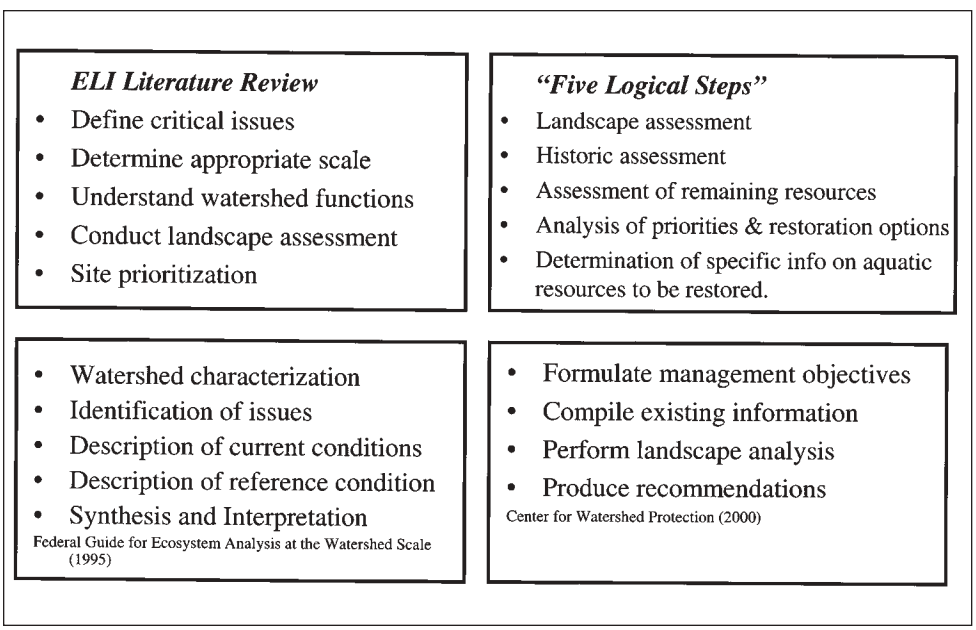


FIGURE 7: Approaches to Planning in a Watershed Context

Proposed "Logical Steps"

Several sets of steps were offered as a starting point *(See Figure 7)*. There are "Logical Steps" offered in the "Purpose & Desired Outcomes," ELI's literature review, the 1995 Federal Guide for Ecosystem Analysis at the Watershed Scale, and the Center for Watershed Protection in 2000. All the proposed sets of "steps" have Common Elements among them *(See Appendix: M-8)*. They all start

by identifying goals, objectives, and issues; recommend engaging in an inventory and assessment, including an analysis of historic, current, and expected future conditions; have a determination of a desired future condition; and include priority setting or identifying recommendations. Stein emphasized that this loop is an iterative process that is ongoing and must continue to evolve.

Stein presented a slide that outlined the basic steps in further detail *(See Figure 8)*. He suggested that an analysis of opportunities and constraints should take place after determining reference and or/desired future conditions and before determining priorities and recommendations. This order would allow for an assessment of what is realistic given the constraints of the landscape. There will always be opportunities and constraints, and they must be included explicitly in the process.

This expanded framework should also include development of an ongoing implementation plan. This step is a challenge because of time and fiscal constraints. But without an efficient, on-going implementation plan, impediments arise. Sustainability relies on on-going monitoring and assessment, feedback and plan refinement, and a mechanism for financing implementation and data management. Finally, coordination with stakeholders and other programs should be integrated into all stages of this process. For example, since the Corps is a regulatory agency and not a land use authority, local jurisdictions ultimately have the authority to make land use decisions. This reality makes coordination and integration critical. In addition, there are many other types of watershed-related programs – stormwater management programs, multi-species conservation programs, water resource and water supply programs – that need to be coordinated with watershed decision-making to harness the array of information generated by other programs to avoid groups from operating at cross purposes.

Application of "Common Elements" in the Absence of a Formal Watershed Plan

Since few places have formal watershed plans or programs in place, we must develop a framework that works in areas with and without formal watershed plans. The core of this framework includes three of the steps presented earlier:

- Determination of reference and/or desired future conditions;
- Analysis of opportunities and constraints; and
- Determination of priorities and recommendations.

The challenge is to take these "Common Elements" and identify analogs that can be applied in project-specific or site-specific circumstances *(See Figure 9)*. The analogs are almost a set of site-specific questions that can be asked to help implement the Common Elements. For example, when determining reference and/or desired future conditions without a watershed

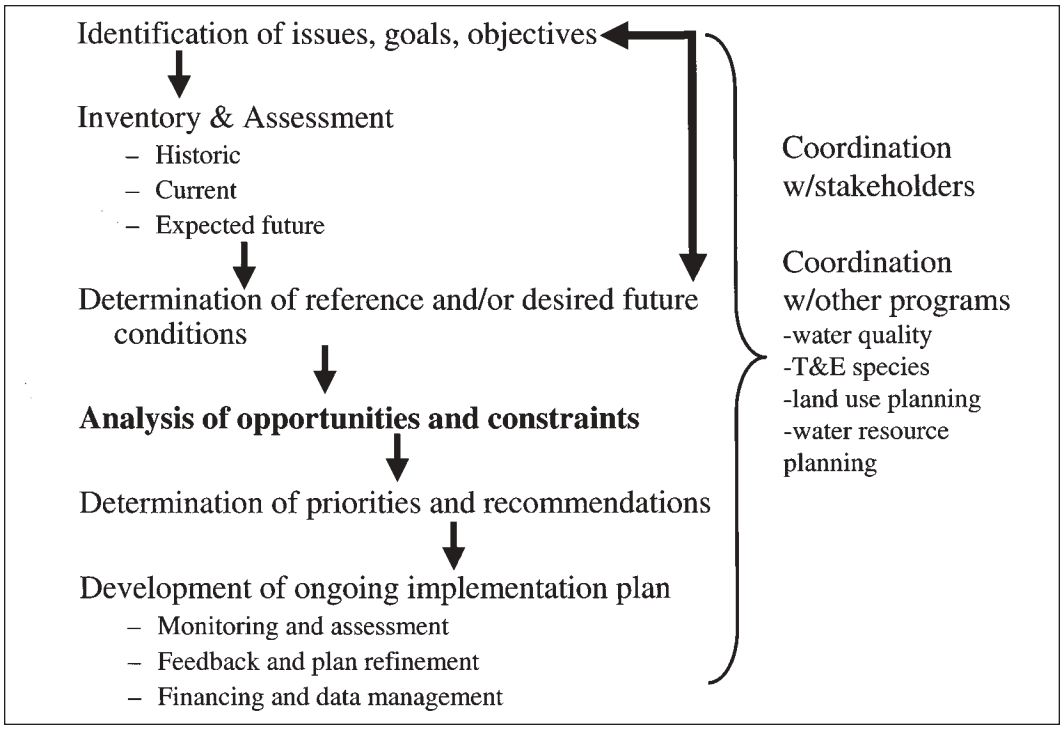


FIGURE 8: Modified Common Watershed Planning Elements

plan, you may instead consider regional reference "templates."

Stein presented several examples how these "common elements" could be applied at different scales. He discussed their application at the regional scale, a sub-basin/local catchment scale, and project-specific-scale.

At the regional scale, the Maryland Department of Natural Resources (DNR) has developed a hierarchical strategy for prioritizing wetland and riparian conservation and restoration. The agency has the infrastructure and data to work at a statewide scale. At the regional scale, green infrastructure hub and corridor rankings provide a regional context for conservation and restoration activities. After restoration priorities were identified at the regional scale, the agency focused on specific watersheds to identify restoration priorities within those watersheds. At the site-specific level, DNR uses Stream Corridor Assessments to identify restoration. DNR's approach allows the agency to focus at the site-specific scale to identify specific projects that can then nest up to achieve overall goals.

At the sub-basin/local catchment scale, the San Juan Watershed Special Area Management Plan is a watershed-specific effort that was one element of a larger program. The goal was to better understand and prioritize restoration based on sediment transport in the watershed. Using existing data (e.g., U.S. Geological Survey geologic maps and digital elevation model data, Natural Resources Conservation Service soil surveys), sources of coarse sediment, key sediment transport reaches, and sources of fine sediment were mapped. The focus was then directed to the sub-basin scale to prioritize restoration. Gabino Canyon, which is a sub-basin of the San Juan Watershed, demonstrates how the watershed approach can be used to prioritize restoration using existing data. This process generated a set of planning considerations for the specific sub-basin. The project also generated a conceptual project-specific checklist. The checklist is a set of yes/no questions that were designed to help project managers make mitigation decisions in a watershed context *(See Figures 10 and 11)*. This type of checklist could be used in an instance where a watershed plan is not in place and the sub-basin focus is not available.

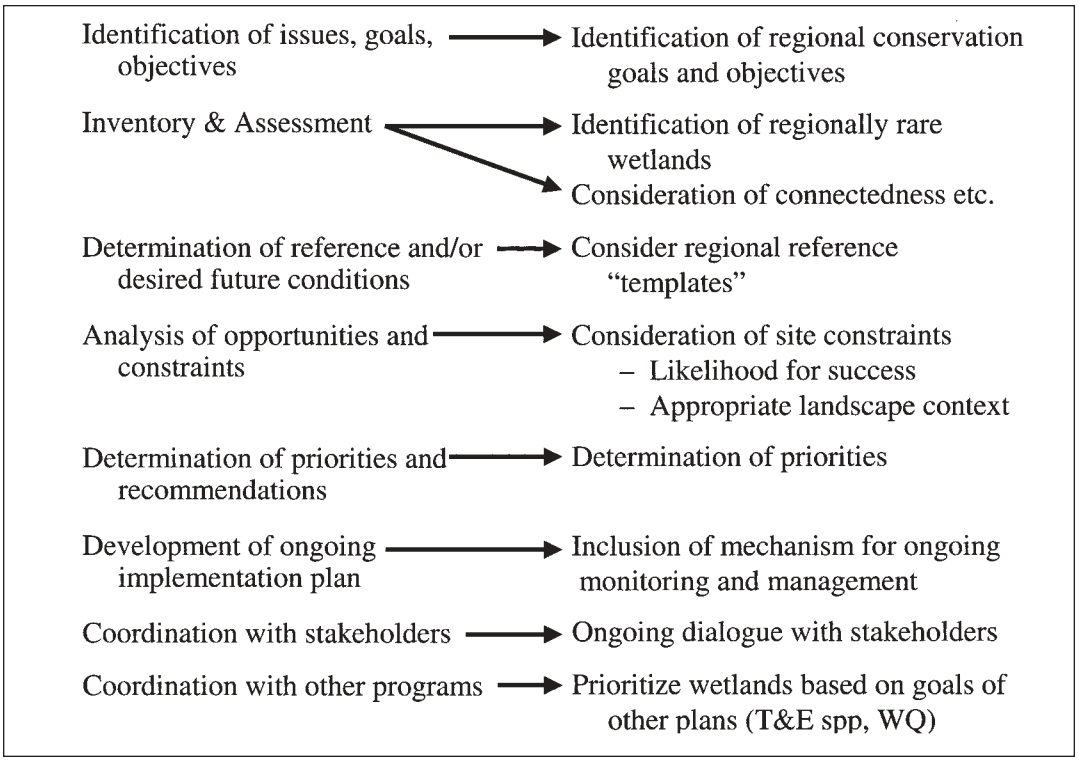


FIGURE 9: Project-specific Analogues to "Common Elements"

Potential barriers

There are many barriers to making the paradigm shift to implementing watershed-based decision-making. These barriers include:

- The availability of regional/synoptic information at multiple scales.
- Lack of mechanisms to easily compile and access data. As GIS and Internet technologies improve, however, these mechanisms are more accessible.
- Differences in institutional/agency missions or objectives. The goals and priorities are different for every agency and can be difficult to overcome, both within and between agencies.
- Lack of efficient mechanisms for including local land use authorities. Some federal agencies are better than others at reaching out to and partnering with local land use authorities on these types of processes, but command and control regulatory structures must learn to work with local land use authorities to make significant progress.
- Lack of mechanisms in place to integrate or balance with other watershed-scale management programs, such as multi-species conservation plans, watershed-based water quality programs, flood and fire control programs, or vector control programs. Although these types of programs have different goals, they may be collecting the same information and using the same maps that watershed efforts need.

Stein offered several recommendations to overcoming these barriers. They include:

- Clear articulation of objectives and communication to others working in the area;
- Adoption of an appropriate scale for analysis and planning and an appropriate management unit;
- Use of a phased or tiered approach to assessment and management;
- Adoption of an iterative approach;
- Understanding of the implications of data gaps and prioritization of data acquisition (again, an iterative process);
- Integration of the effort into existing programs;
- Establishment of a system for long-term data management and access – the ability for individuals to share data is critical.

Tools to support watershed-scale decision-making

Stein presented several examples of watershed-based tools being used in California. These tools were developed using EPA's model for integrated monitoring and assessment *(See Figure 12)*. All three of these levels are required for a truly integrated program *(See Figure 13)*. Level One consists of a regional inventory of resources, such as NWI, remote sensing, or mapping. Level Two includes an assessment of regional conditions, an important component of watershed-based decision-making. In California, Stein has worked on both Southern California Riparian Ecosystem Assessment Method (SCREAM) and the California Rapid Assessment Method (CRAM), which work together to create a regional picture. SCREAM was created in partnership with NOAA. The tool integrates spatial data layers and spatial data, and feeds them into a GIS. A series of automated decisions are then made from rule-based models, ranking the quality of stream reaches and giving overall condition scores. CRAM is a site-based method to assess both attributes of wetland condition and the stressors to those attributes. The method generates an overall condition score. CRAM can be used in ambient monitoring. If it is performed at several sites, the information can feed into a

- Limit impervious surfaces in upper sub-basin
- Restore headwater areas to reduce production of fine sediment
- Preserve confined, sediment transport reaches in the mid sub-basin
- If development occurs, concentrate on clay-soils in the lower sub-basin where proportional increases in runoff will be minimized
- Protect water quality of Gabino Creek by focusing water quality treatment systems along degraded side-canyons where past clay mining occurred
- Opportunities for enhancement of floodplain and buffer areas in broad meandering lower sub-basin

FIGURE 10: Planning Considerations for Gabino Canyon

watershed perspective. Finally, Level Three consists of site- or project-specific and process-based questions.

Stein concluded by stating that in order to encourage and facilitate the paradigm shift from a site-based focus to a watershed-based focus, we must:

- Develop tools to facilitate watershed perspective for project-specific decisions
- Provide specific and consistent guidance
- Address barriers to implementation (information, development of tools and methods, institutional/cultural)
- Develop efficient mechanisms for information exchange and interagency/jurisdictional communication
- Develop tools for ongoing monitoring and assessment at the local, regional, and national scale

Questions and Answers

Martindale inquired who the audience is for the "Logical Steps." Hough responded that the MAP Workgroup has identified regulators and mitigation providers as the obvious groups. Other possible targets for the guidance include those entities that fund and/or implement watershed plans. If we educate these groups about the kinds of information and analysis that would benefit mitigation planning, we increase the likelihood that it will be included in watershed plans. Another participant added that the guidance that comes from the MAP Workgroup will go to district regulators to help them form their own watershed approach to compensatory mitigation activities.

Wold stated that he appreciates and agrees with the statement made about incorporating local land use authorities. If local land use authorities are not involved, end results will rely on voluntary action. He asked if the speakers had considered how to involve local jurisdictions. Stein responded that it is best if initiatives evolve with some local constituency, such as a city, watershed group, or conservancy. Local organizations have valuable information about the area. The guidance should specify what kinds of information are important and how to organize it in partnership with local, state and federal groups. These initiatives are more successful than when the priorities are imposed from above.

Nadeau stated that scale is a barrier that must be considered. Barriers occur at all levels of operation: federal, state/tribal, and local. These barriers must be recognized in order to effectively avoid them or address them. Stein agreed that the MAP Workgroup should consider scales of barriers. Some barriers can be addressed at the federal level, for example, institutional or cultural barriers and barriers to information availability and access. Other barriers, however, are more appropriately addressed at the local level.

Klimek asked about the context in which the "Logical Steps" will be utilized and how they will link back to the regulatory context. If a regulator is using a checklist, they should first determine if there is an existing plan and see to what extent the "Logical Steps" compare to the plan in order to decide if the plan can be used in the regulatory context. Stein agreed with Klimek and added that if the majority of permit writers who make management decisions first try to determine if a watershed plan is in place, it would be a

Watershed-based Decision Criteria

Does site contain a regionally rare wetland or sensitive spp.?	Y/N
Do other wetlands exist with 1 km (non-riverine)? Is site contiguous up and downstream (riverine)?	Y/N Y/N
Are there major cost or logistic constraints to site restoration?	Y/N
Is the adjacent land use primarily open or undeveloped?	Y/N
Is upstream/catchment hydrology relatively intact?	Y/N
Is site associated with other management programs?	Y/N
Is there a mechanism for ongoing monitoring/management	Y/N
Are adjacent land uses expected to change in the near future?	Y/N

FIGURE 11: Conceptual Project-specific Checklist

tremendous step forward. If regulators found an existing plan and tried to compare how the "Logical Steps" relate to the plan with the intent of incorporating the plan into regulatory decision-making, there would be further progress.

Brumbaugh said that the Gabino Canyon example was a holistic, geographically integrated plan. One of the difficulties the MAP Workgroup faces in writing the guidance is that they are addressing only compensatory mitigation. They are trying to construct a logic for where to place mitigation based on impacts and expected futures. He asked if one were trying to direct the location of compensatory mitigation, how the decision-making could take into account an array of alternative futures. Stein responded that the alternative futures approach fits well into planning considerations because it is not just a question of where to locate mitigation, but where both impacts and mitigation should occur in the watershed as a whole.

Martindale asked what questions a project manager would have to ask to address the Logical Steps or Common Elements if they had a permit sitting on their desk and no watershed plan available. Stein answered that the draft checklist he discussed *(See Figure 11)* was used to demonstrate how some of the "Common Elements" could be recast to address questions in a project-specific framework.

Hall agreed with the additions Stein made to the original "Logical Steps," particularly the opportunities and constraints and the monitoring and measurement. He asked how local land use planners could be encouraged to embrace these kinds of questions. He stated that the Corps tries to provide incentives for land use planners to consider these issues in Florida. They tried to entice county planners to embrace GIS and HGM by agreeing to develop a regional general permit (RGP) if they incorporated their products into a county comprehensive plans. RGPs not only save regulators time, but also influence behavior. In one county, the planner tried to put these products in the county comprehensive plan and met opposition from politicians and county commissioners.

Bedford stated that when the phrase "Logical Steps" is used, it implies that these steps should proceed in order. She added that the steps should be viewed as part of an iterative process and that they could all be approached at once. The process should be iterative and simultaneous. Stein agreed with the need to make the process iterative and simultaneous and added that the arrows in *Figure 8* should be double-ended to depict this necessity.

Stedman asked how humans, who are an integral part of the watershed, fit into this process. Problems arise when regulators dealing with rapidly developing areas view humans as threats to the landscape. She asked how "social significance" fits into the steps. People must have the chance to weigh in about whether they want mitigation wetlands located in ecologically pristine parts of the watershed or in their back yards. Bedford responded that Stein addressed this issue in one of his slides under "identification of issues, goals, objectives" and "coordination with stakeholders" *(See Figure 8).* Stein agreed that the issue of social significance is not as clearly and explicitly articulated in his "Common Elements" as it should be. For example, the Los Angeles River Watershed effort is concerned less with restoration than with building a

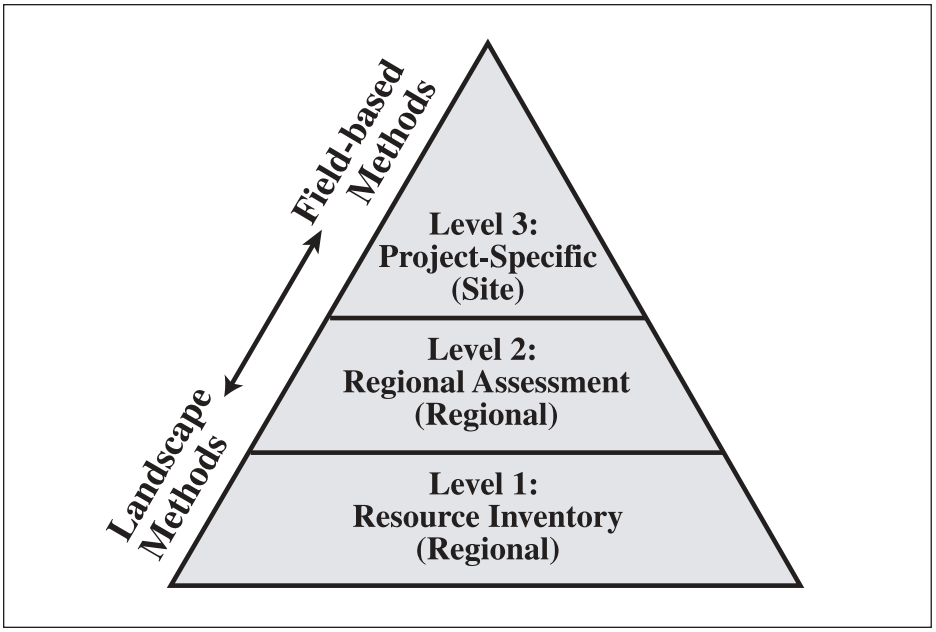


FIGURE 12: Three Tiers of Regional Wetland Monitoring and Assessment Programs

sense of community around the river. This may not be an appropriate consideration in the context of mitigation or restoration, but it is an important consideration in a more general watershed context.

Cole stated that in his experience working on watershed assessments, management recommendations, and plans, wetlands are usually a small piece of the final report, which also includes rivers and streams and historical and cultural issues. He asked whether the MAP Workgroup is interested in addressing watershed planning as a whole, or just the wetlands component. He suggested that wetlands should to be nested in a larger context. Wilkinson added that the MAP Workgroup is charged with developing guidance specifically on making compensatory mitigation decisions under §404 of the CWA.

Schaftlein asked who the decision-makers are in the steps. Stein answered that the process is intended to inform decisions; the plan does not make a decision. The goal of the process is to help determine reference and/or desired future condition, analyze opportunities and constraints, and determine priorities and recommendations. The decisions will be partly scientific and technical, partly political, and partly social.

Nadeau stated that there is watershed planning, which is an iterative process, and there are watershed plans, which are products. The MAP Workgroup should clarify whether they are trying to come up with Common Elements to watershed planning or suggesting elements that should be a part of developing a plan that can guide decision-making. Wilkinson suggested that the MAP Workgroup plans to articulate Common Elements for the watershed planning process. The contents of a plan cannot be prescribed because they will need to be regionalized based on local circumstances, development pressures, and the stakeholders involved. Martindale agreed, adding that regulatory decision-making should be included.

Facilitated Discussion

This session was designed to address the second Desired Outcome: Clarify the "Logical Steps" of a watershed-based approach to compensatory mitigation. The goal of this facilitated discussion was to clarify the "Logical Steps" of a watershed-based approach to compensatory mitigation.

The symposium participants agreed that the "Comment Elements" offered by Stein provided a clearer framework than did the "Logical Steps" provided by the MAP Workgroup *(See Figure 8).* Therefore, the following discussion used the Common Elements as a starting point for the discussion. The Common Elements were numbered one through seven and the participants contributed comments on the specific elements as follows:

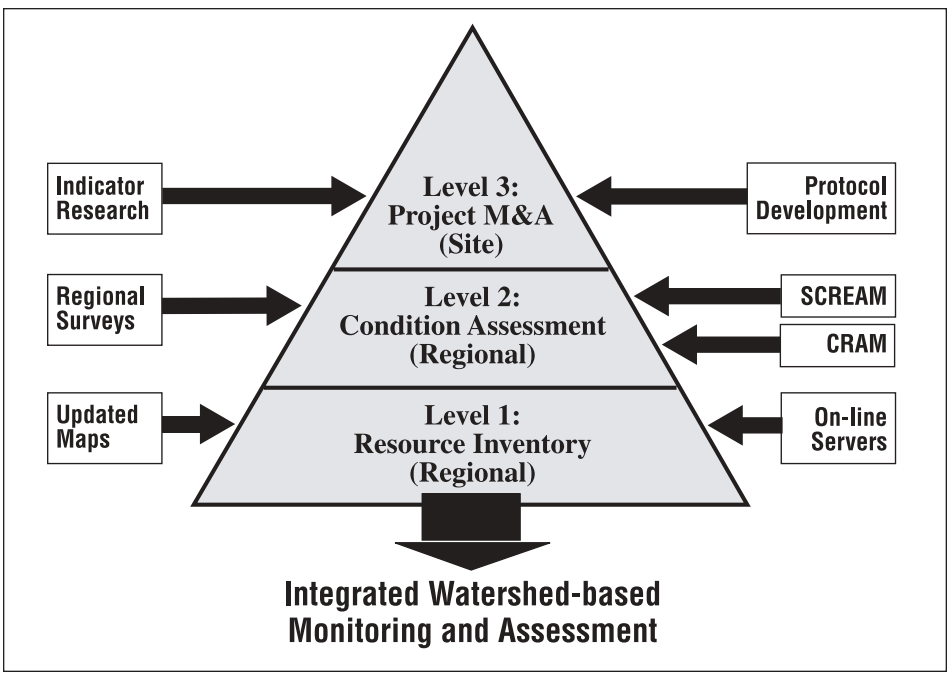


FIGURE 13: Integrated Assessment Toolkit

1. Identification of issues, goals, objectives
   - An important component of the whole approach is the identification of particular areas within a watershed where problems might be relieved or minimized by wetland restoration (Tiner).
   - Identification of relatively intact pieces remaining in the watershed – the healthy pieces that maintain processes – should be considered a super objective (Sumner).
   - From a regulatory perspective, this step must include a definition of the impacts for which you are trying to compensate (Martindale).
   - Scale should be considered in this step since it may dictate everything else in the process. Issues of scale can drive all of the other steps (Stein).
   - This step should identify the goals and objectives, which should identify the questions that need to be answered, which should dictate the scale (Gersib).
   - This step should include a definition of critical regulatory issues. Even though the step does not encompass case-by-case considerations, pressing issues faced by the regulatory program should be considered, such as an identification of areas with high growth rates.
   - It is critical that this step occurs first. Many watershed plans developed in the 1980's and 90's had strong stakeholder involvement and big communication efforts. A lot of these efforts' funds were spent clarifying issues and objectives. This requires encouraging people to be honest and explicit about their interests. Although this may be iterative, it must be done well first or the entire effort will be a waste of time and money (Brumbaugh).
   - This step should include identification of target products. For example, it should define how the information will be presented at the end of the process (Martindale).
2. Inventory and assessment
   - Scale should be considered in the inventory assessment since you can conduct a landscape or a site-specific assessment.
   - Looking at expected future conditions may be impractical and not as useful in this step (Collins).
   - This step needs to be spatially explicit for a mitigation plan. It is important to understand more than what kinds of wetlands are in the watershed; you also need to determine where they are, where they've been destroyed, and where they've been degraded (Bedford).
3. Determination of reference and/or desired future conditions
4. Analysis of opportunities and constraints
5. Determination of priorities and recommendations
   - Add "evaluate options." People must have a sense of alternatives in order to see that there is more than one opportunity for where to restore and protect wetlands (Sumner).
6. Development of an ongoing implementation plan
   - This step should either include "adoption of a plan," or plan adoption should precede this step. Having entities formally adopt a plan is powerful (Wold).
7. Coordination with stakeholders and coordination with other programs
   - The coordination component of this step must be embedded in #4 because there are many factors in the landscape besides wetlands that should be considered, such as best management practices in rural communities and urban restoration. If projects are cost-shared, partners have strong opinions about what ought to be done, where, and why (Ashby).
   - This step should be integral to every step of the process (Stein).
   - The words "coordination with other programs" seems too soft for the level of investment it will take to make all this happen. Before #1 should be "scope and obtain buy-in on what the watershed plan will inform (e.g., CWA, ESA, NEPA analysis and decision-making).

General comments:

- Step #2 should precede Step #1 because sometimes baseline information is needed to make those decisions (Klimek).
- We should look at this as a comprehensive process because §404 cannot be considered outside of the context of watershed considerations (Klimek).
- Scales must be considered in advance (Gersib).
- Defining scale includes setting a boundary, but also determining the scale at which analysis is conducted.
- Although the process should be iterative and simultaneous, #4 should come before #5, and must come after #1. It is really important to articulate goals and what you want to accomplish first before you start analyzing opportunities and constraints. If you fail to do this, you may fall prey to opportunities and constraints (Collins).
- It is unclear if in step #4, the word "analysis" means identifying opportunities and constraints, or if it means conducting an actual analysis. Perhaps step #4 should say "identification" and analysis should be reserved for step #5. Stein responded that he purposely used the word "analysis" in step #4. He wanted to go further than "identification" to address the driving opportunities and constraints.

Additional Discussion

Stedman stated that the MAP Workgroup will be developing guidance on how to take a watershed approach to compensatory mitigation, not on how to develop a watershed plan that will inform mitigation decisions. The guidance will be targeting the Corps regulator sitting in their office with a permit in front of them and no watershed plan to rely upon. We need to provide guidance on how this person can use existing, available watershed information to make a decision by themselves. Much of the preceding discussion has focused on watershed planning and that is not the same as a watershed approach to compensatory mitigation. Instead of providing guidance on how to convene a group that identifies issues, goals and objectives, we should be providing guidance on how a regulator can take existing information about the watershed and use it to inform mitigation decision-making.

Martindale stated that as a regulator, she would like a map as a final product of any plan or process.

Wilkinson asked the MAP Workgroup to define their vision for these Logical Steps. She asked if the steps are meant to guide a planning process, what should be in a plan, or a process for making an individual compensatory mitigation decision. Hough responded that the question goes back to the intended audiences, which includes regulators and watershed stakeholders. These steps will help generate a logic or framework, possibly along with checklists or decision support tools, for regulators to make better decisions. The steps could also inform watershed planning that is already underway or will be funded in the future to ensure that planning efforts include analysis that would provide more information for regulators.

One participant added that the guidance should help guide individual mitigation decision-making on a case-by-case basis, but should also be a guide for the overall framework.

Nadeau stated that the guidance should play two roles: (1) Compensatory mitigation should be considered during the planning process, along with the array of other issues that must be considered; (2) The product of planning processes, such as Special Area Management Plans and Advanced Identifications, should help guide the permit writer and should continue to inform the permit writer as the iterative planning process continues.

Another participant added that the MAP Workgroup is trying to help guide decision-makers to place mitigation at sites that will have the most ecological value at the watershed scale and that will be the most sustainable. It need not involve planning.

Stallman added that a watershed plan will not be useful to a regulator in helping them identify better locations for mitigation. Hall stated that the Workgroup should consider two issues: (1) The needs of regulators in identifying where to place mitigation from a watershed perspective; (2) Command and control regulatory programs are fairly mindless. If you want the §404 program to accomplish good things on a watershed basis, they will need a broadly based watershed plan that identifies the important aquatic resources in the watershed and guides the regulator in making particular permit decisions in the context of those resources.

SESSION I: Criteria used to analyze priorities and restoration options

Sessions I, II, and III were designed to address the third Desired Outcome: Identify the most important criteria used by existing watershed-based planning tools/resources to analyze priorities and restoration options. Each session included three consecutive presentations by representatives of watershed-based initiatives. Each of the panels was devoted to discussing criteria that were used to develop priorities and restoration options. Each panel presenter was asked to address three questions in their presentations:

1. What criteria did you use to analyze priorities and determine restoration options?
2. How were the criteria developed (i.e., what information or data were used)?
3. What tools were employed to compare the criteria (i.e., ranking, GIS, other decision support tools)?

The presentations were followed by a question and answer session and then a facilitated discussion. Session I featured three speakers: Josh Collins, Cara Stallman, and Eric Wold. The facilitated discussion that followed their presentations was constructed to seek input from all of the participants on what criteria they felt were the most important to use for analyzing priorities and determining restoration options.

Josh Collins
San Francisco Bay Area Wetlands Restoration Program, San Francisco Estuary Institute

Collins' presentation focused on the San Francisco Bay Area Wetland Habitat Goals Project. The Goals Project developed goals and objectives at a regional scale. It was a working partnership between state, local, and federal partners. The project relied upon three steps to regional ecosystem conservation:

- Set quantitative regional goals for how much of what kinds of habitat are needed where and why. This step is necessary because it makes tradeoffs explicit from the outset. The scientific and engineering answers must relate directly to management issues that are clear and dominant.
- Adjust policies, programs, and projects as needed to achieve the goals. Managers must be willing and able to change how they work and what they do. Budget for flexibility.
- Measure progress toward the goals (and adjust the goals for new ideas). Data fuel adaptive management, and good data are very cost-effective.

The partners embarked on the Goals Project because there was a long-standing history of inflexibility on the environmental side – a history of untenable arguments. People felt that every wetland could do everything for everyone all the time and that every square foot of every wetland is precious. There are two types of wetlands in the bay area: tidal marsh and diked tidal marsh. These wetland types are mutually exclusive and each contains some threatened and endangered species. The two types have different groups advocating for their protection. It was important to rely upon the historical ecology to find common ground between the two sides. The acreage of tidal marsh in the Bay Area has shrunk considerably since Euro-American contact. There are three competing views of the bay's diked marsh resources: diked marsh as real estate, diked marsh as seasonal wetlands, and diked marsh as potential tidal marsh.

In order to set habitat goals, the Project began by assembling a team of environmental managers, scientists, engineers, and leaders from non-governmental organizations and local, state, and federal agencies. Several additional factors should be considered: federal regional offices can be a source of larger scale thinking and planning; scientists need to be mindful of budgets and schedules; managers need to give scientist time to think; and it is necessary to find dynamic staff.

The following points were important in setting habitat goals:

- Define the scope of the regional goals – what is the region (natural, social, and practical)
- Define the big problems to be addressed – don't try to solve all of the problems at once
- Understand the environmental past, present, and change – history unites people
- Use everything anyone knows – expert guesswork can be useful particularly since many areas don't have adequate data
- It's OK to think ecologically – people are often afraid to ignore practical boundaries

- Make regional maps of past, present and needed future habitat
  - Maps help people think well together and are an excellent coordination tool
  - GIS is good for scale shifting analysis with groups
- Have fun with conceptual models
  - Model what we know and don't know and what we can and can't manage
  - Try to separate natural history from human history

From a practical point of view, the following issues were important:

- Ecosystems don't care, people do
- The role of environmental science is to advance public debate not to solve all problems
  - Culture is key
  - Science is a big part but is arguably the easiest part
- Plan for implementation before the goals are set
  - Must have some kind of committee to review projects to see if they fit in a watershed plan or context
- Measure progress
  - Inventory what we have, monitor how it's doing, assess government response, survey public sentiment.
  - Link mitigation projects to impacted sites and track net habitat changes in watershed and regional context.
- Report frequently to the public
  - Interim products keep people engaged in process
  - Public involvement helps build support

The Bay Area Wetland Tracker is a web-based tool that shows projects, restoration and mitigation, data on sites available. It allows people to toggle around through various layers.

The following criteria were used by the Goals Project to assess regional conservation plans: Is it relevant? Is it defensible? Will it be valuable tomorrow?

Collins concluded by stating that a successful regional habitat plan states how much of what kind of habitat is needed where, and why; includes an expert map not defined by jurisdictional or property lines; and inspires a caring community to help achieve goals.

Cara Stallman
Baldwin County ADID
Baldwin County Planning and Zoning Department

Development of the Baldwin County Wetland Conservation Plan was a multi-year effort to identify, assess, and restore wetland resources in Baldwin County, Alabama. Baldwin County is 1,600 square miles and has 1,400 miles of rivers and streams, and 500 square miles of wetlands. One third of the county is wetlands. The wetland types include: grady ponds (depressional), saltwater marsh (fringe), delta riverine (bottomland hardwood), interdunal swales, and pitcher plant bogs.

The planning effort was undertaken because the County is experiencing rapid development and explosive growth, the state does not have any wetland regulations, and the local tourism and fishing industries rely on wetlands. The objective of the plan was to provide the best information regarding wise land use decisions to the public and local leaders, in particular the Baldwin County Commission.

The Plan included four major tasks:

- Develop a wetland protection overlay district (WPOD) and incorporate it into zoning regulations.
- Develop a wetland education and outreach program.
- Research, design, and implement wetland restoration and construction projects.
- Develop a GIS wetland data layer containing information on wetland locations, types and functional capacity for wetlands throughout Baldwin County.

Stallman's presentation focused on the last task. The Baldwin County Digital Wetland Layer was developed using National Wetlands Inventory data, USGS digital wetland data (color infrared photos and NWI protocol), and quadrangles edge-matched to create a continuous countywide coverage, which was based on political boundaries, not watershed boundaries. The layer includes types and functional capacity of wetlands sites. Digital wetland coverage was statistically compared to the Corps' wetland determinations. The data were validated through an on-the-ground survey of sample sites, which found that the data layer was 85.6 percent accurate.

The project used NWI data to create an HGM classification layer. They calculated the HGM percentage per watershed of different HGM types (i.e., riverine, fringe, flat, and depressional wetlands). The project developed the Remote Wetland Functional Assessment Model (RWFAM), as well as individual models for flat, riverine, and depressional wetland type. They did not develop a model for fringe wetlands, but rather designated all fringe wetlands as high functioning and important for preservation due to their ability to provide buffering from erosion and fish habitat, and their limited extent. Wetlands were designated as being suitable for conservation, enhancement, or restoration based on answers to a series of questions for each HGM type.

The model used the following criteria, which were derived from remote data layers identified in parentheses:

- Size of wetlands (NWI polygon)
- Presence of ditches (NWI)
- Surrounding land use (NLCD)
- Water regime (NWI)
- Presence of roads (BC Planimetric Data)
- Threatened and endangered species (The Nature Conservancy, Alabama Department of Conservation and Natural Resources)
- Wellhead protection areas (EPA)
- Flood zones (FEMA)
- Digital soils data (NRCS)

The model is watershed-based (8-digit HUCs) and uses ArcGIS, Visual Basic, and selects spatial information. As new and better data become available, they can be incorporated into the model. The model asks a series of yes/no questions to determine each wetland's level of function for each of four function groups (wildlife habitat, water quality improvement, groundwater recharge, and flood control). The questions include: 1) Is the wetland within the 100-year floodplain? 2) Is the wetland impacted by the presence of a road? 3) Is the wetland in a wellhead protection area? 4) Has the wetland been subjected to a forest fire? 5) What is the acreage of the wetland? 6) Are there known endangered species near this wetland? 7) What is the land-use surrounding the wetland: agriculture, forest, urban?

An advisory committee calibrated the model in advance and defined the thresholds scores for conservation, enhancement, and restoration. The model found that 88 percent of the county's wetlands were suitable for conservation, 10 percent were suitable for enhancement, and one percent was suitable for restoration. The final products are updated and validated map products; a digital layer of assessed wetland functions that will be available to citizens, elected officials and other public agencies for planning purposes; and development of a program document that can be used to influence land use regulations.

The planning commission uses the tool for non-regulatory planning purposes. For example, a large subdivision is currently being approved. The commissioners are using the maps to guide development. They also give the maps to the public at no cost, which has made them popular with property owners and has helped them secure the public's buy-in. The next step is to get maps and information into the hands of other jurisdictions and municipal governments.

Eric Wold
West Eugene Wetland Plan and Partnership
City of Eugene

Eugene is located at the southern end of the Willamette Valley ecoregion. Eugene is the second largest metropolitan area in Oregon. It is mostly wet and upland prairie with streams and vernal pools. In 1988, the city began a four-year planning process. The process culminated with the adoption of the plan by the city and county. State and federal agencies acknowledge the plan and conduct their permitting in accord with it. From the standpoint of implementation, the plan helps guide land acquisition, land management and mitigation, education, and the development of recreational facilitates.

The legal context in the State of Oregon also supported the success of the project. The state has a removal/fill law, as well as stringent land use planning requirements. The state land use law requires municipalities to conduct natural resource planning, which includes doing a wetland/stream inventory and identifying policy requirements. When

Eugene began conducting its natural resources planning in 1988, a large part of West Eugene was determined to be wetland. The city decided that rather than allow for piecemeal permitting, they would use a new Oregon law that allows local jurisdictions to create their own wetlands plans. To date, Eugene is the only jurisdiction in the state that has taken advantage of the wetland conservation rule.

The criteria used in writing the plan were developed by a technical advisory committee composed of city planners, consulted planners, state and fed agencies, and consultants. Public input was extremely important and played a part from the very beginning. Seven public workshops were held, opinion surveys were handed out at workshops and mailed to owners, field trips were conducted, and a wetlands speakers bureau was formed. They also had direct contact with property owners and held public hearings before planning commissions and elected commissions of the city and county. Approximately 25 percent of the project budget was spent on securing scientific input from staff and consultants. The remaining 75 percent was spent on working with the public. State land use planning laws require public involvement.

Key questions for criteria development were as follows:

- Where would wetland management (including mitigation) most likely succeed in perpetuity
  - Where were historic wetlands
  - Where are current wetlands
  - Where is existing high quality habitat
  - Were is hydrologic connectivity to major streams within 100-year floodplain
- Other criteria
  - Rare plants
  - Rare animals
  - Existing zoning for natural resources
  - Habitat connectivity
  - Wet prairie habitat (was predominant habitat type in area)

The plan was developed following a series of steps:

- Historic vegetation was gathered from an existing 1850's plant survey (General Land Office survey data)
  - Plan boundaries were not defined by watershed or by political boundaries. Instead they included the area that was thought to contain the majority of the wetlands in the Eugene area. This essentially coincided with the Eugene city limits, although some wetlands located in the adjacent county were included.
- Wetland inventory and habitat quality
  - On-site field work to identify wetlands
  - Air photo interpretation
  - Assessment of quality
- Hydrologic connectivity to major streams within 100 year flood plain
- Rare plants were mapped and documented (there are three federally listed species)
- Rare animals were mapped and documented (there is one federally listed species)
- Existing zoning for natural resources – there were very few areas zoned for natural resources
- Habitat connectivity – strong emphasis for prioritization of connected areas
- Wet prairie habitat types were mapped and emphasized for prioritization. Impacts to wet prairie habitat led to much higher mitigation ratios in the West Eugene banks.

The criteria were used as a decision support tool to designate areas for protection. Wetlands were classified in one of three categories: (1) Protect – no development, stringent land use regulations, and setback requirements; (2) Restore – no development, land use regulations, but no setbacks; or (3) Develop – can develop with state and federal permits. The goal was to acquire wetlands that fell into the protect or restore categories.

Each site was scored for each criterion (0 - yes or 1 - no). Planners assigned a quantitative rank for each site and then assigned a designation. The designations were approved by elected bodies and planning committees. The city of Eugene and Lane County adopted the recommendations. The state officially recognized the plan by ensuring that all permitting would be consistent with the plan. EPA and Corps gave less formal endorsement, but use the plan to guide permitting.

The broad objectives of the plan are to find a balance between wetlands protection and sound urban development, while satisfying state and federal laws and regulations. The planning area is approximately

8,000 acres. Of this, 81 percent is non-wetlands; 19 percent is wetlands. Of the wetlands areas, 79 percent of the wetlands received "restore" or "protect" designation; 21 percent were designated for development.

The West Eugene Wetlands Partnership formed after the plan was adopted in 1992. Even before the formal establishment of the group, the City of Eugene, Bureau of Land Management, and The Nature Conservancy were working together in partnership. In recent years, other agencies have joined the partnership.

Wold outlined the progress that has been made in the four areas of plan implementation: land acquisition, land management, recreation, and environmental education. He also summarized the accomplishments of the Partnership.

Wold concluded by offering what he thought were some of the keys to success. The Partnership thought big and ecologically and people believed it could happen. Formal adoption of the plan was key, as well as investing in securing the support of the community and elected officials. Finally, the effort nurtured partnerships and adapted to changing circumstances.

Questions and Answers

Miller asked Wold why the inventory only considered jurisdictional wetlands. Wold responded that they only looked at jurisdictional wetlands because these are the only wetlands that the City has jurisdiction over.

Hough asked Collins what criteria they used to determine the types of wetlands to restore, other than the historic extent of wetlands. Collins responded that the list of criteria included key species habitats and connectivity, which were generally based on an historical array of habitat types.

Hall asked Stallman how the elected officials reacted to their plan and whether or not they are incorporating the plan into zoning regulations. Stallman responded that the planning commission loves the plan, but they do not have the ability to zone. The plan does not have any regulatory teeth. She is currently trying to increase upland buffers from 10 to 30 feet, but is encountering serious opposition from property rights advocates.

Bank asked Wold how they convinced elected officials that it was worth taking the land identified for protection and restoration off the tax roles. He asked if they use eminent domain or rely upon willing sellers. Wold responded that they rely entirely on willing sellers and added that prices are based on appraised value. At the time the plan was adopted, the city council was more environmentally progressive. The county commission has always been responsive to property rights concerns. Three of the last two amendments to the plan were passed 3-2. People in Eugene prefer to have decisions made locally, rather than federal or state agencies.

Facilitated Discussion

The goal of the following facilitated session was to seek participants' input on which criteria they felt were the most important to use for analyzing priorities and determining restoration options. The session began with participants offering different criteria. The criteria identified are in *Figure 14.* The remainder of the discussion was devoted to seeking additional input from the participants.

Stein noted that the criteria could alternatively be lumped into four categories. *See Figure 15.*

After listing the criteria in *Figure 14,* the following comments were offered. Collins stated that the criteria listed are more like datasets than criteria. Criteria are the primary things that you want to achieve. Bartoldus added that function should be separate from type. Bedford stated that the overall goal should be to identify the relative abundance of wetland types in a watershed, or the watershed profile. Getsinger asked if water quality includes trophic functions.

Stein stated that these functions could be collapsed into one category, but it is probably best to keep them separate and explicit. Bartoldus added that the criteria listed are all tied together and that some types of wetlands are more vulnerable to stressors.

Martindale added that, from the standpoint of a regulator, all of these criteria will need to be addressed.

1. Sustainability/stressors/vulnerability
2. Surrounding land use
3. Historic aquatic resources
4. Land ownership
5. Remaining high quality resources
6. Position in landscape/location
7. Wetland condition
8. Threatened and endangered species issues (presence, recovery)
9. Hydrologic connectivity/sediment
10. Recreational needs
11. Commercial uses/opportunity costs
12. Cultural significance
13. Water rights
14. Water quality
15. Invasive species vulnerability
16. Vulnerability
17. Habitat connectivity
18. Soil types
19. Wetland rarity
20. Disease vector control
21. Difficult to replace wetlands
22. Zoning
23. Political will/local priorities
24. Wetland types
25. Tropic functions
26. Level of effort required

FIGURE 14: Criteria for Analyzing Priorities and Determining Restoration Options

- Condition
- Landscape position/ context
- Logistics
- Social

HGM – wetland assessment

FIGURE 15: Four Categories of Criteria

SESSION II: Criteria used to analyze priorities and restoration options

Session II was the second of three sessions devoted to addressing the third Desired Outcome: Identify the most important criteria used by existing watershed-based planning tools/resources to analyze priorities and restoration options. The presentations were followed by a question and answer session and then a facilitated discussion. Session II featured three speakers: Ken Brazil, Dan Smith, and Ralph Tiner. The facilitated discussion that followed the presentations was constructed to seek input from the participants on the criteria they felt were the most important for analyzing priorities and determining restoration options.

Ralph Tiner
Nanticoke River & Coastal Bays Watersheds U.S. Fish and Wildlife Service, National Wetlands Inventory Program

Tiner's presentation was devoted to a discussion of new tools and products available from the U.S. Fish and Wildlife Service's (FWS) National Wetlands Inventory Program that can be used to help guide wetland mitigation planning in a watershed context. To date, mitigation is conducted on a "case-by-case basis" and does not consider "the proper placement…within the landscape context," "the ecological needs of the watershed," and "the cumulative effects of past impacts." Some agencies do, however, consider these issues. The MAP has charged the federal wetlands agencies to:

- Analyze issues related to using mitigation within watershed context;
- Develop guidance to have mitigation achieve "the greatest benefit and probability of long-term sustainability"; and
- Help decision-makers use "watershed-based planning tools."

The National Wetlands Inventory has several standard products. NWI produces a wide array of data, including maps at a scale of 1:24,000 for most of the country along with accompanying geospatial data. NWI maps are available for about 90 percent of the United States and the digital data are available for about 40 percent of the lower 48 states. The program has been producing wetland data and maps since the 1970's. Some of these early maps are now 30 years old, which limits their utility. Most of the NWI digital data is from the early 1980's, which also has limited ability to reflect current conditions. The program also develops a variety of acreage-based status and trend reports.

More recently, NWI has been developing a new set of tools and products. These include:

- Watershed characterization reports;
- Watershed-based wetland functional assessments;
- Historical assessments of trends in wetland functions; and
- Inventories of potential restoration sites.

Most of the new products have been developed for state agencies. The agencies have requested the information to guide the development of watershed-based wetland conservation strategies or for identifying potential wetlands restoration sites. In the 1990's, Massachusetts was developing a watershed approach to proactive wetland restoration. Tiner conducted an assessment of wetland location, an identification of which wetlands were impaired, and an identification of former wetlands that would be suitable for restoration. The second part of the project was an assessment of problematic areas of the watershed where there had been flooding, erosion, water quality problems, and a loss of connectivity with fish and wildlife habitat. In the second stage of the project, they targeted their proactive restoration to address some of these problems.

NWI's "watershed characterization reports" can be structured to address all of the information called for in the "Essential Steps," including a relatively complete inventory of wetlands of the U.S. and additional information. The reports can include a current status of wetlands, preliminary assessment of wetland functions, inventory of potential wetland restoration sites (buffers around wetlands and streams), assessment of extent and general condition of "natural habitat", and historical perspective.

Nanticoke Watershed

FWS has been working on a watershed assessment report in the Nanticoke Watershed, which is located in Maryland and Delaware and drains into the Chesapeake Bay. The watershed is 800 square miles and drains a quarter of Delaware.[5]

The Nanticoke Assessment included a landscape assessment, which documents wetland types, wetland functions, condition of wetland buffers (whether vegetated, developed, or in agriculture), condition of stream buffers, potential restoration sites, and overall condition of "natural habitat." The project also included an historic assessment of wetlands and their functions (wetland acres) and overall "natural habitat."

The assessment procedures included:

- Photo Interpretation
  - Update NWI data – NWI data were updated with the most recent photography. When they work with states that have conducted more current and detailed assessments, NWI uses the state data as the base instead of less current NWI data.
  - Interpret land use/cover
- Map Interpretation
  - Enhance NWI data – In order to identify the flow of water through the systems to determine whether it is an outflow wetland, inflow wetland, or isolated wetland
- GIS Analysis
  - Create digital resource database
  - Enhance NWI data
  - Generate maps/stats for analysis and presentation

Baseline geospatial data are also created to help view mitigation in a watershed context. The primary data sources for this are:

- NWI - Their own wetland inventory maps
- USGS hydro data – stream maps
- USGS digital topographic maps
- Land use/cover data
- USDA soils data (for historic analysis)

When NWI conducts a historic analysis on present day agricultural land, they use soil survey data as a template to identify where wetlands used to be, based on the hydric-soil map unit. When they work in urban or coastal areas it is more difficult to reconstruct historical wetlands because data and historic maps often are not available.

Other collateral sources of data include:

- USDA soils data (for present day wetlands) – when they update NWI maps they consult the soil survey, which has digital data. They lay the digital data on top of the NWI wetlands to determine what was missed.
- State wetland data – they use state data as collateral in the background if the NWI data are recent or as the primary data source if the state data are more detailed.

The assessment of existing aquatic resources was completed using NWI data and was based on photointerpretation, not satellite image analysis. The NWI data included updated NWI data using aerial photographs and wetlands and deepwater habitats by FWS types. It also included enhanced NWI data using wetlands by landscape position, landform, water flow path and waterbody types (ponds, lakes, estuaries, etc.) and NWI types, acreage, and maps.

Enhanced NWI allows one to identify additional properties important for wetland functional assessment. It can depict:

- Landscape position - the relationship between a wetland and a waterbody, such as a river or lake basin.
- Landform - physical form or shape. It can identify basin wetlands from flats and floodplain wetlands from interflows.
- Water flow path - directional flow of water. It can identify isolated, outflow, inflow, free-flow, and bi-directional flow wetlands.
- Waterbody type (natural, artificial, specific types). It can be used to identify types such as vernal pools and grady ponds.

Enhanced NWI reveals more discrete wetland and deepwater habitat types and descriptors about landscape position, landform, water flow path, and waterbody type (also known as LLWW), which are vital for functional assessments.

[5] To see more, go to: U.S. Fish and Wildlife Service. National Wetlands Inventory. 6 Jul. 2004 <http://wetlands.fws.gov>.

Standard NWI information can provide information on the different types of wetlands present in an area. Enhanced NWI provides a sense of how many wetlands are in the watershed because it includes data on individual cover types for a single wetlands and information on their landscape position. In addition, all of the data are displayed in map format.

Enhanced NWI can also relate the assessment information discussed above to a wetland functional assessment. It can correlate characteristics with functions. For example, the NWI Program completed a report for the Northeast, which was a collaborative process involving several states (Maine, New York, Delaware, and Maryland). The program uses GIS to generate maps and depict statistical analysis. They can identify the percentage of wetlands acreage that performs specific functions *(See Appendix: O-20 and O-21).* A preliminary assessment can be developed based on existing information. The NWI Program has a matrix of wetlands functions/characteristics and they can identify which wetlands have high or moderate functions.

With this approach they can predict the following functions: surface water detention, streamflow maintenance, nutrient transformation, sediment and other particulate retention, shoreline stabilization, coastal storm surge detention, provision of fish and shellfish habitat, provision of waterfowl and waterbird habitat, provision of other wildlife habitat, and biodiversity.

The NWI Program can also generate an historical assessment. They use hydric soil information to estimate pre-settlement wetlands. The historical assessment can provide information on wetland types (generalized for pre-settlement conditions), acreage, functions, and general trends. Pre-settlement wetlands are determined using USDA soils data, USGS topographic maps, and NWI data. Wetlands are classified by general NWI types and the enhanced wetland classification includes LLWW descriptors. This information can help predict pre-settlement wetland functions. By applying a weighted index, the data generated on pre-settlement versus current wetland functions can be used to analyze how wetland functions have changed over time. The example provided shows that a large number of headwater wetlands have been converted to agriculture.

The landscape assessment can provide information on resources beyond wetlands and deepwater habitats. It can assess buffers (100m) around wetlands, streams, ponds and lakes, as well as potential restoration sites and "natural habitat" in the watershed. Different aspects of wetland buffers and stream buffers can be assessed, including whether the buffers are vegetated (i.e., "natural habitat"), developed, or in agriculture. In addition, the tool helps identify potential wetland buffer restoration sites.

The NWI Program can help identify potential wetland restoration sites. Sites are classified as "type 1 sites" and "type 2 sites." Type 1 sites are former wetlands. They use soil data to identify current land use and determine whether or not the wetlands are in restorable condition. Type 1 sites include effectively drained hydric soil map units, filled areas with no development, impounded areas, excavated areas, and farmed "wetlands." Type 2 sites are degraded or altered wetlands. Most of these can be identified through the standard NWI codes. Type 2 wetlands include those that are partly drained, impounded, excavated, farmed "wetlands," and tidally restricted wetlands.

In the Nanticoke Watershed, this approach was used to identify wetland restoration opportunities. The numbers generated are considered conservative because they did not conduct a full-blown assessment of drained wetlands and well-drained farmland. After the information is gathered, the maps that are generated will identify wetland restoration sites by type. *(See Appendix: O-30 and O-31)*

Tiner then discussed how these new NWI tools can be applied to meet the following objectives of the National Mitigation Action Plan:

- Watershed characterization: The NWI data can provide information on wetland status and functions, deepwater habitats, riparian corridors, buffers, and overall natural habitat (overall status of the watershed). This information can help meet the MAP objective of describing the current status of the landscape context (acres and functions).

- Historical assessment/trends: NWI data can provide information for an historical assessment (wetland types and functions, riparian corridors, buffers, and natural habitat) and recent trends. This information relates to the MAP objective of assessing both the cumulative effects of past impacts (types of wetlands lost and functions diminished) and the ecological needs of the watershed.
- Inventory of potential restoration sites: NWI data can generate information on restoration opportunities for wetlands, stream corridors, and buffers. This relates to the MAP objective of identifying opportunities for mitigation.

These NWI tools are currently being used in several different settings. FWS has conducted a project on watershed-based wetland conservation for the state of Maine in the Casco Bay Watershed. They have also worked to enhance the Maryland Department of Natural Resources' Green Infrastructure Tool. These tools have been used to generate baseline data for Maryland and Delaware's Nanticoke River Watershed planning effort, as well as guide watershed management in New York City's water supply reservoirs in the Catskills.

Based on FWS's experiences in the Northeast, generating this watershed information generally costs approximately $100-150/square mile when land use, land cover, and digital soils data are available and where NWI has not yet been updated and enhanced. Where NWI has already been enhanced, it costs approximately $50-75/square mile.

In sum, new NWI tools provide a foundation for watershed planning that can be used to help make compensatory mitigation decisions in a watershed context. The tools do not, however, set priorities; regulatory agencies must still determine where to mitigate, when to mitigate, and how much to restore.

Ken Brazil
Arkansas Wetland Inventory and Restoration Prioritization
Arkansas Soil and Water Conservation Commission

The Arkansas Wetland Resources Information Management System was supported by a multi-agency wetlands planning team. The work began in the early 1990's and brought together an array of agencies and scientists. The central questions they were concerned with were: How many and what kind of wetlands they had in the state? How many of these wetlands have been restored or impacted? What is currently being lost?

The project followed the EPA Monitoring Program Guidance, which consists of three levels of assessment: Level 1 is a landscape assessment, Level 2 is a rapid assessment, and Level 3 is an intensive site assessment. The project focused on the Bayou Meto watershed, which is a primarily agricultural area that is experiencing intense development pressures.

The landscape assessment was a rule-based GIS analysis of landscape features. It included the

- ❑ *Assemble appropriate data on ecosystem components needed for decision-making (emphasis on existing watershed-scale geographic data).*
- ❑ *Review maps of ecosystem components (e.g. water, soil, vegetation) to begin to understand wetland patterns, problems and potentials in the watershed.*
- ❑ *Prepare Component overlay maps to investigate relationships between individual wetland components (e.g., to what extent does existing forest occur on hydric soils).*
- ❑ *Develop general wetland goals and objectives of the project, emphasizing measurable and mappable structural attributes (e.g., highest priority goal or goal may be establishment of a naturally-vegetated corridor along main stem of the river; and objective may be to restore a minimum 60-meter wide buffer along ditches. Both of these address mappable structural attributes).*
- ❑ *Implement GIS procedures to generate priority maps of protection and restoration priorities based on objective, clearly stated criteria.*
- ❑ *Review priority maps, verify on-ground as needed, evaluate resulting maps and revise criteria as appropriate (if priorities fail to meet defined goals).*
- ❑ *Synthesize knowledge of watershed characteristics and wetland protection programs into a strategy for wetland protection and restoration based on goals developed for the state and watershed.*
- ❑ *Develop monitoring and evaluation plan for the watershed strategy.*

FIGURE 16: Standard Methodology for Analysis (GIS Prioritization)

assignment of wetland priority ranking within a watershed. They developed a standard methodology for analysis to guide the establishment of criteria in the GIS protocol *(See Figure 16).* The rapid assessment helped them determine what type of wetlands they had and included a classification of the wetlands. The rapid assessment established a baseline inventory and identified landscape changes.

Brazil then discussed how the watershed data are used. They developed an information management system – the Arkansas Wetland Resources Information Management System – to distribute the information and a website so non-GIS users can easily retrieve the information. The website can help users access status and trends information, as well as information on the types of permits being considered in an area, the types of restoration activities underway, and what agencies and organizations are actively working in an area. The tool can also generate maps that provide information on how different sites are ranked.

The project also focused on how to use the initial classification information to assess functions and develop a ranking system. Currently, the project is developing a framework to determine geomorphic setting. They are trying to create a framework to prioritize information and integrate it into a numerical value so that the information can be used to determine what is relevant in a particular area in relation to what has occurred historically and to other surrounding wetlands in the landscape. They are also developing a decision support system that quantifies the following: threat, abundance, priority, uniqueness, landscape position, previous losses/gains, connectivity, HGM function, water quality, type of impact, and unique plant community.

Daniel Smith
Los Angeles District Special Area Management Plan, Engineering Research and Development Center Environmental Laboratory

The objectives of the Special Area Management Plans (SAMP) conducted in the Los Angeles District of the Army Corps of Engineers were to:

- "…develop and implement a watershed-wide aquatic resource management plan and implementation program, which will include preservation, enhancement, and restoration of aquatic resources, while allowing reasonable and responsible economic development and activities within the watershed…"; and
- Establish general programmatic permits for activities regulated under the §404 Program.

SAMPs are conducted in areas experiencing rapid development and heavy permitting activity. Regulatory Guidance Letter 86-10 requires that SAMPs must include active involvement of federal, state, and local governmental agencies, non-governmental agencies, and stakeholders; coordination with existing programs in establishing protection and management areas; and must lead to the development of a defined regulatory product (i.e., general permit).

The payoffs for developing the plans are many. The regulated public gets an efficient and predictable permit review process and they provide the Corps with the opportunity to look synoptically at "waters of the United States" within a watershed context. These plans have been developed for all of the watersheds in the Los Angeles District, with the exception of the San Luis Rey watershed. The plans cover southern Orange Country to Western Riverside County and San Diego County.

Riparian ecosystems were the focus of the Los Angeles SAMPs. The riparian areas included those along ephemeral, intermittent, and perennial streams where surface and/or groundwater interactions result in distinctive geomorphic features and vegetation communities. The riparian ecosystems normally include the bankfull stream channel, active floodplain, and infrequently flooded terraces. This functional definition of the riparian ecosystem often

encompasses areas that are not regulated as waters of the U.S., allowing them to include not only jurisdictional wetlands, but historical areas and alluvial terraces as well.

Riparian ecosystem integrity is defined in the context of a reference condition prior to cultural alteration. It is not an assessment of function or condition. The integrity of riparian ecosystems depends on physical, chemical, and biological attributes and processes across multiple spatial scales including the riparian ecosystem itself and in its drainage basin.

The tool developed for Southern California – Multi-Scale Assessment of Riparian Ecosystem Integrity (MAREI) – includes five phases:

- Phase 1: Identify location of riparian ecosystems
- Phase 2: Conduct baseline assessment of hydrology, water quality, and habitat integrity of riparian ecosystems
- Phase 3: Conduct alternatives analysis
- Phase 4: Develop a watershed restoration plan
- Phase 5: Conduct supplementary studies for indicator revision/verification/calibration

Smith made several observations based on the presentations and discussions on Day One of the Symposium and on the materials provided in advance by the MAP Workgroup.

Observation 1: As with all attempts to shift paradigms, we are currently caught in a conceptual/semantic vortex. This same problem was encountered when the HGM approach to assessment was introduced. It required the acknowledgement that not all wetlands are the same. He counseled the Workgroup not to despair; it is normal and necessary to experience such a vortex. Although painful, this step is necessary, as it is critical to be rigorous about concepts and vocabulary.

Observation 2: Smith's comment related to the first three "Logical Steps" presented by the MAP Workgroup: landscape assessment, historical assessment, and assessment of remaining aquatic resources. He stated that the integrity of wetland ecosystems depends on physical, chemical, and biological attributes and processes across multiple spatial scales including the wetland ecosystem proper, adjacent upland areas, and its drainage basin. He emphasized that there is a difference between assessing the function/condition/integrity of wetlands in a watershed using "site specific" techniques, and assessing function/condition/integrity of wetlands in a watershed using techniques that explicitly consider structural characteristics and processes across multiple spatial scales in the assessment.

Smith stated that there is a wide range of assessment techniques available at different spatial scales that provide different levels of detail *(See Figure 17).* There are many assessment tools that are used at the site-specific scale, such as Proper Functioning Condition (PFC), Wetland Evaluation Technique (WET), Indices of Biological Integrity (IBI), and the Hydrogeomorphic (HGM) Method. However, there are very few tools available that are applicable at the reach and watershed scale. Those tools that do exist are applied at a quantitative calibrated or quantitative uncalibrated scale, such as MAREI, Hydrologic Simulation Program – Fortran (HSPF), Soil Water Assessment Tool (SWAT), or a Synoptic Approach. Site-specific models focus only on

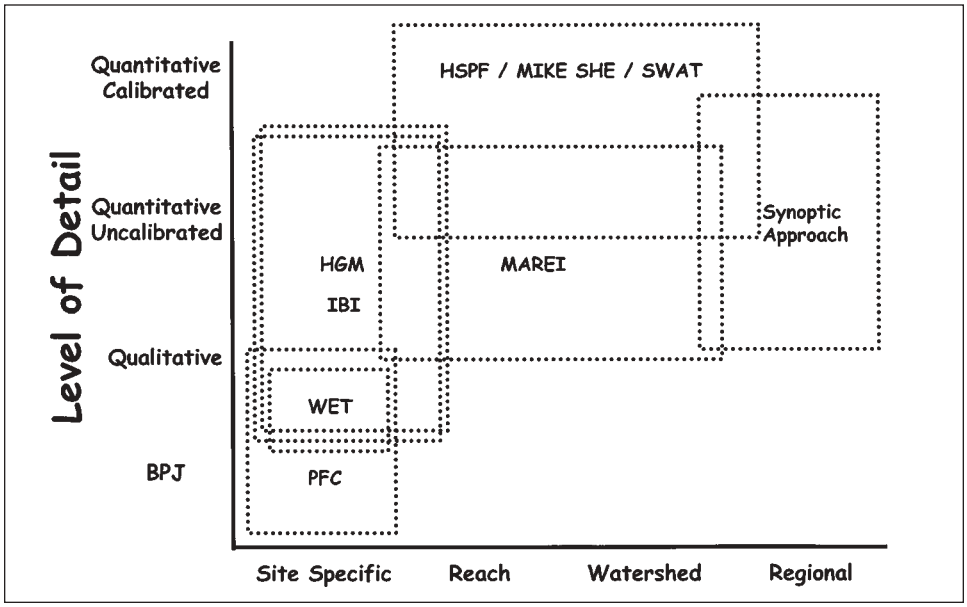


FIGURE 17: Classifying Wetland Assessment Techniques

the movement of water through the watershed. Up until recently, there were no techniques available to conduct a regional watershed assessment. MAREI was developed to make available a simpler, more rapid assessment that could route the components and processes of the watershed and have an impact on how wetland function is assessed.

Observation 3: The MAP Workgroup must develop guidance on the steps for making compensatory mitigation decisions in a watershed context that are explicit about how wetlands should be assessed (i.e., site-specific vs. multi-scale). He added that during the first day of the symposium, participants presented tools that included site-specific assessments in the "watershed context" –site-assessment within the boundaries of a watershed. This is very different, however than using the watershed context to derive the measurements of condition. This is a critical difference and he stated that the group should discuss what wetland assessment techniques could be used in the watershed context. He stated that the MAREI approach is, in fact, the one existing method that does provide such a model.

Observation 4: Smith referred to the last two "Logical Steps" outlined by the MAP Workgroup, an analysis of priorities and restoration options and determination of where, when, and how much. He offered several observations that related to statements that appear in the Scoderi, Shabman, and White article[6] provided to the symposium participants:

- "recognition of the surrounding watershed condition is essential to selecting a location for a particular wetland restoration or creation site…" Smith added that this statement supports his second observation, above. It supports the need to look at the watershed context when conducting an assessment.
- "regulators and in-lieu-fee administrators we interviewed are suggesting much more. They believe that **compensatory mitigation should be governed by priorities for wetland restoration and protection in individual watersheds** rather than by the current regulatory practice of favoring on-site and in-kind replication of wetlands lost to fill permits." This statement provided Smith with his first clue in his search for answers.
- "Some people agree in principle that watershed-oriented compensatory mitigation is environmentally desirable but view it as unworkable until formal watershed plans have been developed for all of the nation's watersheds." This statement relates to the conversation on day one that two approaches are necessary – one a process that relies on the existence of a watershed plan, and the other that is a more streamlined approach that can rely upon a checklist.
- "we do not believe that formal watershed plans are necessary…"
- "In the in-lieu-fee programs we studied, the program administrators and Corps regulatory staff jointly select the types and locations of mitigation actions that serve their understanding of watershed priorities for wetland restoration and protection. This is a workable and low-cost process for guiding decisions on compensation actions that would best serve watershed priorities in consideration of what was or would be lost by fill permits." Smith stated that the authors found that Corps regulators have already developed the types of checklists that this symposium is trying to generate.

Smith offered maps of the Santa Margarita watershed that were generated using MAREI *(See Appendix: K-54, K-55, and K-56).* These maps depict the three indices that were used in the project:

1. Hydrologic Integrity Indices – this map scores the condition of that riparian ecosystem and displays it in the context of the local drainage
2. Water Quality Integrity Indices
3. Habitat Integrity Indices

Phase 4 of MAREI was the development of a watershed restoration plan. The objective of this phase is to develop a watershed-wide restoration plan that establishes restoration templates and priorities for riparian ecosystems. The approach involved classifying each riparian reach by geomorphic zone; identifying current condition of each riparian reach; determining the appropriate restoration template based on condition; estimating the relative level of

[6] Scoderi, Paul, and Leonard Shabman. "Rethinking Compensatory Mitigation Strategy." National Wetlands Newsletter January-February 2001: 5+.

effort required for restoration; simulating the change in hydrologic, water quality, and habitat indices following the application of restoration template they've designed; and identifying priority restoration areas based on selected criteria.

The tool allows for the development of a geomorphic, geohydrologic classification for each watershed. The tool generates a map of the geomorphic zone assignments for each of those riparian regions. Each region is assigned a restoration template based on its current condition. There are five kinds of templates: natural restoration, incised restoration, constrained restoration, aggraded restoration template, and engineered restoration template. Each of these templates allows for the visualization of what a restored site would look like for each of the templates. The templates are then mapped and they assign a relative level of effort to each of the possible outcomes: none; light planting; light earthwork / moderate to heavy planting; moderate earthwork / heavy planting; and heavy earthwork / heavy planting. Each of these levels of effort can be mapped, allowing, for example, the change in the Hydrologic Integrity Index following a simulated restoration. The level of effort is then added to the map leading to a final map that depicts the change in Hydrologic Integrity Index divided by Level of Effort Following Simulated Restoration. The map depicts where you will get the "biggest bang for the buck" and where restoration efforts should be focused.

Smith addressed the three questions posed to him by the MAP Workgroup. The first question was, "What criteria did you use to analyze (or select) priorities and restoration options?" Smith summarized the responses of previous speakers. He stated that Sumner relied upon reference profiles, Collins used restoration of habitat (consensus on target quantities), Stallman used consensus ranking based on site-specific assessment of condition, and Wold relied upon consensus-based site-specific assessment of condition. Smith added that MAREI helps identify sites where restoration can yield the biggest gain in integrity for the smallest investment of effort.

Indicator metrics can be adjusted through a simulation process. Before restoration a value was assigned to a particular metric and adjusted based on the restoration template that was applied. After the restoration is simulated, the first map shows the change in hydrological integrity. The level of effort is added and the final map depicts where restoration efforts should be focused to achieve the biggest ecological lift for the least amount of money. These same scenarios have been developed for developing corridors, restoring particular wildlife habitats, and many other parameters.

In response to the second question, "How were the criteria developed (i.e., what information or data were used)?" Smith responded that they worked in consultation with the Corps' Los Angeles District.

Questions and Answers

Hall added that Smith's presentation raised another question. Before the group determines which criteria are the most important, there needs to be a more substantive discussion about assessment tools. Regulators are focused on the assessment of functions and values. However, the discussion about mitigation and the watershed context leads one to feel that this is the wrong focus. Wilkinson added that assessment tools were going to be discussed later in the day.

A discussion followed about what is meant by making compensatory mitigation decisions in a watershed context. Several participants expressed concern that to some practitioners, the watershed context may simply mean making site-specific decisions within the boundaries of a watershed. However, this paradigm shift requires a deeper understanding about the watershed context. The new approach requires the use of assessment techniques that capture the multi-scale nature of the data. Wetland assessment in a watershed context should mean that the data used to derive the measure of condition, function, and integrity are based on multi-scale factors in the watershed. The way a wetland functions is dependent not only on what is in the wetland, but what is around and upstream from the wetland. These watershed factors must be captured in any wetland assessment.

Martindale asked Smith where the funding for the Los Angels SAMPs came from and if regional general permits (RGPs) were developed in all of the watersheds. Smith replied that the funding came from a variety of

sources, including the Corps and EPA State Wetland Program Development Grants. Funding was also provided by counties, private development companies, and quasi-governmental agencies, such as transportation authorities. The SAMPs are in different phases of development and no RGPs have been developed yet.

Stedman asked Smith about factoring watershed characteristics into an individual site assessment. She asked if an example of such an approach would address not only how well a wetland could absorb phosphate or nitrogen, but also whether or not it is downstream of the nutrient source. Smith responded in order to measure the hydrologic integrity of a wetland, a hydrologic analysis of the basin must be conducted to determine how water routes and the hydrologic needs of the wetland. Stedman asked if there are any assessment techniques that utilize opportunity. Smith responded that HGM and IBI have tried to incorporate landscape factors. Both HGM and IBI consider upstream factors, but only implicitly, not explicitly. In the work with the Los Angeles SAMPs, one of the metrics they used for hydrologic integrity is land use / land cover of the basin above that wetland.

Sumner asked Tiner how NWI is standardizing the use of modifiers. Tiner replied that they are letting the regions decide what their users want. The data have not been standardized. It is in the developmental stage. The information that is generated is available through their partners, not through the NWI website. Once the information is standardized it will be available on the NWI website as part of the NWI database.

Stein asked Tiner if the historic change assessment relies upon the reinterpretation of the original source maps or if they use the old data set. Tiner answered that if more recent trend analysis is available, NWI will add wetlands identified in the new inventory to the original database. Currently, if a forested wetland was identified by NWI in the 1990's, they make the assumption that it was there in the 1970's. For the pre-settlement assessment, hydric soil data is used. Prather asked if NWI works with the USDA's National Resources Inventory. Tiner replied that there was an attempt to do this, but no agreement was reached. Prather inquired whether or not NWI is mapping isolated waters and if so, whether they are qualifying these sites. Tiner responded that they are not qualifying isolated wetlands.

Collins added that the Goals project did not use watersheds to develop regional priorities. But by looking at the watershed scale, a pattern of habitats emerged that became a self-replicating template for the larger watershed. When the project reaches the implementation stage, every wetland is considered in the context of the watershed and sediment supply.

Collins directed a question to Brazil. He stated that the Goals Project has had difficulty conveying the differences in resolution and error among different data layers that are available to the public. He asked if Brazil had any recommendations for how to convey to the public information about data extrapolation and accuracy. The Goals Project does not convey the differences in data layer integrity and resolution. Brazil responded that they have two viewers on their website, one of which is used by the public. The number of coverages that are available to the public is limited. His experience has shown that in public meetings, most people are familiar with maps and understand that what is shown on a map does not always correspond with what is out on the landscape. They have yet to discover whether or not this will be a problem.

Facilitated Discussion

The goal of the following facilitated session was to discuss what data/information has been used or could be used to develop the criteria identified in the facilitated discussion that followed Session I and to discuss the strengths and weaknesses of these different types of data sources. There was, however, some disagreement as to whether this would be the most effective use of the group's time. Stein stated that during the discussion following Session I, the group did not reach closure on the question of what are the most important criteria. He added that the question of what data are important becomes obvious once you decide which criteria you will be using. He suggested that the group spend the facilitated discussion time further discussing criteria.

The group agreed that the remaining time in the session should be devoted to: 1) defining what is meant by criteria to clarify any confusion; and 2) continue the discussion about criteria.

The group first sought to define the term "criteria." Sumner suggested that criteria could be defined as factors for determining restoration opportunities at a specific site. Klimek stated that she was not comfortable with the definition of criteria because it starts with the site and scales back to the watershed. The watershed should be the starting point and then you should scale down to the site level.

Wold added that he thinks the definition should be, "Factors for determining restoration opportunities within a specific watershed." Instead of "at a specific site." Cole agreed with Wold's suggestion. A decision first needs to be made before the site level is addressed. Sumner agreed as well. Smigelski added that the watershed is the universe and the criteria are the sieves used to identify the specific site.

Smith stated that there are many criteria used to determine restoration opportunities without considering the watershed scale. This discussion should focus on criteria that are specific to considerations in the watershed context.

A participant stated that the term used in the definition should be "mitigation" instead of "restoration." Klimek did not endorse the term "mitigation." The "Site/Kind Guidance," currently out for public comment, says mitigation is defined differently if it is in a watershed context. She recommended going back to restoration. Smith suggested "criteria that uniquely occur when you are in a watershed context" to distinguish it from all the other criteria that could be used, such as in-kind, out-of-kind and other factors.

Based on the participants' comments, Wilkinson offered the following definition: **Criteria are factors for determining mitigation/restoration opportunities that uniquely occur when considering a specific watershed.** The group agreed that the definition accurately captured their concerns.

Discussion and Classification of Criteria

Sumner added that from the top down, there are ecological factors and social factors to consider when determining whether or not a site is appropriate. The ecological factors include site considerations (i.e., soils, hydrology, and vegetation) and landscape ecological factors (i.e., connectivity, buffers, surrounding land use). On the social side there are site considerations (i.e., property values) and community constraints (i.e., zoning). Criteria could be developed for each of these components. The analysis could be conducted in a checklist form or a conceptual GIS model.

Martindale added that if the MAP Workgroup creates guidance that encourages the development of maps for regulators, the transition to making compensatory mitigation in a watershed context will happen. She added that the guidance should be brief.

Hough asked Smith if he felt that there are criteria not included in the list in *Figure 14* that are critical to include. Smith responded that he felt that the omission involves not what criteria are on the list in *Figure 14,* but how the assessment is conducted.

Stein stated that there are two levels of resolution for criteria. A criterion, such as condition of the wetland, is unclear. If the criterion is reworded as a statement, such as restoration should be conducted at a location that provides connectivity between two contagious ecological habitat patches, it would be much clearer. Stein asked the Workgroup how specific they expect the criteria in the guidance to be. The criteria could be worded generically to allow the districts flexibility in further defining them, or as specific statements, such as his second example. The two approaches will have very different data requirements. Hough responded that the Workgroup will be developing criteria that are more specific, which will require higher resolution and will help maximize the ecological benefit per dollar spent.

Wilkinson asked the participants which criteria would help identify areas for mitigation that would have the highest benefit and probability for long-term sustainability. Smith answered that the criteria developed on Day One *(Figure 14)* is good, but could be refined. For example, the criterion "Wetland Rarity," could be restated as "restore wetlands that will increase habitat for rare species or specific rare species." Almost all of the criteria on the list could be rephrased to make it more specific.

Wold suggested that both of the frameworks already offered by Stein and Sumner *(See Figures 1 and 2)* are good. Criteria just need to be developed for the categories in each of the frameworks. This group could revise each of the criteria already listed and restate it as a short phrase or a criteria statement. Each statement could them be placed in one of the categories. Wold asked Stein which criteria are the most important in the "landscape position" category.

Smigelski stated that the guidance should be constructed to allow for flexibility. The criteria should suggest things that could be considered, but should not be too prescriptive. It should include general categories of criteria and examples of specific criteria could be provided to demonstrate the types of things that should be considered. Nadeau agreed that the criteria cannot be too prescriptive, or they won't be useful nation-wide.

Gersib stated that their watershed characterization project developed two sets of criteria: site assessment criteria and landscape assessment criteria. The two sets of criteria are, however, linked. At the site scale they consider functions, such as flood storage desynchronization. At the landscape scale they consider how humans have altered the delivery and routing of water. These two factors are directly connected, but different criteria are assessed in different ways at different scales.

Stedman stated that when Stein rephrased the criterion as a statement, it was more of an objective. Objectives will differ based on location and the ability to achieve the best mitigation for the dollar spent. This is particularly true in coastal areas where restoration is costly and often the best areas for mitigation from an ecological perspective are too costly.

Martindale suggested that one criterion be added to the list: the level of effort required.

Schaftlein questioned whether restoration funds should be concentrated in one targeted area until the desired outcomes are achieved, or if they should be spread out across the landscape.

Ainslie suggested that there are two scales being considered. At the site scale, you must consider how the watershed affects the wetland mitigation site. At the landscape scale, you must consider how that wetland contributes to watershed function and outputs of the watershed. Smith responded that the role of any wetland in a watershed is determined by its position in the landscape. Ainslie added that if the endpoint is water quality, he would consider how that wetland contributes to water quality. He would then determine how to redistribute his investment for the given payoff, which in this example is water quality, which is a watershed function.

Sumner suggested that the goal of making compensatory mitigation decisions in a watershed context should be to achieve an *appropriately* sustainable wetland feature.

Wilkinson summarized the preceding discussion. The participants indicated that the MAP Workgroup should develop categories of criteria. These categories should be flexible enough to allow them to be tailored locally. There should be different criteria depending on the scale being considered. Finally, Stein and Sumner agreed that the two frameworks they offered are two different ways to depict the same approach.

SESSION III: Criteria used to analyze priorities and restoration options

Session III was the third and last session addressing the third Desired Outcome: Identify the most important criteria used by existing watershed-based planning tools/resources to analyze priorities and restoration options. The presentations were followed by a question and answer session and then a facilitated discussion. Session III featured three speakers: Steve Ashby, William B. Ainslie, and Alyssa Olson Callahan. In the facilitated discussion that followed the presentations, the participants defined "decision support tool" and identified the different categories of decision support tools that are available to help guide the placement of compensatory mitigation where it would have the greatest benefit and probability for long-term sustainability. Finally, the group discussed the different strengths and weaknesses of each of the groups of decision support tools.

William B. Ainslie
Synoptic Approach for Wetlands Cumulative Effects Analysis, U.S. Environmental Protection Agency, Region IV

EPA's Region IV asked the agency's Corvallis lab to help them determine how to prioritize their restoration efforts. The Synoptic Approach was born out of this request. It is a regional prioritization of wetland restoration based on sediment retention function.

Ainslie's presentation described the Synoptic Approach, how it works, why it should be used and what it is good for. The approach was described in the context of its application in the Southeast where it was used to develop a sediment reduction assessment. He also discussed the criterion used for prioritization and whether or not landscape-scale information can be used in mitigation decision-making.

The Synoptic Approach is designed to geographically prioritize wetland protection or restoration with limited effort, resources, and information. The prioritization criterion is outlined in a publication by Scott Leibowitz and Jeffrey Hyman.[7] The approach acknowledges that often data covering large areas is limited. Ultimately, the approach leads to a map as an output.

The Synoptic Approach is particularly appropriate to use when quantitative, accurate information is not available, particularly at regional scales; when the cost of obtaining or improving information is high; when the cost of a wrong answer is low; and when there is a high demand for information. The Synoptic Approach is appropriate when prioritizing multiple decisions, rather than trying to optimize a single decision, such as inputting watershed information to make a permit decision.

The goal of a Synoptic Approach to geographic prioritization is to maximize ecological benefit gained from limited resources. It is essentially a cost/benefit approach, with the benefit expressed in terms of an ecological endpoint and the cost expressed in terms of effort.

The prioritization criterion is the marginal change in ecological function per management effort (dF/dE). The criterion is change in function, *not* total function.

[7] Hyman, J.B. and S.G. Leibowitz. "A general framework for prioritizing land units for ecological protection and restoration." Environmental Management 25 (2000): 23-35.

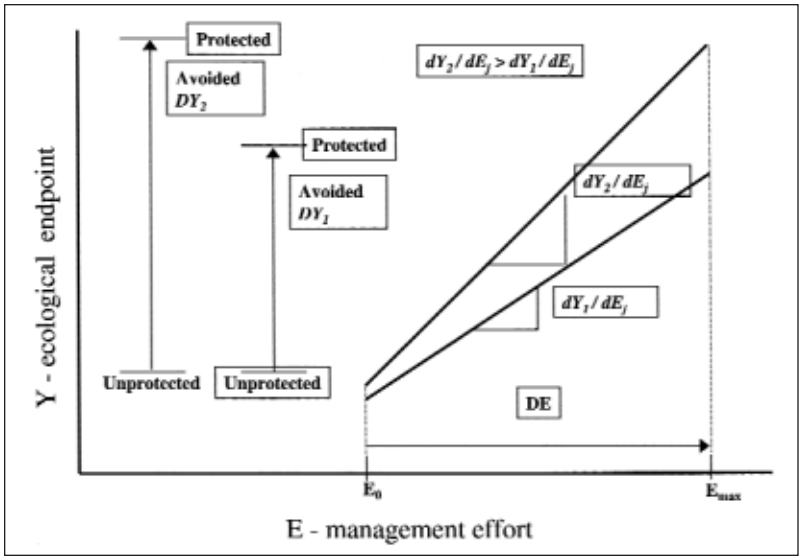


FIGURE 18: Prioritization Criterion: Creation of the Ranks

It does not try to measure total function. It helps determine whether you will get change if you expend a certain amount of effort in a particular situation *(See Figure 18).* This example assumes that each wetland is currently protected and that if effort is not expended, the wetland will no longer be protected and will be degraded. In this case, the endpoint is the avoidance of degradation. To compare different sites to one another, the slopes of the lines are compared. The slope of the line to the left is greater; the program ranks the watershed higher because you can get more protection for the same amount of effort.

Because detailed data are rarely available, the Synoptic Approach is designed to use judgment indicators. Leibowitz and Hyman wrote another paper on the use of scale invariance in evaluating judgment indicators.[8] Judgment indicators can be used when the relationship is not known. This approach allows endpoints to be represented with indirect measurements of related variables (indicators). It does not allow estimation, but can be used for relative ranking.

The Synoptic Approach develops a conceptual model that can guide the selection of indicators. It lays out our understanding of relevant ecological processes. The purpose is to formalize our understanding and guide indicator selection. It is not used to simply lay data layers over one another. The model provides a more logical and rational approach to selecting indicators. The model is *not* developed for simulation, hypothesis testing, or direct analysis.

The big caveat is that the results of the Synoptic Approach "should not be treated as empirical or field-tested findings. The conclusions of the assessment are based on judgment guided by scientific principles and a general understanding of the relevant ecological processes…Thus the results are somewhat akin to the conclusions of a scientist providing expert testimony at a trial."[9]

In EPA Region IV, the Synoptic Approach was used as a sediment reduction assessment, which was influenced by TMDL lawsuits. The tool was used to prioritize wetland restoration to maximize stream water quality. Sediment is the number one nonpoint source pollutant in the United States and the third most prevalent source of stream impairment on the 303(d) list in the Southeast. Wetlands have a demonstrated ability to retain sediments, thereby improving downstream water quality. Consequently, restoring wetlands in the right places can contribute to the amelioration of stream sediments.

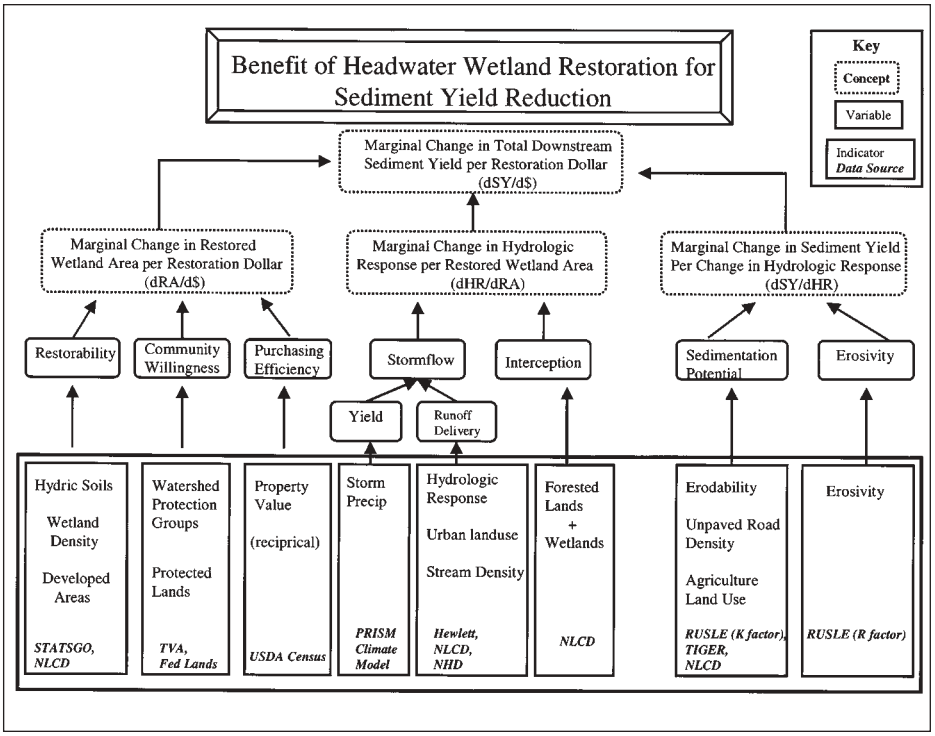


FIGURE 19: Benefit of Headwater Wetland Restoration for Sediment Yield Reduction

[8] Leibowitz, S.G. and J.B. Hyman. "Use of scale invariance in evaluating judgment indicators." Environmental Monitoring and Assessment 58(1999): 283-303.

[9] Schweiger, E.W., S.G. Leibowitz, J.B. Hyman, W.E. Foster, and M.C. Downing. "Synoptic assessment of wetland function: A planning tool for protection of wetland species biodiversity." Biodiversity and Conservation 11,3(2002): 379-406.

The goals of the Region IV Synoptic Prioritization were to:

- Maximize wetland restoration to ameliorate sediment in streams ("Biggest Bang for the Buck")
- Prioritize restoration efforts (Section 404 mitigation banking, TMDL implementation, Watershed Program, Nonpoint Source Program)
- Use a defensible, rigorous and repeatable framework
- Continue development of synoptic framework

The Assessment Objective was to identify where restoration should be targeted to provide the optimal reduction of sediment yield if some level of funding were available for restoring headwater wetlands.

The prioritization criterion is: Marginal change in total downstream sediment yield (SY) per restoration dollar ($). dSY / d$.

Since this cannot be measured directly, the conceptual model was broken down into three key concepts, which are further broken down into variables, which are further broken down into indicators, or the data that is used. The three key concepts are:

- Marginal change in restored wetland area per restoration dollar (dRA/d$) (or increase in wetland restoration per dollar)
- Marginal change in hydrologic response per restored wetland area (dHR/DRA) (or decrease in hydrologic response)
- Marginal change in sediment yield per change in hydrologic response (dSY/dHR) (or decrease in sediment delivery)

The first concept is defined by a Wetland Restoration Index, which is comprised of three variables and additional indicators *(See Appendix: A-17 and A-18).* The second conceptual model, Hydrologic Response, is defined by two variables and additional indicators *(See Appendix: A-19 and A-20).* The third conceptual model, Sediment Yield, is defined by two variables and additional indicators *(See Appendix: A-21 and A-22).* None of the data used were difficult to access and all were widely available. The data also needed to be uniform across the region being studied.

The Synoptic Approach can be summarized by the following equation:
dSY/d$ = dRA/d$ X dHR/dRA X dSY/dHR X HW

The change (decrease) in sediment yield due to wetland restoration is dependent upon the wetland restoration being cost effective, attenuating the hydrologic response, and intercepting sediment. All three of which vary geographically across Region IV thus allowing for the geographic prioritization. A headwater weighting factor was included.

In applying the Synoptic Approach, it is important to keep in mind that the scale of the assessment is very large – an 8 digit HUC. Other techniques can be used to "step-down" the assessment. It is applicable for giving commercial bankers incentives for locating banks in particular watersheds. In high priority watersheds, it may provide you with justifications for conducting restoration off-site and out-of kind. There is only one function addressed by the Synoptic Approach and other agencies have other priorities. The Synoptic Approach was also conducted in each state in the region. Watersheds were prioritized in each state, which may be useful in a programmatic context.

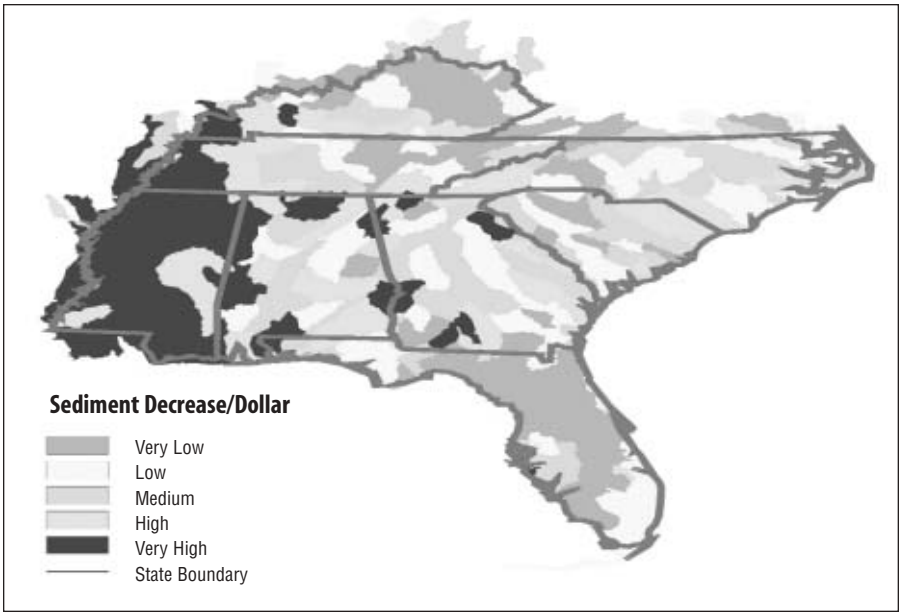


FIGURE 20: Marginal Decrease in Sediment Delivery per Restoration Dollar in Watershed

In summary, the Synoptic Approach is a prioritization technique to maximize ecological benefit given limited resources. Region IV used the approach to prioritize wetland restoration for amelioration of sediment delivery. Application of synoptic results may be appropriate for use in the §404 Program. At the very least the assessment in Region IV provides a basis for discussing mitigation in a watershed context.

Steve Ashby
SMART Program, U.S. Army Engineer Research and Development Center Environmental Laboratory

Ashby outlined several concepts he feels are important to consider in making watershed-based decisions. He stressed that the mosaic of hydrologic settings is very important and that subsurface hydrogeology is an area that is not being adequately addressed in the watershed approach. Subsurface boundaries are different than surface boundaries. Wetland profiles are very useful for some of the system integrity metrics that are used. Temporal and climate impacts will affect sustainability impacts. Finally, Dan Smith's classification of wetland techniques is a helpful portrayal of some of the tools Ashby addresses in his presentation.

ERDC has developed watershed models to demonstrate material and nutrient transport from the watershed into a river. The program can model activities conducted by the Corps in a river, such as streambank stabilization, which impact the sediment in-stream, out-of-stream, and downstream.

There are several Corps models that have been in existence for some time. There are models for quantifying benefits (flood control and ecological benefits) for the National Economic Development (NED) and National Ecosystem Restoration (NER) planning objectives, respectively. The task of the SMART program is to analyze impacts that have traditionally been addressed on a project-by-project basis and make connections between upstream impacts and downstream responses; this is a systems approach to watershed modeling. ERDC is trying to develop a decision support system that is a seamless link of models that can show these interactions with one push of a button.

An expanded version of a conceptual model would take things like reference conditions or desired conditions and interject other issues related to water systems, such as flood control and hydropower. The categories in are those that have been identified by EPA's Science Advisory Board and the Ecological Society of America *(See Figure 21).* This example is a conceptual model for the Upper Mississippi River.

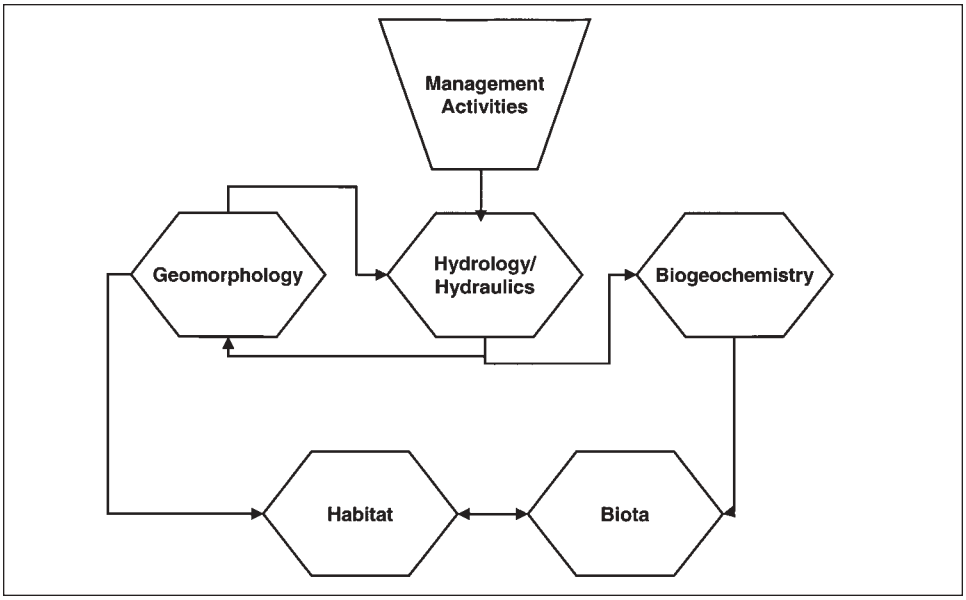


FIGURE 21: Conceptual Model for Assessing System-wide Response to Management Activities

Figure 22 depicts a geospatial approach to watershed assessment that can be used at different scales. ERDC plans to use this to develop quantitative, mathematical models that can be used with a variety of data, from easily gathered information up to more rigorous data. This is being used as a planning and a regulatory tool in a lake restoration project. The Sediment Impact Assessment Model *(See Appendix: B-6)* is not yet part of the program. The goal of the approach is to balance the sediment system when sub-basin loadings change (e.g. due to grade control, bank stabilization) and predict resulting instabilities/stability in downstream channel reaches. Another model

(See Appendix: B-7) was developed to demonstrate eutrophication response in reservoirs. It is a tool that could be applied to wetlands to demonstrate water quality issues, such as material transport and mass balance.

The Illinois River Basin Restoration Project has developed a draft feasibility plan. It is being developed by an interdisciplinary team and is geared toward aquatic habitat. It could, however, be used to guide compensatory mitigation. The project has identified specific criteria and constraints for determining where to place restoration sites:

- Proximity to other high quality areas
- Geographic spacing to maximize benefits to river system to support fish populations
- Anticipated sedimentation rates
- Availability of placement areas (dredging)
- Willing landowners
- Site will maintain desirable water quality
- Provisions for habitat diversity

The project developed criteria for prioritization:

- Combining habitat restoration and/or protection projects closely coordinated with projects developed under other goals to maximize systemic ecological integrity and effectiveness of restoration efforts and dollars.
- Focus on quality of habitat and the presence of threats to the integrity of the quality of the area under consideration. Areas threatened most immediately should be targeted for protection.

The criteria they developed for prioritization include:

- Connectivity to the Illinois River and major tributaries and between protected areas
- Improve and protect existing moderately degraded habitats near rare and unique communities
- Altered hydrologic regime in the most relevant disturbance regime
- Rare area

The project developed some of the specific criteria based on local conditions. For example, the criteria for terrestrial patch size recommendations include bottomland hardwood forests (500-1000 acres 3000 acres for some interior avian species), grasslands (100-500 acres), nonforested wetlands (100 acres spaced 30-40 miles apart), and riparian zone (100 feet each side 200-300 feet wide total).

The criteria for aquatic habitat include main stem backwaters/side channels and in-stream riffles. The Illinois plan also includes a summary condition indicator: Physical Quality Index (PQI). The Index considers index values determined by expert opinion; assessed only the physical configuration of the backwater habitat in terms of depth to maximize value and use by a broad range of plant, fish, and wildlife species; and applied to without-project and all levels of restoration being considered.

The model generated about six different alternatives.

The project included a tiered approach:

- General criteria for the ecosystem (regional)
- Connectivity and patches (sub-regional)
- Detailed assessments for individual projects (site-specific)

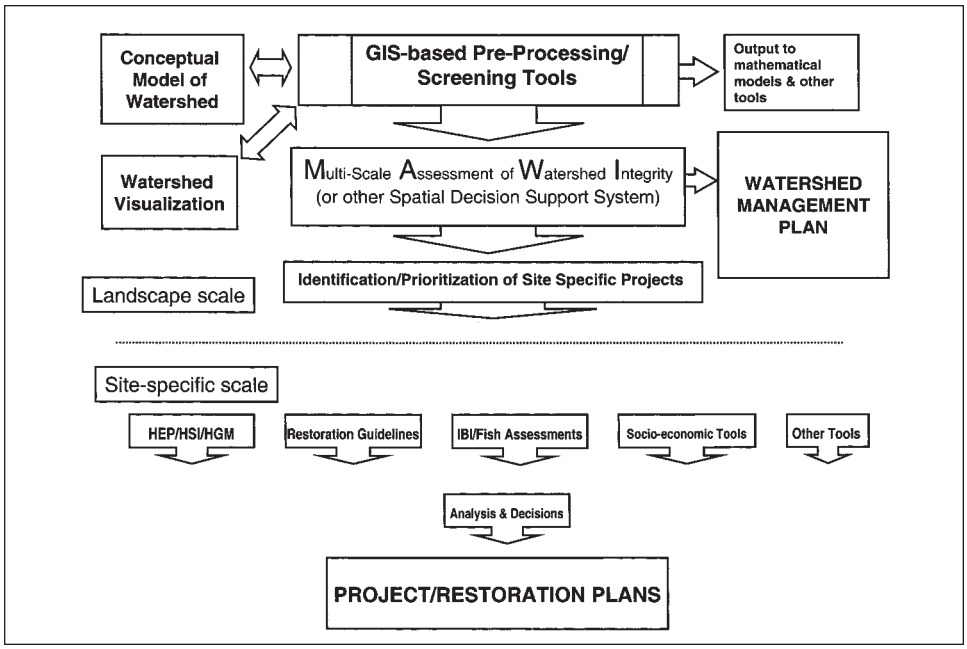


FIGURE 22: Watershed Assessment Framework

The Illinois River Basin Restoration Plan outlines measures of success:

- Measured in time scales related to species and system
- Considers periodicity of extreme environmental events
- Measured in spatial scales that relate to a whole ecosystem with long-term evaluation (Zedler 1988).
- Includes ecological meaningful indicators that mark progress toward ecosystem management and restoration goals (Richter et al. 1996)

The project includes a monitoring program to track success – the Illinois River Monitoring Program. The program measures an array of parameters, including several measures of IBI, acres of quality habitat, the increase in number/range of terrestrial area-sensitive species, among others.

The System Ecological Integrity Metric uses a systemic evaluation based on a series of indicators. It was developed using approaches utilized by the Chesapeake Bay Foundation and the Upper Mississippi River – Illinois Waterway System Navigation Study.

The project identified the need for more focused studies that identify data gaps, establishment of reference conditions, effects of agricultural chemicals on ecosystems, role of groundwater, degree of impairment, risk and uncertainty analyses, and adaptive management.

In sum, SMART is building tools for system-wide assessments that could be used for regulatory purposes. Conceptual modeling can assist in criteria development. The tiered approach is useful (system, connectivity, site). More focus is needed on temporal and spatial metrics. Finally, risk and uncertainty must be addressed through adaptive management.

Alyssa Olson Callahan
Coastal Services Center Initiatives
NOAA Coastal Services Center

NOAA Coastal Services Center's Landscape Characterization and Restoration Program (LCR) has developed several decision support tools. Each of the tools uses criteria developed based on stakeholder needs, desires, and capacities. The program seeks to build capacity and fulfill the needs of their stakeholders. The tools are GIS-based, desktop interfaces. She discussed four decision support tools and the criteria for each. The four tools are SWAMP, Rhode Island Tools, SCREAM, and Lake St. Clair Integrated Coastal Management Tool.

SWAMP is a pilot project developed by LCR based on a predecessor tool, the North Carolina Coastal Region Evaluation of Wetland Significance (NC-CREWS).[10] The methodology and criteria are the same as those in NC-CREWS, but SWAMP uses ARC GIS technology. SWAMP has not, however, been field tested in North Carolina. NC-CREWS has been field-tested and validated in the state. Some of the criteria in SWAMP include proximity to sources, proximity to water bodies, soil types, wetland types, and buffer widths. SWAMP and NC-CREWS focus on water quality – the hydrology and habitat of wetlands.

The Rhode Island Suite includes two tools that focus on two types of habitat restoration: eelgrass and salt marsh. The criteria were developed based on stakeholder needs and available data. The Sea Grass Site Selection model aims to prioritize eelgrass restoration opportunities. Two of the criteria in locating eelgrass restoration sites are identifying sites that (1) avoid fishing areas and (2) target shellfish closure areas.

Under the Salt Marsh Site Selection tool, stakeholders wanted to prioritize marsh restoration based on three criteria: (1) Socioeconomic considerations; (2) Feasibility (road access, land ownership, major utility right-of-way, known hazardous waste sites, presence of invasives, and the ability to have a construction staging area nearby); and (3) Ecological function.

[10] Wetlands :: GIS Wetland Functional Assessment (NC-CREWS). North Carolina Department of Environment and Natural Resources, Division of Coastal Management. 8 Sept. 2003 <http://dcm2.enr.state.nc.us/Wetlands/nccrews.htm>.

The Rhode Island stakeholder groups found that the greatest benefit of the project was not necessarily the final delivery of the tools, but rather, development of the datasets that were required prior to building the tools.

The Southern California Riparian Ecological Assessment Method (SCREAM) was discussed earlier by Stein. It is a decision support tool developed to support the planning and site prioritization goals of the Southern California Wetland Recovery Project. SCREAM was designed to examine the functional contributions of habitat, hydrology, and biogeochemistry to the watershed. The methodology and all of the criteria for the tool were developed working with WRP and the Science Advisory Panel. SCREAM includes over 30 metrics and over 50 individual scores. Some examples of what SCREAM calculates include:

- Habitat – lateral and linear continuity of habitat surrounding land use and connections to wetlands
- Hydrology – channel vegetation material, bank material, entrenchment, sinuosity, runoff and infiltration potential based on soil type and land use, and unique catchment land use contributions to a particular area of a stream, biogeochemistry, and persistent and nonpoint pollution sources based on land use.

The Lake St. Clair Integrated Coastal Management (ICM) Tool is currently in development. NOAA Coastal Services Center worked with stakeholders in Lake St. Clair to develop a draft coastal habitat restoration and conservation plan. NOAA was asked to build a decision support tool to help coastal resource managers and planners examine decisions and identify restoration and conservation priorities. The list of project stakeholders is extensive.

Hydrologically, Lake St. Clair is a connecting waterbody between Lake Huron and Lake Erie via the St. Claire and Detroit rivers. The surrounding land uses include high intensity industry, corporate agriculture, and sprawl. There was not a good wetlands inventory for the area. NOAA worked with stakeholders to register their concerns and gather information about issues. There were water quality problems but they were asked to deal with habitat, so they added impervious surfaces. They developed some initial metrics for stakeholder review. These metrics were designed to address habitat, connectivity, and quality issues; they included: nearest neighbor, proximity, size, core area, impervious surface, and inventory.

The tool was designed to allow stakeholders to query the output data quickly at a variety of scales. The tool also included the ability to conduct "scenario testing." It allows stakeholders to view what is currently on the ground through the calculations of the metrics, go into the program and make a change, and evaluate the change through the metrics. You can then view the current state and the changed state. The tool's scenario testing has a variety of output formats, including maps, tables, and reports.

The stakeholders requested the inclusion of data on plant, animal, and natural communities, which was provided by the Michigan Natural Features Inventory, as well as data included, including distance to stream corridors, distance to streams, shoreline hardening, and presence of invasive species. Data on socioeconomic growth, historic water levels, soils, and land ownership was also added.

Olson-Callahan presented an example problem. She chose one watershed in Lake St. Clair where no watershed plan exists, but some goals have been outlined. These goals include: achieve no net loss of habitat; decrease the number of habitat patches, by creating linkages and increasing total size; and conduct restoration activities in areas that would benefit rare, and high quality habitats (or threatened and endangered species); and create habitat buffers to rivers and streams. The map she presented has color-coding to depict habitat (forest land cover class or wetland land cover class), which are displayed as individual patches with quality scores.

In this example, the change that is made is the development of a 1.0-acre deciduous forest to low-density development. In the scenario, the developer is agreeing to conduct restoration by planting trees and restoring deciduous forest elsewhere. The tool is used to determine how the goals can be achieved. Scenario testing can be used to change the proposed development and add forest in other areas.

The only thing needed to run this tool is a raster land cover. Any geographical boundary can be used, such as watershed, county, or township. A flexible classification scheme can be used. You can determine what is habitat and what isn't and how the habitats related to one another. The user determines the scores and the values. There are optional features, such as queries, overlays, and scenario testing, and multiple outputs, such as GIS Shapefiles, map images, reports or tables.

Questions and Answers

Collins asked Ainslie whether the headwater wetlands analyzed using the Synoptic Approach were out-flow wetlands and if the tool addresses downstream decisions. Ainslie answered that it does not specifically address these issues because of the scale and the inability to get any data that would cover the entire geographic region of their study area.

Wold stated that the example presented by Olson-Callahan was very intriguing from the standpoint of managing a wetlands program or open space program. The example demonstrated how the decision support tool could identify restoration sites based on the criteria selected. He inquired whether the tool identified the most ideal sites, or if it took into consideration land ownership. Olson-Callahan responded that the example provided made the assumption that restoration could occur anywhere, regardless of land ownership. The tool does, however, allow for a land ownership layer to be added to the window. Wold inquired how long it would take to adapt the Lake St. Clair tool to another geographic region. Olson-Callahan replied that the tool is fully developed. It is a stand-alone interface and with the appropriate software it can be easily adapted. It is currently going through stakeholder review and will be publicly available this fall. If you are willing to work with Great Lakes data, a web version will be available.

Brazil asked Olson-Callahan what datasets were used for the Lake St. Clair tool. She replied that the base layer is the land cover raster, which provides information on size, core area, nearest neighbor, and proximity. A streams layer is needed for distance to streams, and natural heritage data provides element occurrence polygons and information on invasive species. They are all flexible formats and the software help files describe how the metrics are calculated. He asked if all the data were available. She replied that those that are not cover parameters that are optional and the tool will not provide scores for those issues.

Schaftlein inquired whether the MAP Workgroup envisions government agencies using these tools to give applicants a menu of choices or whether the applicants would hire a consultant to use the tools to generate options. Brumbaugh responded that a number of government agencies, particularly at research labs, are applying these tools so that they can be used by planning or regulatory staff. Brumbaugh added that the Corps currently anticipates that the tools will be used by the agencies. For example, the Interagency Joint Commission would use the Lake St. Clair tool. He asked Stein if applicants use the SCREAM tool itself or just the outputs. Stein responded that SCREAM will be made available to watershed groups, counties, and others to use on their own. His program also hopes that they will be able to provide groups with a lot of the data already packaged so they can use the outputs directly.

Ashby added that many of the tools he discussed will be in the public domain. There will be some issues related to proprietary use of tools developed in the private domain. But, for example, the BASINS model developed by EPA for TMDL assessment is available to the private sector and public agencies. In the future, they will need to determine how to make available tools that have not been peer reviewed or are not nationally accepted or approved. They must consider whether the tools meet the standard of being defendable in court. Olson-Callahan added that their tool will be going through peer review.

Dan Smith asked Olson-Callahan if the land cover data are standardized. She responded that they used NOAA's Coastal Change Analysis Program (C-CAP)[11] data, which is not an appropriate dataset for permitting. Any raster land cover data used with the tool for permitting should use digital orthoquads. C-CAP will be rolled into the National Land Cover

[11] NOAA Coastal Change Analysis Program. NOAA Coastal Services Center. 26 Feb. 2004 <http://www.csc.noaa.gov/crs/lca/ccap.html>.

Dataset in 2004. Smith asked if the Lake St. Clair tool could be transported to another area without standardized land cover data first, if different land cover data have different categories, and if problems are created with the algorithms. He also asked if the model would have to be recalibrated in such circumstances. Olson-Callahan responded that there would not be any problem with the tool's algorithms and it would not need to be recalibrated. The user defines what is habitat, sets the definitions, and defines the algorithms. There are three options for defining habitat: simple (everything that is picked is alike habitat), unique (everything that is picked is only like same types), and root.

Facilitated Discussion

The specific goal of this facilitated discussion was to determine what tools (ranking, GIS, other decision support tools) are the most effective for comparing the criteria. The MAP Workgroup is charged with developing guidance that will help decision makers utilize the watershed-based planning tools *already developed.* The purpose of using these tools is to help guide the placement of compensatory mitigation where it would have the greatest benefit and probability for long-term sustainability.

Wilkinson began by seeking agreement on the definition of the types of decision support tools that the group would discuss. She offered the following definition: decision support tools that "can help guide the placement of compensatory mitigation where it would have the greatest benefit and probability for long-term sustainability." There was agreement that this is the group of decision support tools that would be discussed.

The group then discussed the different categories of decision support tools that are available to help guide the placement of compensatory mitigation where it would have the greatest benefit and probability for long-term sustainability. Brumbaugh stated that all of the decision support tools were developed for different purposes. They could be grouped by purpose.

Sumner suggested that decision support tools could be grouped into three categories that are applicable at different scales and require different levels of effort:

1. Geospatial tools – the preceding presentations have all offered examples of these types of tools. They are GIS-based landscape tools that come in different forms based on purpose or objective.
2. Checklists – these are rapid assessment, site-specific tools. They are condition assessments, much like functional assessments.
3. Site-specific tools – these are more intensive and essentially entail conducting an engineering design survey.

Collins and Tiner suggested that the tools could be linked back to the MAP Workgroup's "Essential Steps" or "Common Elements." Each of the steps should have a type of tool associated with it.

Collins suggested that the geospatial tools could further split into two categories:

1. Tools that are visually based – those that produce a map. The user can see the maps and use the visual images to make their own determinations. It displays the data visually.
2. Tools that are analytically based – those that are model-based and come up with a value. These tools generate a metric.

Collins added that data management is implicit in each of these approaches.

Wilkinson asked how the above classification relates to the "Essential Steps" or "Common Elements." Stein suggested that the larger question is how the decision support tools can be used to support the decision making process in its entirety. The "Common Elements" should be able to be met through the use of any of these three categories of tools – geospatial tools (both visually based and analytically based tools), checklists, or site-specific assessments.

Ainslie pointed out that the Synoptic Approach was developed to avoid allowing data to drive the process. Too often, decision makers determine what data are available and then decide what to do with it. He stated that Dan Smith's analysis of effort versus change in hydrologic integrity is a more helpful organizing principle.

Determine the strengths of weaknesses of the different approaches

The group focused on the three categories of tools and the different strengths and weaknesses of each with regard to which are quick, cheap, and easy, and which are difficult or expensive. They also considered other strengths and weaknesses, such as accuracy, staff requirements, time requirements, training and technical capacity, scale, effort, data requirements, output, and cost.

Martindale added that training will be necessary for regulators on how to use any of these tools.

For each of the three groupings of tools, Wilkinson asked the participants to indicate the relative strengths (+) and weaknesses (–) of each category of tool.

Geospatial tools

- + variable scale (watershed)
- +/– variable accuracy
- – expensive
- – data development is expensive
- + mapping is easy if data are available
- – modeling is expensive
- – lack of transparency (black box syndrome)
- + can address cumulative impacts
- + answer questions in a checklist before conducting a site-specific assessment

Checklist

- + least staff time/capacity
- – provides the least information
- + more transparent
- – less defensible, reliable
- + good for small impacts
- – not enough information to make permit decision

Site-specific

- – most expensive (data is expensive if it is site-specific)
- + most accurate
- – least regional perspective

Hall offered one possible progression: Checklist (quick screening) → geospatial (more detail) → site-specific (once the site(s) are identified).

Gersib warned that the checklist and site-specific assessment categories represent the traditional, site-specific approach to compensatory mitigation decision-making and fail to address the watershed perspective. A checklist would only capture the watershed approach if it required an analysis of surrounding land uses and other issues. Geospatial approaches are the tool of choice and the foundation for a watershed perspective. The checklist approach should only be used to fill the gaps until geospatial tools are developed.

Lunch Speaker
Len Shabman

Shabman began by reiterating one of the main messages of the 2001 National Research Council report, *Compensating for Wetland Losses Under the Clean Water Act* – that mitigation should be placed in a watershed context and that mitigation decision-making should occur at larger spatial and temporal scales than it has in the past. He emphasized that permitting and planning were not part of that central message.

Wetlands can be viewed as a natural capital asset. They are valued for the services they yield. Some valued wetland functions include habitat, hydrology, water quality, sediment trapping, and nutrient cycling. The amount of value placed on these functions varies depending on landscape position and location and on replaceability of the provided functions. Shabman's continuing concern is that, although acres are being replaced in compensatory mitigation for wetlands, functions are not being replaced. He also suggested that debate over on-site vs. off-site and in-kind vs. out-of-kind compensatory mitigation could be clarified by a watershed approach to mitigation. One issue that might arise with a shift to the watershed approach would be the assessment of equivalency, i.e., deciding that compensation wetlands are equivalent to the wetlands being impacted. Functional assessment can be applied, but it may be cumbersome and controversial.

Shabman stated that the most successful planning products serve as guides to judgment – a set of rules and concepts – but do not seek to replace judgment. However, the implementation of a watershed approach to compensatory mitigation does not require the creation of a plan. In most cases, these efforts must proceed without formal, written plans and will rely on the best professional judgment, continued cooperation, and coordination of staff from multiple agencies, given realistic limitations to time and resources. In cases where a formal plan is required, e.g. a program that might require a plan as part of a mitigation banking application, wetland functions should be considered before in deciding the level of formality required of the plan.

PRESENTATIONS AND EXPERIENCES: The use of watershed-based planning tools and resources in a regulatory context

This session was devoted to addressing the fourth desired outcome: Discuss the potential use of these watershed-based planning tools/resources in a regulatory context. Richard Gersib, Suzanne Klimek, and Dan Smith gave brief presentations, which were followed by a question and answer session and a facilitated discussion on the challenges or potential obstacles that might arise from linking restoration priorities identified by watershed-based planning tools back to the regulatory process.

Richard Gersib
Watershed-Based Mitigation
Washington State Department of Transportation

Gersib's presentation focused on a watershed-based tool that the Washington State Department of Transportation (WSDOT) is using to target mitigation options in urban and urbanizing areas. The effort sought primarily to increase environmental benefit while reducing cost.

Gersib began by discussing how the WSDOT takes restoration priorities identified using a watershed-based planning tool and places them in a regulatory context. The first step is to understand the type and extent of potential project impacts at the site scale, as well as the condition of key ecological processes at landscape scales. For example, in Western Washington State, key physical factors are the delivery and routing of water, sediment, pollutants, large wood, and heat, while key habitat factors include aquatic integrity and upland habitat connectivity. Next, sites capable of mitigating expected project impacts are identified, i.e., project impacts are matched with the sites within the watershed that are most suitable for mitigating those impacts. Sites that maximize long-term environmental benefits are targeted. This is done by evaluating both current land use and future build-out scenarios for each catchment. In Washington, state laws require local governments to create growth management plans. The WSDOT used these plans to evaluate current and future land use. After these stages of analysis have been conducted, mitigation sites offering maximum benefit to the landscape can be targeted.

These watershed characterization methods seek to integrate the mitigation of wetland, riparian, floodplain, and stormwater impacts by restoring the landscape's natural capacity to function. When mitigation focuses on restoring the natural functional capacity of the landscape through the restoration of degraded wetland or riparian systems or the removal of existing impervious area, self-maintaining systems are re-established, providing a suite of other functions and values in addition to the impacted functions.

The WSDOT has completed two projects in the I-405 North Renton Area. For these projects, spatial and temporal scales for analysis were established and drainage analysis units were identified according to local jurisdictional boundaries. The condition of the North Renton area was then characterized, identifying areas that were and were not properly functioning, as well as areas that were at risk, revealing a suite of ecological functions. Future development was analyzed to see how the ecological process might change over time. Areas that had been hydrologically altered were also identified and mapped. This process generated potential restoration site databases for wetlands, riparian areas, floodplains, and stormwater retrofitting. WSDOT staff then worked with local groups to establish criteria for prioritizing restoration sites.

Gersib explained the challenges and opportunities of this initiative. Challenges have included:

- Multiple levels of environmental regulation involving different people, perspectives, levels of government, and regulatory purposes
- Lack of coordinated watershed planning that precludes a unified vision, strong leadership, set scales of analysis, and coordinated efforts to compile data
- Gaining the buy-in of other state agencies, which is difficult for a variety of reasons – some agencies are reluctant to accept outside initiatives and staff can be wary of environmental initiatives for fear of additional regulations or requirements

- Obtaining the cooperation of local jurisdictions, particularly if relations have been strained in the past
- Staff shortages within many local jurisdictions, which can compromise the timely acquisition of this data

The WSDOT has taken measures to combat these challenges, including the documentation of assumptions in order to provide transparency. They have also updated their methods after each project.

Various opportunities have also been revealed throughout the WSDOT's efforts:

- In identifying potential areas for restoration, the WSDOT has also been able to identify areas to be avoided and how they function within the landscape
- People representing a variety of perspectives – technical and non-technical, internal and external to WSDOT – have demonstrated enthusiasm for the watershed approach
- Project engineers have been provided with mitigation options that were not previously available
- New data and perspectives have provided the opportunity to share information and build relationships with local jurisdictions, tribes, conservation organizations, and regional recovery groups
- People recognize that a comprehensive systematic approach to understanding natural systems, how humans have altered them, and how those systems have responded to human disturbance is essential

Gersib concluded by stating that as our understanding of natural systems increases, our opportunities to identify mitigation sites consistently can increase environmental benefit and reduce mitigation costs.

Suzanne Klimek
North Carolina Ecosystem Enhancement Program

Klimek began by stating that the Ecosystem Enhancement Program (EEP) analyzes mitigation opportunities after avoidance and minimization of impacts has occurred. The EEP provides mitigation for all the North Carolina Department of Transportation's (NCDOT) needs and also conducts an in-lieu-fee program to which people may contribute.

Local watershed planning, the most detailed form of watershed planning in North Carolina, can be used as a tool for identifying restoration priorities. A successful local watershed plan must have four key ingredients: (1) technical assessment consultant services to model build-out and land use change and compile data on water quality, biological factors, storm samples, and chemistry samples; (2) involvement of local stakeholders and resource professionals from the local, state, and federal level in order to establish priorities and allocate resources; (3) assistance by team coordinators or local partners for implementation; and (4) watershed and water quality monitoring. Prioritization of projects is then based on technical data regarding environmental benefit to the watershed, stakeholder input, and feasibility of implementation of a project. It should be noted that different approaches to prioritization are applied in different watersheds.

Watersheds are chosen for this intensive planning by first assessing which 8-digit cataloguing units (CUs) in the state are projected to have the most significant NCDOT impacts over a seven-year period and selecting those CUs appropriate for local watershed planning. The seven-year time period is used so that planning for restoration can begin before impacts occur. A GIS-based screening methodology is then applied to selected CUs. Resource professionals and local stakeholders also provide input on the selection. EEP staff examine both assets in the watershed (resources, endangered species, high value land tracks, water supply watersheds) and problems (water quality impairment or trends towards impairment, hydrological or habitat problems). Once the assessment is complete, a plan must be developed in order to set the stage for implementation and

improve the viability for chosen projects, keeping feasibility in mind. Stakeholder involvement, collaboration, and partnerships are key in this phase in order to gain support and buy-in for projects.

In terms of a comprehensive restoration in a watershed, EEP's resources provide only one part of the solution. EEP efforts are more effective when combined with other efforts, such as local land use management initiatives and implementation of best management practices. The EEP does prescribe best management practices that could be implemented through grants from other agencies and recommends local land use controls. All recommendations are based on the particular needs of individual watersheds and their communities.

Cost-benefit analyses and modeling are also conducted in order to determine where return for these types of projects is greatest, how much the landscape has improved, and whether or not goals and targets have been achieved.

Integration of identified priorities for restoration into a regulatory context requires additional considerations. Projects must comply with compensatory mitigation criteria and are only applied after avoidance and minimization measures have been taken. Results of local watershed planning are used to justify to regulators the implementation of projects that are alternatives to more traditional types of compensatory mitigation.

With analysis lasting approximately 18 months, EEP efforts are continually expanding across the state, and eight more projects are expected to begin in 2004. Wetland restoration and preservation, stream and buffer restoration, wet pond retrofits, and construction of water control structures are types of solutions identified in the prioritization process.

Klimek also discussed both opportunities and barriers posed by compensatory mitigation prioritization processes. Opportunities included the identification of alternatives for areas where on-site/in-kind mitigation cannot be accomplished, the interagency accomplishment of producing stream mitigation guidelines for the state, the release of publications recommending improvements to compensatory mitigation practices, and the continued integration of holistic watershed restoration into compensatory mitigation processes. Barriers that have been presented throughout this initiative have been a resistance to change by stakeholders and governmental agencies, restrictive policies based on 'no net loss,' lack of monetary resources, and a lack of methods to measure functional loss and development.

Daniel Smith
Los Angeles District Special Area Management Plan, Engineering Research and Development Center Environmental Laboratory

Smith presented the Multi-Scale Assessment of Riparian Ecosystem Integrity (MAREI), a set of development tools that have been created to fit into the regulatory process. Smith's work has centered on southern California watersheds. MAREI links to the regulatory process include the establishment of general programmatic permits for activities regulated under §404 of the Clean Water Act; assessment of the quantity and location of mitigation needed; identification of avoidance areas; and comparison of alternatives.

The MAREI approach involves five phases:
- Phase 1 – Identify location of riparian ecosystems
- Phase 2 – Conduct baseline assessment of hydrologic, water quality, and habitat integrity of riparian ecosystems
- Phase 3 – Conduct alternatives analysis
- Phase 4 – Develop a watershed restoration plan
- Phase 5 – Conduct supplementary studies for indicator revision/verification/calibration

Smith discussed the first three phases in detail. In Phase 1, the location of riparian ecosystems are identified and a planning level delineation of 'waters of the United States,' aquatic resources, and riparian ecosystems is conducted. GIS coverage for waters of the U.S. and riparian ecosystems is developed using aerial photographs and topographic maps. The data is verified with a stratified random array of field samples, and a "probability" of jurisdictional status is assigned to each mapped polygon based on federal and state criteria.

Phase 2 involves a baseline assessment of hydrologic, water quality, and habitat integrity of riparian

ecosystems. An important step in this phase is to define riparian ecosystem assessment units. Riparian reaches are defined as a segment of riparian ecosystem along a mainstem channel that is relatively homogeneous with respect to geology, geomorphology, stream channel geometry, substrate, and hydrologic regime, vegetation communities, and cultural alteration. Reaches are initially identified remotely using aerial photos and/or topographic maps and verified during field data collection. Hydrologic, water quality, and habitat indicators are then used to assess the attributes and characteristics that influence riparian ecosystem integrity. Hydrologic indicators reflect the frequency, magnitude, and temporal distribution of stream discharge, as well as the interaction between the stream channel and floodplain. Water quality indicators show land use in a drainage basin with respect to the potential increase in non-point pollutants in addition to the stream delivery system and the hydrologic interaction between stream channel and floodplain. Habitat indicators reflect the spatial extent and quality of riparian habitat and adjacent non-riparian habitat, as well as the continuity, or connectedness, of riparian habitat. Information is assessed across multiple spatial scales, including the riparian reach scale, the local drainage scale, and the drainage basin scale. Integrity indices and integrity units are then calculated for each assessment unit. The range of indicator scores and integrity indices will be consistent with the range of conditions exhibited in a watershed.

The alternatives analysis of Phase 3 has two main objectives. First, in order to determine which areas should be avoided, the analysis develops a "Prospective Aquatic Resources Conservation Area" alternative using the baseline assessment results and other criteria, such as medium to high integrity indices; existence of headwater reaches, corridors connecting existing large patches, disconnected reaches in agricultural areas, and areas with greater than 15 percent impervious surface; the presence of critical habitats and management, conservation, or research reserve areas; current protection under the NCCP Reserve System; and the ability to support threatened, endangered, or sensitive species. The second objective of Phase 3 is to assess direct and indirect impacts of all alternatives, including the preferred alternative. Effects are simulated and integrity indices and integrity units are recalculated. These results are compared to the baseline results using selected criteria. Maps generated by this phase clearly illustrate avoidance areas and alternatives. Criteria for comparing alternatives include whether waters of the U.S., critical habitat, and riparian ecosystems will be directly or indirectly impacted, as well as changes in the hydrologic, water quality, and habitat integrity units for riparian ecosystems.

In the initiative Smith presented, an alternatives analysis was conducted, but initially met with strong resistance from the involved transportation authority. However, over a period of about six months, the analysis continued with coordination among the authority's engineers and biologists, and the alternatives information generated was ultimately utilized by decision-makers.

Questions and Answers

Klimek was asked how functions and levels of functions are matched between wetlands in conducting out-of-kind mitigation. Klimek responded that their methods rely on the stream mitigation guidelines that have been developed in the State of North Carolina. This document emphasizes best management practices. Plans to develop functional guides are in place.

Sumner asked both Smith and Klimek if their initiatives' maps are being used to create mitigation requirements. Klimek indicated that her maps are not being used for these purposes. Smith said that his maps are being used to decide how much mitigation is required. 'Mitigation debt' is calculated based on direct and indirect impacts both upstream and downstream. Stein then raised a rhetorical question to all discussion participants, asking if mitigation burden should be based on project, catchment, or watershed.

Martindale asked Smith how long the alternatives analysis took to complete. Smith answered that the alternatives analysis did not take very long to complete, but that the more time-intensive part of the process is simulation, particularly for a large pool of alternatives. He indicated that, if the baseline

assessment has already been completed, the alternatives analysis could be completed in a matter of days for a typical assessment.

Facilitated Discussion

The goal of this session's facilitated discussion was to discuss the challenges or potential obstacles that might arise from linking restoration opportunities identified by watershed planning tools back to the regulatory process. Symposium participants were first asked to identify "lessons learned" in applying these concepts in a regulatory context. The following experiences were contributed:

- A primary challenge can be hostility and resistance to a project; the relevant stakeholders must be willing to understand the process, and project managers must be able to explain it to them.
- Regulators are often wary of new tools and may be concerned that tools will be abused. The guidance should assure regulators that these tools will not be abused and will not usurp their best professional judgment (Sumner).
- Once stakeholders have been familiarized and educated about the benefits of a tool, acceptance often comes easily (Miller).
- These types of tools receive a different type of scrutiny in the regulatory context (Nadeau).
- Regulators need to be aware of the tools that are available and how they might be useful. Tools must be both useful and user-friendly (Martindale).
- Two objections often heard from regulators that should be addressed are that there is a lack of science to back up the use of tools and resources and a lack of peer review of tools and resources (Hall).
- Sometimes tools developed outside the federal agencies are not fully considered by the federal agencies; perhaps a certification or review should be conducted in order to assess the acceptability of these types of methods (Bartoldus).
- Tools can be abused or misapplied; regulators should receive training on how to apply tools (Bartoldus).
- Congressional or presidential orders to streamline may prevent resource agencies from accepting tools (Schaftlein).
- Keeping tools up to date is a challenge when the data it is base on becomes outdated.
- Trust and transparency is an important factor in acceptability by both federal agency staff and those working outside the federal agencies (Stein).
- Although it is uncommon, models should be published and peer-reviewed like any other scientific method (Collins).
- Much of what has been developed is applicable only in a specific arena or region; trust in tools can be increased with assured national consistency (Nadeau).
- Consistency should not be confused with rigidity (Stein).
- The level of documentation required for decisions is confusing; documenting rational for a decision holds more legal weight than scientific certainty.
- Courts will defer to agency decision-making as long as it is shown to not be "arbitrary or capricious" (Eggers).
- If good guidance is present and available information is used to make sound decisions, agencies will usually prevail in court.
- Time and cost to develop new tools must be efficient, and the federal government should serve as a catalyst for the application of existing tools (Hough).
- Grants to state entities can help to build capacity (Sumner).
- Technology transfer to the states by the EPA has been very helpful (Stein).
- Partnerships among federal, state, community and nongovernmental groups can generate both buy-in and funding (Bartoldus).
- Access to data is fundamental for the development of these tools (Collins).
- It might be useful for regulators to review tools as they are being developed (Martindale).
- The federal agencies must work with local entities to build up data sets to meet local needs, e.g. NWI or NOAA Coastal Services Center programs (Stein).
- In providing grants, federal agencies should be flexible but should give some criteria for the

decision-making process (Bartoldus).

- Guidance should address the appropriateness of different decision-support tools for varying scales and provide some examples to local decision-makers (Ainslie).
- One of the biggest aids in involving federal programs at the local level, e.g. NWI and NOAA CSC programs, has been active vocal and financial support by local or state governmental groups (Tiner).

PANEL DISCUSSION I: How can the "Logical Steps" be used to make regulatory decisions in areas with existing watershed plans?

Panel Discussions I and II were devoted to addressing the final desired outcome: discuss the level of information necessary to effectively utilize these watershed-based planning tools/resources in a regulatory context. Panels for both sessions were composed of federal agency representatives working in wetlands issues on-the-ground for field offices around the country. The sessions were designed to elicit what federal field personnel think a guidance document could or should say to encourage a watershed approach to the placement of mitigation in districts with extensive watershed planning and in districts with little to no planning or information. The presentations in each panel were followed by an open discussion.

Panel I featured three speakers: Steve Eggers of the U.S. Army Corps of Engineers' St. Paul District, Jeffrey Mengler of the U.S. Fish and Wildlife Service's Chicago Field Office, and Steve Morris of the National Marine Fisheries Service's Portland, Oregon Regional Ecosystem Office. The Panel I presentation and ensuing discussion were designed to address the question: What could or should a federal guidance document say to encourage placement of mitigation where it would have the greatest benefit and probability for long-term sustainability in a district with extensive watershed planning?

The Panel I presentation began by asserting that the final logical step is the determination of where and how much aquatic resources need to be restored in order to attain objectives. In many cases, information regarding species, habitat, the relationship between the two, and the various economies involved may be unavailable, and the challenge becomes how to manage wetlands within a district consistently with existing plans.

The Corps regulatory program could be a powerful tool for implanting watershed plans by offering both program infrastructure and incentives—the stick and the carrot. As a first measure, a public notice could be published to inform the regulated public, especially the mitigation providers and their associated consulting firms, of watershed plans and approaches to regulatory actions. Impacts to critical aquatic resources and upland buffers, as identified by the plan, would be avoided or minimized.

Both incentives and disincentives could be used to encourage conformance with the watershed approach. Incentives might include authorizing regional general permits for expedited processing of projects that are in conformance with the watershed plan or providing expedited approval of mitigation that is in conformance with the watershed plan. Disincentives might also be utilized, such as requiring individual permit reviews for projects not in conformance with the plan, special condition permits to protect resources, denial of §10 or §404 permits if appropriate, and rejection or lower credits for compensatory mitigation that does not conform to the existing watershed plan.

Some institutional challenges to these ideas might include involvement of stakeholders, public notification, development of general permits, and decision-making consistent with existing watershed plans. Another challenge might be incorporating different plans into the regulatory process. There may exist multiple plans, perhaps with competing agendas, e.g. plans may focus on different endangered or threatened species. Multiple listed species must be dealt with during the watershed planning process, and several layers of data should be examined for decision-making.

Recommendations for Guidance

Panel I presented several recommendations for guidance on making compensatory mitigation decisions in a watershed context:

- Compensatory mitigation siting should be required to be in accordance with existing plans
- Although in-kind compensation is typically preferred, flexibility to incorporate out-of-kind compensation based on priorities identified in existing plans should be included

- While existing plans may be used to identify priorities for the site and kind of mitigation, each applicant should remain responsible for the design and planning of their compensatory mitigation
- Guidance must be flexible enough to work in areas with differing circumstances, e.g. areas with extensive planning, a small amount of planning, or no planning at all
- Broaden the definition of compensatory mitigation in order to increase the flexibility of what can count as mitigation credit and to focus resources in areas of need – solutions may be traditional or untraditional
- Allow Corps Districts to issue their own mitigation guidelines

Questions and Answers

Cole emphasized two points. First, mitigation banking is sometimes not an appropriate option for some areas; and second, guidance should have a mechanism to verify or monitor compliance, but the Corps should be the lead on enforcement actions.

Ainslie asked how loosely "out-of-kind" mitigation can be defined and pointed out the potential of jurisdictional problems with upland areas. He suggested that guidance should enlarge assessment areas and make regulators aware that viable possibilities exist outside the wetland area.

Stedman asked how individual permit applicants might be required to comply with an existing plan. Eggers responded that regulators could threaten to deny permits or increase mitigation ratios.

Prather emphasized the importance of interagency trust and flexible but tangible language in the guidance, e.g. setting data requirements for applicants to allow for better evaluations. Gersib agreed with these points, stating that greater flexibility would be allowed with solid plans, alternative mitigation options, and greater levels of information.

Collins suggested that interagency groups must be created to assist applicants with guidelines and to make sure projects are correctly interpreting guidelines.

Stein emphasized that long-term monitoring and management is key and that third party monitoring may be appropriate. For example, the U.S. Fish and Wildlife Service has set up endowments that fund the establishment of a land trust and other types of third parties that conduct long-term monitoring and management. He also suggested that the Corps could partner with counties to make sure other counties are working consistently with regional strategies.

PANEL DISCUSSION II: How can the "Logical Steps" be used to make regulatory decisions in areas *without* existing watershed plans?

Panel II featured three speakers: George Getsinger of the National Marine Fisheries Service Habitat Conservation Division, based in Jacksonville, Florida; Molly Martindale of the U.S. Army Corps of Engineers' San Francisco District; and Richard Prather of Region VI of the U.S. Environmental Protection Agency, based in Dallas, Texas. The Panel II presentation and ensuing discussion were designed to address the question: What could or should a federal guidance document say to encourage placement of mitigation where it would have the greatest benefit and probability for long-term sustainability in a district *without* extensive watershed planning?

Panel II presented three "straw man" recommendations for the guidance to be drafted by the MAP workgroup on compensatory mitigation in a watershed context:

- Corps project managers should make compensatory mitigation decisions with reference to the watershed location and the functions of the aquatic resource to be filled
- Compensatory mitigation should replace lost aquatic functions either on-site or as close to the impact site as is feasible and in a landscape position appropriate to both the target functions and the mitigation location
- Agencies may already be working together on individual and nationwide permits; encourage regulators to consult other entities for possible mitigation locations

Panel II also emphasized that each district has its own "culture," with project managers of different backgrounds and interests. Guidance on this topic should broaden the thinking of these managers.

Questions & Discussion

Stein called to mind previously issued mitigation banking guidance, which was not prescriptive but advisory. The guidance also backed up regulators when they were challenged. Stein recommended that the guidance focused on in this symposium should play the same type of role – advising regulators of things they should consider in evaluating permits from a watershed perspective.

Ainslie suggested that guidance should recognize that multiple levels and types of information may be available. For example, in the case where much information is accessible, the guidance should advise that a watershed approach should take precedence over strictly on-site and in-kind approaches. However, if no information is available the guidance should recommend a baseline approach of replacing functions as closely as possible.

Cole asked how much the Corps can direct actions towards certain areas, pointing out that the Corps can only suggest or recommend certain actions or locations, but cannot enforce them. He also suggested the use of incentives to help influence the permit applicants' mitigation actions. Gallihugh pointed out that interagency guidance to address in-kind/out-of-kind and on-site/off-site mitigation is forthcoming. The guidance will provide more flexibility for regulators and applicants to think creatively about solutions. Getsinger also mentioned that NOAA can direct people in evaluating options and that the Fishery Conservation and Management Act has a statutory requirement to look at the ecosystem approach for critical fish habitat. Getsinger emphasized that coordination between states and between state and federal government agencies is key in collecting cumulative knowledge. Ashby added that coordination between regulatory and non-regulatory groups is also a key consideration. Brumbaugh illuminated the point that the sharing of GIS data drives coordination between planners and regulators, since both sides spend their time on different projects.

Stedman expressed surprise at the panel's "straw man" recommendation that on-site/in-kind mitigation should be preferred to off-site/out-of-kind mitigation.

She suggested that guidance should encourage people to find available information or planning, and should not have a default of on-site/in-kind mitigation if no plan is in place. Martindale responded that the panel's suggestions were meant to keep some reigns on off-site mitigation, so that projects are still appropriate for the watershed. Brumbaugh pointed out that on-site/in-kind mitigation may be appropriate in many circumstances, but that the National Research Council indicated that, given several assumptions or caveats, an on-site in-kind proposal should be defensible when the permit is being considered.

Collins emphasized that interagency communication is essential to watershed efforts. Stating that being able to see the past and the present helps understand the state of the watershed, he also suggested three priorities for watershed assessment: historical and modern water supply, sediment supply, and vegetation patterns. Potter added that decision-makers must be aware of critical downstream resources and potential impacts. Regardless of the presence of a plan for the watershed or multi-layer data, downstream impacts should be apparent.

Klimek asked how to encourage corrective plans, as opposed to reactive plans. She added also that regulators should only fund plans if there is solid agreement that the plan will be implemented.

Mengler discussed how the Clean Water Act can have conflicting results, using §319 as an example. In order to obtain §319 funds for watershed planning, the U.S. Environmental Protection Agency requires the use of nine criteria. This can work against the goals of §404 program if plans without the nine criteria aren't recognized.

Wrap up and Closing Statements

Symposium participants were given the opportunity to offer their thoughts on the most pertinent issues addressed in the 2 1/2 days of discussions. The following summarizes these comments:

- Stakeholder/public input, coordination and priority-setting should come early in the process (Wold)
- Currently there is not enough science or evaluation of past mitigation efforts (Charles)
- Decisions to place mitigation on- or off-site should be based on scientific analysis (Charles)
- The "Common Elements" framework presented by Stein offers a good starting point (Sumner)
- The overall goals of the Clean Water Act should be kept in mind (Klimek)
- Consultants are the best link between the science and the regulatory communities (Martindale)
- Independent science panels can be used to develop or review plans and can bring the academic world into the planning process (Gersib)
- Mitigation Banking Review Teams provide a good model for watershed-based in-lieu-fee programs by incorporating science into decision-making, fulfilling an advisory role, and supplying expertise (Mengler)
- The federal agencies who are compiling core data should provide access to the data through a web-based clearinghouse (Stein)
- The watershed approach should not lead to more avoidance or facilitate the destruction of wetlands elsewhere (Collins)
- Acquisition has brought opportunities for restoration and needs to be linked with regulatory programs (Stetler)
- Avoidance is not always ecologically wise (Mengler)
- Management is key for sustainability and effectiveness (Mengler)
- The U.S. Fish and Wildlife Service should be more flexible about allowing mitigation on its lands (Martindale)
- Decisions to use mitigation funds on public lands or U.S. Fish and Wildlife Service lands should be made very carefully (Hall)

Concluding Remarks

John Goodin, from the U.S. Environmental Protection Agency and Mark Sudol, Chief of the U.S. Army Corps of Engineers Regulatory Branch, delivered closing remarks. They thanked the symposium participants for helping to generate useful products. The discussions and presentations will be constructive in developing guidance on compensatory mitigation in the watershed context, which is targeted for release in late 2005.

One purpose of the symposium was to look at criteria that will facilitate decision-making with respect to compensatory mitigation in the watershed context. Throughout the 2 1/2-days, pieces of a fundamental structure that will shape guidance emerged, including the importance of resource assessment, the need for readily attainable data, and the utility of screening and decision support tools.

Symposium Presentations

A William B. Ainslie
Synoptic Approach for Wetlands Cumulative Effects Analysis, U.S. Environmental Protection Agency, Region IV

B Steve Ashby
SMART Program, U.S. Army Engineer Research and Development Center Environmental Laboratory

C Barbara Bedford
Cornell University

D Ken Brazil
Arkansas Wetland Inventory and Restoration Prioritization, Arkansas Soil and Water Conservation Commission

E Bob Brumbaugh
Institute for Water Resource, and John Goodin, U.S. Environmental Protection Agency

F Josh Collins
San Francisco Bay Area Wetlands Restoration Program, San Francisco Estuary Institute

G Steve Eggers
U.S. Army Corps of Engineers – St. Paul District; Jeffrey Mengler, U.S. Fish and Wildlife Service – Chicago Illinois Field Office; and Steve Morris, NOAA National Marine Fisheries Service, Regional Ecosystem Office, Portland

H Richard Gersib
Watershed-Based Mitigation, Washington State Department of Transportation

I Suzanne Klimek
Ecosystem Enhancement Program, North Carolina Department of Environmental and Natural Resources

J Alyssa Olson Callahan
Coastal Services Center Initiatives, NOAA Coastal Services Center

K Daniel Smith
Los Angeles District Special Area Management Plan, Engineering Research and Development Center Environmental Laboratory

L Cara Stallman
Baldwin County ADID, Baldwin County Planning and Zoning Department

M Eric Stein
Southern California Wetland Recovery Project, and Ken Potter, University of Wisconsin-Madison

N Rich Sumner
U.S. Environmental Protection Agency

O Ralph Tiner
Nanticoke River & Coastal Bays Watersheds, U.S. Fish and Wildlife Service, National Wetlands Inventory Program

P Eric Wold
West Eugene Wetland Plan and Partnership, City of Eugene

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