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Defining Service Areas

Four perspectives from private, public, and nonprofit sectors address how different approaches for defining geographic service areas can strengthen compensatory wetland mitigation. The contributors assess lessons learned, challenges, and opportunities for improvement.

Mitigation in Pristine Areas

What happens when there are too few places to offset impacts?

Site Protection Instruments

Choosing the appropriate long-term site protection for mitigation

Floating Wetlands in Urban Waters

Habitat, water quality, and partnership-building benefits

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Calendar March—May

2013 State/Tribal/Federal Coordination Meeting
Association of State Wetland Managers, March 19-21, 2013, Shepherdstown, West Virginia
http://aswm.org

2013 AWRA Spring Specialty Conference
American Water Resources Association, March 25-27, 2013, St. Louis, Missouri
www.awra.org/meetings/Spring2013/index.html

Coastal Geotools 2013
National Oceanic and Atmospheric Administration, March 25-28, 2013, Myrtle Beach, South Carolina
http://geotools.csc.noaa.gov/default.aspx

North American Wildlife and Natural Resources Conference
Wildlife Management Institute, March 25-30, 2013, Arlington, Virginia
http://wildlifemanagementinstitute.org

APA National Conference
American Planning Association, April 13-17, 2013, Chicago, Illinois
www.planning.org/conference

The Big River Moves
The Big River Works, April 15-16, 2013, Chicago, Illinois
http://bigriverworks.org/forums/the-big-river-moves/

8th IAHS International Groundwater Quality Conference
International Association of Hydrological Sciences, April 21-26, 2013, Gainesville, Florida
http://conference.ifas.ufl.edu/GQ13/

Earth Day 2013: The Face of Climate Change
Earth Day Network, April 22, 2013
www.earthday.org/2013

8th Phragmites Group Workshop
Great Lakes Phragmites Collaborative, April 22, 2013, Quebec City, Quebec
http://greatlakesphragmites.net/events/

National Mitigation and Ecosystem Banking Conference
JT&A Inc., May 7-10, 2013, New Orleans, Louisiana
http://mitigationbankingconference.com/index.html

River Rally
River Network, May 17-20, St. Louis, Missouri
www.rivernetwork.org/programs/national-river-rally

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Background image: Hawaiian common moorhen, an endangered waterbird specie, in Hawaii. Photo courtesy of the Natural Resources Conservation Service.

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Building a Sustainable Future

What if you could reintroduce fire management to a fire-dependent long-leaf pine ecosystem? Or restore a riverine ecosystem to help sustain the rare gulf sturgeon and reestablish populations of other listed species? Or protect and restore enough habitat to sustain viable populations of bog turtle in the Blue Ridge Mountains? Or perhaps restore a connection between an inland coastal swamp and a coastal river in a rapidly developing area?

Well, these are the types of outcomes we can come to expect from wetlands mitigation programs if we start using the watershed approach to inform mitigation decisions. All of the outcomes listed above are real, have already happened, and were a direct result of decisions about how and where wetland mitigation dollars were spent. These are just a few examples in which The Nature Conservancy (TNC) has been involved—and there are likely many more across the country, both with our participation and without.

TNC and our partners achieved these successes because we based the type and location of the mitigation banks and mitigation projects on landscape-level conservation plans developed by us or by others. Rather than focus first on the impact of a development project, these started with planning efforts to identify landscape-scale needs—in these cases, biodiversity needs. Once we understood the most pressing needs, we then looked for opportunities to conserve and restore important habitat areas to meet these needs. Mitigation was the means to achieve these desired outcomes—outcomes shared by TNC and other stakeholders. The value of having these clear project outcomes is also recognized by other mitigation providers and by other funding agencies and entities that together help achieve these outcomes.

The concept of first defining these larger watershed-scale desired outcomes is the essence of the watershed approach—so named and defined in the 2008 Mitigation Rule and the subject of the forthcoming handbook by TNC and the Environmental Law Institute (ELI). The watershed approach is about taking a systematic approach to defining environmental and aquatic resources needs at a watershed or landscape scale. In many cases, watershed needs have already been identified in other plans—total maximum daily loads (TMDLs) identify water quality issues that might benefit from stream and wetland projects. State wildlife action plans and state natural heritage plans often define specific conservation needs for species of concern. Or perhaps flood-control plans, which can identify areas where increased or protected floodplains can help attenuate flood flows. Taking these and other watershed-specific needs and making them relevant to decisions about the type and location of wetland and stream restoration projects is what the watershed approach is about.

> "At its simplest, the watershed approach is about defining clear desired outcomes at the watershed scale and then providing a map about how we might get there."

The process of developing a successful watershed plan to inform wetland and stream mitigation projects requires strong stakeholder engagement that includes state and local agencies, local communities, and important constituencies in the region—all of whom can help define the needs important within that particular watershed. Combined with solid technical analysis of the current condition of aquatic resources and resources previously lost, this information can form a powerful tool to help wetland mitigation decisions, both public and private.

An issue frequently raised is that agencies do not control the mitigation projects proposed to them by permit applicants or mitigation providers. True. But the interagency review teams (IRTs) that approve compensatory mitigation projects have the ability to create crediting systems that provide more credits for projects that are the type and in locations that meet watershed needs. The existence of watershed plans can also improve decisionmaking at the IRT and agency level because the planning process usually creates a mutual understanding of the issues and needs within a watershed. This shared understanding can help agencies be more confortable supporting and approving such projects—often speeding the project approval process while building confidence in the decisions of the group. And, as we have found, savvy mitigation providers want to site their projects where they can get the most bang for their buck.

Equally important, a well-crafted and well-vetted watershed plan can inform the entire mitigation hierarchy. As we all know, mitigation is the last step of the avoid, minimize, and mitigate hierarchy. A watershed plan focused on wetland and stream restoration and protection can inform agencies and project developers about highly valuable and irreplaceable areas that may be more important to avoid if at all possible. Knowing the relative importance of a wetland or stream system from a habitat, water quality, or flood management perspective can highlight areas that from a function or value standpoint are more important for applicants to avoid. Ensuring watershed plans are widely available also helps to inform development decisions at the front end—helping state transportation agencies and other developers design projects to avoid and minimize their impacts on wetland and stream resources—rather than trying to change these designs after they are submitted for permits.

The watershed approach takes some rethinking of what we know. When I worked for state government in Massachusetts, we often worried that making mitigation "too easy" would weaken the strong protection of existing wetlands. While this will always be a concern, we can also fall short if we do not set ourselves the goal of making mitigation projects contrib-

ute to some larger, clearly defined set of desired environmental outcomes.

The national policy of no-net-loss of wetlands sets a high bar of protection. But we all recognize it does not, by itself, go far enough. We need those acres to be the most meaningful acres they can be so we more than compensate for wetlands we lose and so the significant investments made by public and private entities in compensation projects become an important part of a sustainable environmental future. Mitigation literally allows us to help build our way to sustainability—every development project contributing to a more sustainable outcome.

Yes, defining watershed needs and desired outcomes takes work. Yes, it may require us to stretch how we think about replacing wetland and stream losses "in-kind" by supporting projects that contribute more functions and values in the larger watershed context.

Yet, the evidence seems clear. We can have more successes like we have had in the Pascagoula River, Mississippi, where mitigation banks contributed 6,500 acres to what is now 70,000 acres of important, connected conservation areas. And the long-leaf pine restoration site outside New Orleans in Tammany Parish, where five different bankers, including TNC, established six different banks that together provide 12,000 acres of habitat, enough to allow controlled burns to be reintroduced to these ecosystems. Or in east Tennessee, where TNC created a bank to help protect and restore over 200 acres of habitat for the bog turtle, part of over 700 acres of protected areas that include enough area to ensure viable populations that have a better likelihood of long-term success. Or of the memorandum of agreement (MOA) between local, state, and federal agencies, and TNC in southeastern Virginia, which led to the targeting of 6,000 acres of mitigation as part of a 40,000-acre effort to reconnect the Dismal Swamp to the North Landing River—the result of a very specific habitat conservation plan and an MOA among many parties that agreed upon the specific alignment of the desired connection.

The watershed approach may take work, but it is worth the effort. We won't know where we're going if we don't have a map, and we'll never know if we've arrived if we don't have a destination. At its simplest, the watershed approach is about defining clear desired outcomes at the watershed scale and then providing a map about how we might get there. ■

- Mark P. Smith

MITIGATION

Stacking and Unstacking: The Economics, the Conservation, and the Conversation

The current approach to compensatory mitigation could be limiting additional conservation investment unnecessarily. Stacking and unstacking mitigation credits offers important potential to better capitalize mitigation markets and achieve greater ecosystem services. We call for further dialogue on stacking and unstacking credits to see if greater conservation investment and outcomes can be achieved together.

Stacking, also known as bundling or layering, refers to having approved mitigation credits occur on the same unit of land or water. There is nothing in regulation, policy, or unwritten rules that expressly forbids stacking. Unstacking (or unbundling) occurs where stacked credits on the same unit of land or water are separated out *and* sold to buyers under separate authorities. Hence, more than one credit is sold on the same piece of land or water. This can result in double dipping, where selling one unit of mitigation for more than one impact would not adequately compensate for the environmental loss. However, not all unstacking results in double dipping.

The U.S. Army Corps of Engineers (the Corps) has long considered the Clean Water Act (CWA) §404 authority to expressly prevent unstacking based on the assumption that all stacked credits are ecologically linked, despite their separate regulatory authorities (i.e., CWA §404 and Endangered Species Act (ESA)). Early on, when stacking was trialed in California, both the Corps and the U.S. Fish and Wildlife Service (FWS) agreed that with the species and ecosystems considered at the time there was an irrefutable overlap between the wetland and the species' habitat and any attempt to sell the credits separately would be inappropriately selling the same thing twice: double dipping. Articles by Valerie Layne[1] and Steve Martin[2] in this publication describe how these projects in California have been able to develop credits for both wetland mitigation and species conservation in a single bank, with accounting rules to overcome the double dipping risk and avoid any unstacking.

A glance at RIBITS (Regulatory In-Lieu Fee and Bank Information Tracking System) records shows that there are now several banks in California and Florida currently selling more than one credit type as stacked credits. Yet, the right conditions for stacked credits have proved illusive, and formal approaches to stacked credit banks are evolving. Many have anecdotally expressed interest in stacking ecological services, such as carbon sequestration and water nutrient reduction, yet no such projects have gone on to sell commercially viable credits. However, with more examples of stacked credits now available from which to learn, it may be opportune to revisit the intent of the regulations, advance the practice of stacking credits, and develop a process where unstacking could occur without risk of double dipping. Unstacking might be able to drive greater investment into conservation than stacking alone. A 2008 survey by Jessica Fox et al. (2011) indicated that many in the mitigation industry are very interested in stacking credits.[3] In principle, from ecological and regulatory perspectives, the right conditions for unstacking multiple credits could exist without double dipping.

In light of this, the time has come to revisit those early Californian discussions and assumptions about the application of stacking and unstacking. Robust accounting assures that stacked credits are not oversold or sold to offset more than one impact per parcel. At a minimum, stacking gives bank owners an op-

portunity to diversify. A stack of credits can be marketed and sold to a wider range of buyers, lending a certain economic stability to project finance. And ideally, this kind of diversity can flow through to mitigation project developers investing in a wider range of ecological services to restore and conserve. This is the motivation that has perpetuated interest in stacking so far, being better for business and conservation. The question still remains: how to fully capitalize on this potential and generate more opportunities to stack, and also unstack, credits?

The typical model with stacked wetland and species credits will not work everywhere. In parts of the Midwest or the South, where the newest markets for mitigation currently are, there are few wetland-dependent species. In this case, there are few regulatory or economic tools available to assist if the resources do not naturally overlap, and the lessons from California may be little more than academically interesting. Some might consider California "lucky" in this regard.

The horizon for credits may need to broaden to forest species, carbon, water quality, or streams and associated watershed species. The new Ohio River Basin Trading System, along with trading occurring in the Chesapeake Bay region, illustrates how much interest and potential there could be in water quality trading. In many places, to apply these approaches we wait for the legal framework to enforce specific limits on pollution and then trade these limits in certain water bodies over and above that which the Corps already regulates. Only then would there be stacked credit types to stack. The same may be said for carbon credit potential, where currently only the voluntary carbon offset market is quantifiable.

Biological suitability aside, a template, clear stacking protocol, or guidelines would provide more certainty to regulators and investors alike, encouraging the creation of stacked banks where possible. Layne's article clearly indicated the potentially complex and technical accounting that may be involved. Though technically feasible, one may question if it is possible to simultaneously implement a generalized-enough approach accessible to all regions and ecosystems, yet specific enough to properly address the very real accounting risks that double dipping occurs according to the biology of the species involved. Assuming such a system is within reach, the economists among us may question the transaction costs of such an approach: is it too complex and too costly to implement and regulate for too little biological or financial gain? So, what is the biological or financial gain?

To actualize stacking's true economic benefit, *unstacking* may be essential. Some envision that if stacked credits were legitimately generated from the same acre, but not directly linked ecologically or linked by regulation, then selling both credits to separate buyers on that single acre would generate a higher return. Higher returns attract more investment, but also greater interest in restoring more components of that ecosystem. More, better restoration might result if stacking and unstacking were mainstream.

But when practiced in California, a project proponent requiring both credit types may purchase those stacked credits as one mitigation unit. If only one type is required, the other is retired to avoid double dipping upon that acre. So a stacked credit typically sells for only as much as the most expensive credit. Arguably, this stacking offers returns in marketing only: it provides another pool of potential buyers with a different type of impact. Yet, does this Californian approach support a price point, per acre, enough to encourage bankers to invest more in such projects—either financially or in the range of ecological services restored? Although ideally creating a larger conservation pie overall, stacking might instead simply be slicing the pie in a different way. It may offer bankers a competitive advantage to sell a credit with two kinds of mitigation covered (species and wetlands, for example), but this rarely increases the price of this stacked credit above the market price of the most costly of the credit types involved: it is just dividing up the sale of that acre, not adding to it. Bankers will be reluctant to invest more in a stacked credit, if they are unsure they can price accordingly, despite any competitive advantage.

To solve this, perhaps a new ecological credit is required: one credit metric encompassing the ecological attributes and functions of the area concerned, so expanding the ecological restoration within mitigation and conservation credits. If this could be done, then the ecological aspects of this ecosystem metric credit could be reliably unstacked. One could then purchase a portion of this ecological credit according to their impact need. This incentivizes investing more and restoring more, because you can sell more when you do—the win-win situation desired. But such an ecosystem metric credit would be very expensive to develop, require unprecedented interagency collaboration, and require a highly sophisticated tracking system used by all the regulatory agencies (federal, state, and local governments). Efforts were made toward this in Oregon to better account for the ecological layers, but it had difficulty achieving this level of coordination.

Alternatively, it could be possible to establish credits by separating out ecosystem services according to different regulations and each agency's natural resource authority. It may be possible to credit ecosystem services more specifically, and properly account for, and prevent, potentially overlapping credit attributes (i.e., risk of double dipping). By looking at each authority under existing regulations currently driving ecosystem service markets and defining which are already incorporated, a new credit may more explicitly identify additional services that can be preserved in credit banks, then sold on another regulatory market. For example, many have been interested in the possibility to separate the carbon sequestration value of CWA §404-credited wetlands, and sell this capacity as carbon credits on the carbon market or water quality credits that are not linked to species habitat protection.

With over a decade of both success stories and cautionary tales behind ecosystem services, it is now fairly clear how to conserve multiple ecosystem services on one piece of land. The stacking of ecological services and credits is not our next stumbling block. The next stage is indeed *unstacking*: how to properly account for each of these service "layers" so that the industry and the regulations may properly attract investment and conservation effort to each layer. This is a better path for ensuring that each aspect of the ecosystem receives optimum investment and optimum ecological outcomes. The opportunity to really expand both conservation and financial backing necessitates that stacking—and more importantly unstacking—continues to be an important discussion. ■

- Wayne White and Jemma Penelope

Endnotes

1. Valerie Layne, *Layering Multiple Credit Types in Mitigation Banks*, 33 Nat'l Wetlands Newsl. 8 (Jan.-Feb. 2011).
2. Steve Martin, *An Alternative to Unbundling Ecosystem Services*, 32 Nat'l Wetlands Newsl. 27 (Sept.-Oct. 2010).
3. Jessica Fox et al., *Stacking Opportunities and Risks in Environmental Credit Markets*, 41 ELR 10121 (Feb. 2011).

Site Protection Instruments for Compensatory Mitigation

Under the final rule, Compensatory Mitigation for Losses of Aquatic Resources, 33 C.F.R. pt. 332 (Mitigation Rule), all compensatory mitigation plans authorized under a U.S. Department of the Army (DA) permit are required to address 12 fundamental components, one of which is *site protection*. The Mitigation Rule states that the long-term site protection of compensatory mitigation sites must be provided through real estate instruments or other available mechanisms, as appropriate.

The site protection (or real estate) instrument is a written description of the legal arrangements, including site ownership, management, and enforcement of any restrictions, that will be used to ensure the long-term protection of the compensatory mitigation project site. Since there is no legal authority for the U.S. Army Corps of Engineers (the Corps) to hold a real estate interest in land, site protection must be accomplished through recognized forms of site protection instruments, usually administered by a third party. Since real property laws differ from state to state, each Corps district must work closely with its Office of Counsel and the landowner to determine which instrument is preferred. The real estate instruments most commonly used include conservation easements, deed restrictions, transfer of title, multiparty agreements, and contractual documents.

A *conservation easement* involves a "Grantor" (the property owner) who makes a written conveyance of an easement to the "Holder," who is usually a nonprofit, land trust, or governmental entity with experience in monitoring aquatic resources, managing wildlife habitat, or protecting endangered species and can access the property, monitor compliance, and enforce land use restrictions in accordance with the terms of the real estate instrument. The owner may continue to use the property (e.g., hunting) provided the use is compatible. The conservation easement remains in force even if the property is transferred to a new owner; however, a conservation easement can be extinguished due to a change in use or for a lack of a Holder. Therefore, selection of the Holder is important to the success of the conservation easement.

A *deed restriction* (restrictive or negative covenant) is a condition in a deed limiting or prohibiting certain uses of real property. It does not require a third-party holder because the restrictions are on the land itself and "run with the land," meaning that they are enforceable by and against later owners or occupiers of the land. Restrictive covenants can be used to protect compensatory mitigation sites if included as a condition of the DA permit. The burden of enforcing the deed restriction is on the property owner and potentially the Corps and/or state regulatory agencies. Also, some state statutes may limit the number of years that a deed restriction or negative/restrictive covenant is in force and consider "covenanting parties' intent" when determining whether enforcing the covenant would be adverse to "public policy." Therefore, it is imperative that the restrictive covenant includes the purpose of the covenant in securing a DA permit.

Transfer of title is the transfer of ownership of the compensatory mitigation property to a natural resource agency, governmental agency, land trust, land management entity, or another nonprofit entity deemed acceptable to the Corps. That entity must agree to manage and protect aquatic and other natural resources on the site as applicable. Since it may be possible that following the transfer the receiving entity could convert compensatory mitigation sites to other purposes, some Corps districts have placed reversionary clauses in title transfer agreement to address incompatible uses by a land management agency.

Multiparty agreements (e.g., mitigation banks, in-lieu fee projects, land trusts) are agreements among several interested parties whose roles and responsibilities are established consistent with applicable federal and/or state statutes. Multiparty agreements allow agencies to leverage their resources and specialized areas of expertise to provide and ensure the long-term protection of the compensatory mitigation project.

Contractual documents (e.g., conservation land use agreements, federal facility management plans or integrated natural resources management plans) are agreements to conserve property with certain allowable uses and are often used when the governmental entity is responsible for performing the mitigation and/or is the owner of the compensatory mitigation land. When conservation easement or deed restriction cannot be used due to statutory or regulatory prohibitions, memoranda of understanding, integrated natural resource management plans, federal facility management plans, and conservation land use agreements can be used.

Regardless what type of site protection instrument is used, the following information should be included: (1) expressed reference to the DA permit and/or mitigation banking instrument or ILF project plan and its purpose to protect a compensatory mitigation site under federal and, where applicable, state law; (2) survey/legal description and identification of other property rights/interests; (3) baseline description of conservation resources on the site, including listed species and their habitat; (4) third-party right of enforcement; (5) amendment/transfer 60-day notification requirements; (6) any prohibited and acceptable uses; (7) subordination clause requiring any preexisting easements, liens, or encumbrances to take second priority to the use of the property as a compensatory mitigation site. (Otherwise, if a real estate instrument is recorded *after* a deed to secure a debt, the land may be foreclosed upon to settle the debt and the compensatory mitigation site terminated.)

The Corps project manager should require a title search, title insurance, and a title report, especially for larger sites. A *title search* provides a list of all recorded interests in the real property. *Title insurance* guarantees that the title is clear and that there is no conflict of interest regarding ownership of a particular parcel. A *title report* is a written analysis of the status of title, including a property description, names of titleholders, encumbrances, tax rate, and any taxes due.

Site protection is a required component in any mitigation plan under the Mitigation Rule. Determining the best way to protect a site and preparing the site protection instrument should occur as soon as the mitigation site has been identified. Many Corps districts have developed real estate instrument templates to expedite the review process. ■

- Cynthia Wood

Defining Service Areas for Wetland Mitigation: An Overview

The articles and responses following this overview on service areas offer a range of perspectives from private, public, and nonprofit stakeholders on how defining service areas can strengthen compensatory mitigation. The authors highlight lessons learned, opportunities for improving the process, and questions for further research.

By Steve Martin and Robert Brumbaugh

The service area of a mitigation bank or in-lieu fee (ILF) program is the geographic area in which it can provide compensatory mitigation to offset the aquatic resource functions lost through actions permitted under §404 of the Clean Water Act. The U.S. Army Corps of Engineers (Corps)-U.S. Environmental Protection Agency (EPA) 2008 Mitigation Rule basically codified the definition provided almost 13 years earlier in the 1995 Federal Interagency Mitigation Banking Guidance. However, the general definition in the Mitigation Rule has led to what some perceive as inconsistent interpretations of the Rule by Corps districts or as a lack of scientific backing behind the establishment of service areas (see Womble & Doyle 2010). Many factors affect decisions in defining service areas. The discussion that follows this overview will provide perspectives on defining service areas across private, public, and nonprofit sectors.

To begin, the size and extent of a service area constrains the area within which a mitigation bank or ILF program can provide compensatory mitigation and can affect whether a mitigation bank can be used to offset the aquatic resource functions lost through permitted impacts. It can affect whether the expense of establishing, implementing, and managing a mitigation bank or ILF program is likely to be offset by potential economic returns from credit sales. Establishment of a service area for third-party mitigation entails balancing the likelihood that a mitigation project is able to replace lost aquatic resource functions with the size of the service area and the potential demand for mitigation credits.

Prior to the Mitigation Rule, considerable effort was spent in considering whether compensatory mitigation was best located on or near the permit impact site or off-site. The question often debated was, given the impact site, where and what would be an appropriate mitigation project? Third-party compensatory mitigation inverts this question to, given the compensation site, where can the impacts that would be compensated at a bank site take place? This last question must be answered to determine an appropriate service area for each bank site.

The Mitigation Rule charged the Corps with approving compensatory mitigation projects that were environmentally preferable, would offset aquatic resource functions lost through permitting, and were strategically selected to address aquatic resource needs in a watershed. The Mitigation Rule (33 C.F.R. Part 332.8(6)(vi)(A)) provides descriptions of service areas, addresses service area scale, includes examples of potential service areas, and identifies considerations to be used in establishing service areas. It describes a service area as the "watershed, ecoregion, physiographic province, and/or geographic area in which a bank or in-lieu fee program is authorized to provide. . . ." It addresses the size and scale of a service area: "[It] must be appropriately sized to ensure that the aquatic resources provided will effectively compensate for adverse environmental impacts across the entire service area" and may consider the "economic viability" of the bank. The Mitigation Rule provides examples of potential service areas, such as U.S. Geological Survey (USGS) eight-digit hydrologic unit codes (HUCs) (referred to as catalog units) or smaller in urban areas and two or more contiguous eight-digit HUCs or a six-digit HUC (accounting unit) in rural areas. These are identified only as examples and not required sizes or scales.

These regulations also suggest other considerations in the development of service areas, including applicable locally developed standards, such as state law and areas where watershed boundaries do not exist or are not applicable. Establishing appropriately sized service areas is further complicated because the Mitigation Rule does not assign a scale to the terms "watershed," "geographic areas," "ecoregions," or "physiographic province." These features can be very large, very small, or, in some cases, like administrative boundaries, such as county or state lines completely unrelated to aquatic resources and their functions. Although cited in the regulations, "economic viability" is not defined, nor is direction provided for incorporating economic considerations in the development of service areas. The responsibility to address these concerns falls to the Corps and the interagency review team.

In light of these considerations, we pose the question: how should service areas be defined to ensure that functions are adequately offset by mitigation? ■

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Lessons Learned on Setting Service Areas

By Paul Amato

The Mitigation Rule is not overly prescriptive when it comes to defining bank and in-lieu fee (ILF) program service areas. For this reason, it provides flexibility that is both intentional and appropriate. The preamble and the Rule itself clarify that input from the interagency review team (IRT) will be considered by the U.S. Army Corps of Engineers (the Corps) during bank and ILF program development, including service area determinations. There is no "silver bullet" approach for defining service areas that will best offset impacts in every situation, and it would be unwise to suggest that there is at the current time. Instead, the role of the IRT provides the short, though admittedly not simple, answer to the question posed for this article. I offer up some service area lessons learned (in no particular order) from the U.S. Environmental Protection Agency's (EPA's) western states perspective that we think can improve the process for bank and ILF sponsors, the Corps, and IRT member agencies, and help facilitate compensation for aquatic resources.

- Utilize appropriate watershed plans, but expect that there probably is not one.
- Assume a smaller service area is more appropriate and rigorously justify going bigger.
- Consider the physiographic uniqueness of specific aquatic resource types.
- Be cognizant of habitat conservation plans (HCPs) and other conservation plans in the area.
- Determine the service area early in the process.

Utilize appropriate watershed plans, but expect that there probably is not one. The Rule requires the use of a watershed approach "to the extent practicable" and the use of "appropriate" watershed plans where available, but to what extent are IRTs and the Corps doing this, and if so, doing it consistently? The Rule outlines a watershed approach to compensatory mitigation (40 C.F.R. pt. 332.3(c)), even going so far as to identify information needs in the absence of a watershed plan. This is fortunate because few watershed plans cover wetlands comprehensively. A real need still exists to develop the kinds of "landscape profiles" described by Dr. Barbara L. Bedford,[1] which can be used to create a blueprint of aquatic resource restoration needs. Lacking this information, the burden of proof is placed on the sponsor to support how the proposed bank or ILF project will benefit the aquatic resources across the proposed service area and ultimately the responsibility of the Corps and the IRT to make sure the agreed-upon service area is adequately discussed within, and supported by, a defined watershed approach. The Corps and IRTs are best suited to establish a process by which this is done consistently and in a way that results in appropriate service areas within their regions.

Assume a smaller service area is more appropriate and rigorously justify going bigger. In California, the default approach has generally been consistent with the example in the Rule. We typically use the eight-digit hydrologic unit code (HUC) as a starting point. The guidance from the Sacramento District is to start with the even smaller 10-digit HUC, where the bank or ILF project is located, and to require a written justification that is increasingly more detailed as the proposed service area grows to include adjacent 10- or eight-digit HUC watersheds or ecoregions.[2] This approach has merit, but to adequately inform the Corps and IRT process, it is imperative that the justifications be rigorous and ecologically based, and not simply a paper exercise. Emphasis must be placed on how the bank or ILF project will provide a suite of real benefits to specific aquatic resource types and functions throughout the larger service area.

Consider the physiographic uniqueness of specific aquatic resource types. In some instances, it may be appropriate to set aside watershed boundaries and instead consider the physiographic regions of a particular aquatic resource. Vernal pools serve as a good example in California where a watershed may not be a logical service area boundary. In the absence of nearby vernal pool banks and ILF projects, regulators would be missing the mark to force compensation for Central Valley vernal pools within the same eight- or six-digit HUC. Instead, an ecoregional approach could help establish service areas based on the unique physiographic requirements of vernal pools that are typically found in the gently sloped grasslands of the Central Valley and lower foothills. Establishing bank and ILF program service areas by ecoregion may also help encourage vernal pool bank and ILF program establishment, ensuring that in-kind mitigation credits will be available when impacts to vernal pools are unavoidable.

Be cognizant of HCPs and other conservation plans in the area. HCPs and natural community conservation planning can provide an important resource for banks and ILF programs. They typically have the latest scientific and technical information on covered species and habitat needs, and where there is overlap, there should be coordination. To avoid conflicts, banks and ILFs should be part of the conservation planning process. This process can also help to inform appropriate service area boundaries by identifying spatial linkages between bank and ILF project benefits and documented habitat and conservation areas.

Determine the service area early in the process. In addition to the number and type of available credits, the service area is perhaps the most important factor that controls the viability of the bank proposal. Reaching agreement between the IRT and bank or ILF sponsor on an appropriate service area at the outset is critical to avoid a potentially significant and prolonged diversion from other important aspects of the bank or ILF program development. Early agreement over the extent of the service area prevents a sce-

nario where parties proceed with disparate assumptions over size and location only to discover late in the process, after considerable time and resources have been spent developing the instrument, that they are far from resolution. Ideally, the sponsor has carefully considered the points listed above and service area agreement is reached by way of the optional draft prospectus stage. This has the additional benefits of providing economic certainty to the sponsor and regulatory certainty to the agencies. Using a checklist of specific elements, similar to that found in the Washington State's Wetland Mitigation Banking Act,[3] as a way of determining service area could help promote more defensible and consistent service area determinations.

Determining appropriate service area boundaries can be contentious when economic and ecological interests are at odds. This process can be further complicated when a lack of sufficient information forces parties to take a leap of faith. The Mitigation Rule recognizes that these complicating factors require development of sufficient information (i.e., watershed plans) and robust discussion among IRTs to address the challenges that arise with each unique bank and ILF program. Simply put, the Corps and the IRTs should not have to "go by feel" when making decisions about service area boundaries, and sponsors should have better guidance on what kind and how much information to provide. Early discussions and realistic expectations can help; however, development of national and regional service area guidance could improve our ability to establish these boundaries consistently while taking into account economic viability and, more importantly, the replacement of lost aquatic resource functions. ■

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Standards That Matter

By Martin Doyle

When implemented over an entire state or U.S. Army Corps of Engineers district, compensatory mitigation programs produce a tension that has unintentionally created distinct trade offs between (1) ecological quality, (2) spatial quality, and (3) temporal quality (BenDor et al. 2008). The current policy practice has been to place great preference on spatial quality via limited geographic service areas, yet the trade offs and comparable concern for ecological quality or temporal quality have been lacking.

Ecological quality refers to the ecosystem functions sought by restoration projects, which generally include improvements in physical, chemical, or biological integrity, such as retention of floods and nutrients, stabilizing water temperature, or increases in biodiversity. Most important, high ecological quality in a compensatory mitigation sense would be associated with a restoration site in which functional improvements have been rigorously documented via empirical measurements, rather than relying on surrogate or indicator variables. Such documentation is stunningly rare.

My colleague and I suspect that, if rigorously implemented, such empirical studies of compensatory mitigation would show systemic failure of the vast majority of sites to provide demonstrable improvements in chemical, physical, or biological integrity (Doyle & Shields 2012). I suspect that one of the most common causes of failure is the combination of limited size of the restoration site and the degradation of the watershed relative to the size of the restoration. To date, based on limited information, the null hypothesis of compensatory mitigation programs has been that traditional stream and wetland restoration provides wide benefits. This is flawed, and indeed, backwards. Based on existing information and past performance writ large, the null hypothesis should instead be that compensatory mitigation projects provide limited ecological quality, and rigorous studies are needed to prove this hypothesis wrong.

Second is the issue of location. Site location is important in the performance of compensatory mitigation programs at entire landscape scales. Thus, individual compensatory mitigation sites must also be thought of as having "spatial quality." Restoration sites that are located in close proximity to impact sites could be considered to be of higher spatial quality than those that are far away (or are in another watershed), since they are likely to exhibit similar functions and provide similar services as nearby wetlands. This is the rationale behind strict implementation and interpretation of geographic service areas, a rather blunt policy instrument used to ensure some minimal level of spatial quality of compensation sites within a program (reviewed by Womble & Doyle 2011).

Finally, and less well-understood, is the issue of the timing of restoration relative to the timing of the impacts, or "temporal quality." In order to prevent no net loss of ecosystem functions, the overarching goal of most compensatory mitigation programs, restoration sites must be completed and functioning *before* impacts occur. This was one of the original rationales and core arguments for compensatory mitigation as a management practice. However, given the time required for a restoration site to recover ecological functions, temporal quality can be problematic. At a minimum, achieving higher temporal quality would require that sites are completed and moni-

tored prior to being used for impact compensation; in reality, they should be functioning well before impacts to ensure sustainability of the site. The worst-case scenario, in terms of temporal quality, occurs when impacts occur prior to initiating compensating restoration projects, a painfully common reality of the past. It is important to note that even if a restoration site is an excellent ecologically functioning site near the impact site, if it is completed several years after the impacts, then there is a long time window during which there is a temporary "debit" of functioning ecosystems (BenDor 2009).

The trade offs between these metrics of quality derive from the realities of market forces. More rigorously constrained geographic service areas reduce the area within which restoration can compensate for impacts. Small geographic service areas result in "thin" markets, where insufficient demand potential for mitigation credits (due to uncertainty about the number of potential buyers) fails to provide the incentive for mitigation bankers to speculatively purchase and restore an ecosystem: small service areas decrease the likelihood of entrepreneurial, speculative ecosystem restoration.

Larger geographic service areas thicken the market, but increase the potential distance between impacts and mitigation projects. Yet, entrepreneurs face more secure long-term prospects for selling their credits generated by speculative restoration activities, thus incentivizing environmental entrepreneurship. Moreover, it is possible that large geographic service areas provide an incentive for investment in large restoration sites: thick markets increase the potential to sell large quantities of credits over time, which incentivizes higher risk, larger restoration sites. Critically, if large restoration sites have greater potential to provide greater ecosystem services than small sites (a realistic assumption), then large geographic service areas may be a policy change needed to provide incentives for investment in large, more demonstrably effective restoration sites.

Current regulations have sought to avoid the proximity problem by creating programs that allow compensation to occur after impacts: in-lieu fee (ILF) programs. These programs collect fees at the time of impacts, and then consolidate those fees to develop restoration sites subject to spatial constraints. Thus, these programs ensure spatial proximity of compensation to impact sites, yet can essentially standardize post-impact compensation.

Quite simply, ILF programs assume that at the landscape and programmatic scale, spatial quality should supersede temporal quality; sacrificing the benefits of advance timing of compensation is presumably made up by the advantages of geographic proximity. For some ecological functions (e.g., nutrient loads), such preference for spatial proximity may be warranted. Yet, recent research has shown that improved water quality from restoration cannot be presumed (see review by Doyle & Shields 2012).

Before proceeding with inordinate sums being spent on restoration under the compulsion of compensatory mitigation, the science, policy, and regulatory community should be compelled to first address:

(1) Have the current practices of aquatic ecosystem restoration generated *demonstrable* improvements in the physical, chemical, and biological integrity of the nation's waters at the site-specific and programmatic scales?
(2) What is the relationship between size of restoration and ecological functions gained?
(3) Are there demonstrable benefits that justify small or large geographic service areas?
(4) Is there an optimal scale for geographic service areas? ■

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A Building-Block Approach to Service Areas

By Hal Holland and Greg DeYoung

The unique contribution of mitigation banks arises from the power of choice—the ability to select the best sites and the best design for wetland restoration in advance of impacts. To function at this high level, there has to be a balance in economic and ecological perspectives. Current service area models either minimize the economic variable or pit the two values against each other in agency-banker negotiations. However, with a better understanding of the needs or motivations of bankers and the regulatory agencies, a model can be developed to select sites that prioritize regionally significant conservation. This article proposes a new service area model to provide incentives favoring regionally significant projects over average or low-performing projects.

Risk Factors—Financial

Mitigation credits are not created equal; however, from a purchaser's perspective, as long as the credit fulfills the regulatory mandate, price trumps all other factors. There is no motivation for a project applicant to purchase credits from a bank with higher priced credits, even if the bank provides an environmentally superior mitigation solution. As such, there are two alternatives: either the bank approval process begins to prioritize or incentivize highest quality projects, or, if market

forces are left unchecked, competition will reinforce the model of successful banks being those that develop the lowest cost credits.

Targeting locations where restoration can have dramatic functional improvements is ideal, but financial cost and/or risk factors can deter tackling such critical sites. For example, a banker could chose to create riparian habitat behind a levee, or improve the regional and ecological values by reconnecting the site to the river and reestablishing floodplain wetland processes. If both processes create riparian credits, and there is a preference for higher functioning restoration, a mechanism would be needed to encourage a banker to undertake the floodplain restoration effort.

Often, bankers focus on large sites as a surrogate for ecological value, with the result being a large number of credits to sell. If the size of the service area is not predefined, the banker will feel obligated to negotiate for the largest service area possible to capture a sufficient market to sell the credits within a reasonable amount of time. However, if the size of the service area is predefined, a banker can evaluate the potential sales rate within that area, and scale the size of the bank accordingly.

In summary, bankers undertake a large financial risk when establishing a mitigation bank, with the typical assumption being a timely and reasonable economic return on the investment. If the banker feels solely responsible for managing risk, they will limit exposure (dollars spent) and employ every tool (competitive pricing and extended service area) to maximize sales rates.

Risk Factors—Environmental

When regulators are evaluating projects, they want to be sure that the compensation will fully address the impact. At the time a bank is being developed, the spectrum of what types of impacts may be compensated at the bank are unknown. Therefore, there is a preference that restored wetlands at a bank provide the highest level of functional lift, to cover all future eventualities. Some of the factors to be considered include: proximity to adjacent preserved lands; large sites; ability to compensate for localized wetland functions; and ability to restore natural processes in a broader ecological context.

In certain parts of the country, wetlands compensation is primarily conducted on a wetland classification basis rather than a functional assessment. If only a single wetlands value, such as habitat type, is considered, a service area equivalent to an ecoregion within a six-digit hydrological unit code (HUC) watershed may allow for equivalent offsets. However, if overall functional capacities (e.g., flood control or water quality) of the wetlands are being evaluated, the regional context of the mitigation is much more important. Without an assessment mechanism, defaulting to small watersheds (e.g., HUC-10 watershed covering 227 square miles versus a HUC-6 watershed covering 10,596 square miles) is a basic mechanism for ensuring the compensation has a regional value.

One particular challenge is that there often is not a clear or common definition of what regional values are most important for bank establishment. Without clear guidance, bankers are not sure how a site will be received by the interagency review team (IRT), and the IRT has the burden of making subjective evaluations and then negotiating credit applicability and service area based on what may be appropriate compensation for unknown future impacts.

Current Service Area Approaches

One current approach for defining service areas is to have the bank sponsor justify the size and shape based on function within the watershed and economic viability. Factors such as ecoregion benefit, functional capacities, and economic considerations can be weighed and balanced, and sites with higher benefits can secure larger service areas. However, this process is fluid and subjective, with varied outcomes; similar banks have secured different service areas, and banks with unequal levels of ecological contribution have equivalently sized service areas. The result of this approach is that bankers have little certainty or precedent on which to rely when proposing banks. Worse, negotiations can create a false dichotomy where economics and ecology become pitted against each other in the decisionmaking process.

Alternatively, many parts of the country have a standard approach of assigning service areas based on set watershed boundaries for any bank within the watershed. This process provides a clear planning process for bank development, and leaves the economic evaluation up to the banker as to whether it is financially viable to develop a bank. However, the limited flexibility creates a mold that promotes only certain types or sizes of banks, and incentivizes a banking model that provides the least amount of offset to capitalize on the set service area boundary.

A Better Solution

The existing systems for service area determination both have benefits and detriments from ecological and economic standpoints. Preestablished service areas are helpful for economic planning purposes and minimize subjectivity, but tend to be indifferent to the type of restoration. This limits the power of banking to focus on large sites with complex restoration goals. A more flexible approach allows for regionally important restoration projects to secure larger service areas, but this process is currently very subjective in the outcome and riskier for bankers on the ultimate market for the credits.

A better process would seem to blend the best of these two systems to provide certainty and a clear process for defining the ultimate size of the service area. A quantitative assessment tool should be utilized to document the effects of site setting, restoration objectives, and wetland functions for each site, creating a common method to evaluate both credit allocation and regional site contribution. Regulators and bankers should establish a regional prioritization of restoration outcomes (e.g., habitat connectivity, water quality, flood attenuation, etc.), and assign a consistent and nonsubjective process for assembling the service area's layout according to how a site's features achieve these outcomes. This process would amount to a series of building blocks to expand upon a base service area. For example, a project with little regional significance (e.g., wetlands behind a levee) might receive a 10-digit HUC watershed, but ecologically superior floodplain restoration would add on many eight-digit HUCs as it achieves multiple regional wetlands values.

If the ecological contribution of the bank is directly correlated to the size of its service area, it might just become the new economic viability consideration for the type, location, and size of mitigation banks. ■

Corps District Considerations in the Definition of Service Areas

By Steve Martin and Robert Brumbaugh

The Mitigation Rule does not severely constrain service area determination. This is consistent with its support of a watershed approach that depends upon local needs and functions of importance. U.S. Army Corps of Engineers (Corps) districts have used a number of approaches to define or refine the extent of mitigation bank and in-lieu fee program service areas to provide locally important functions. These approaches include the use of watersheds or hydrologic units, ecoregions, other physical features (physiographic provinces, U.S. Department of Agriculture (USDA) major land resource areas, etc.), administrative boundaries, or some combination of features. A mitigation bank may have separate service areas for different resource types (e.g., vernal pools, seasonal wetlands). The first task in defining a service area is to identify the geography of the affected aquatic resources from a landscape perspective. Is the distribution of the affected resource related to a watershed, ecoregion, or another feature?

Watersheds

Water quality at a given point on a stream reflects the aggregate of natural and anthropogenic characteristics upstream or upgradient of that point to the drainage divide of the watershed including land use and landscape characteristics. Thus, watersheds are often regarded as suitable for considering spatial aspects of ecosystem management (Omernik & Bailey 1999). With this understanding, the National Research Council advocated a watershed approach for compensatory mitigation decisions (National Research Council 2001). U.S. Geological Survey hydrologic units or hydrologic unit codes (HUCs) are not necessarily true topographic watersheds but portions of a watershed (Omernik & Bailey 1999). However, they are watershed-based units representing aggregates of similar characteristics for a portion of a larger watershed, and representative of similar hydrologic conditions in that watershed. HUCs vary in size and scale; for example, the average HUC-6 or accounting unit is approximately 10,600 square miles, the average HUC-8 or catalog unit is 700 square miles, and the average HUC-10 ranges from 60 to 390 square miles. A survey of Corps districts in 2010 showed that service areas in most Corps districts are defined in terms of one or more HUC-8s (Womble & Doyle 2010).

In some settings, watersheds may be of little use for defining service areas. In marine environments, it may be impossible to define a watershed, while in areas with low topographic relief, like the lower Mid-Atlantic Coastal Plain, surface waters may flow in different directions depending upon prevailing wind conditions, making definition of watersheds difficult. It may be difficult to define watersheds in regions where much of the surface water does not directly drain into streams, such as nearly level karst and continental glacial deposits pocked with potholes and lakes.

Ecoregions

Ecological regions, or ecoregions, are based on the premise that regions can be delimited through consideration of patterns or biotic and abiotic features, including soils, physiography, climate, vegetation, and hydrology (U.S. EPA Ecoregion Maps; Omernik & Bailey 1999). Ecoregions may be useful for defining service areas in landscapes where aquatic communities occur in predictable patterns, for example, in the Prairie Pothole Region or the vernal pool regions of California. A focus on habitat-based functions is more likely to lead to consideration of ecoregions than HUCs, especially when a bank provides compensatory mitigation under both the Clean Water and Endangered Species Acts. The two ecoregion classifications most widely applied in the United States are the U.S. Environmental Protection Agency's (EPA's) (developed by Omernik) and the USDA's (developed by Bailey). Both have four levels with the smallest, Levels III and IV, being the most commonly considered in setting service areas. One issue in setting service areas is that ecoregion boundaries may not be as distinct as topographic divides. Setting a service area by simply circumscribing an ecoregion, such as a Level III ecoregion, can result in a large variation in service area size or cutting across a large number of watersheds. One EPA Level III ecoregion extends from Biloxi, Mississippi, to Baltimore, Maryland. Using such an ecoregion may require limiting the service area to a Corps district or a portion of a district.

Administrative Boundaries

Administrative boundaries, such as county or state borders, have been used to define service areas. Banks developed for use by a single permittee, like a government agency, military installation, or department of transportation (DOT), may have service areas limited to that government unit. In some cases, groups of counties may be used as bank service areas; for example, under the Illinois Wetland Protection Act, service areas are defined as Illinois DOT regions. Local governments may require that impacts be compensated within their borders, thus limiting service areas for actions requiring local authorization. For example, in the Chicago and Minneapolis metropolitan areas, local government regulation can complicate service area definition (Robertson & Hayden 2008). Administrative boundaries may not reflect the distribution of aquatic resources or their interactions, especially when those resources are found across a large region, such as a Corps District.

Other Physical Features

Other physical features, such as physiographic provinces, littoral drift cells, or reef complexes, may be useful for defining service areas. Combinations of features have also been used to define service areas. In Minnesota, service areas can be based upon local government units (LGUs) and watersheds. In Virginia, state law defines bank service areas as the HUC-8 in which the bank is located and adjoining HUC-8s in the same river basin. The interagency review team in Virginia further reduces the service area to the same physiographic province (e.g., coastal plain, piedmont) that the bank occurs in because of differences in aquatic resource characteristics (gradient, substrate, stratigraphy, and climate) between the provinces. In the Colorado Rocky Mountain Front Range, elevation is used to partially delimit service areas. The 6,000-foot elevation contour coincides with other changes—physiographic and ecoregional—that divide portions of a watershed (comprised of two HUC-8s) into separate service areas.

A number of districts have authorized banks with multiple service areas (e.g., primary, secondary, and tertiary service areas). In part, these different orders of service areas are intended to address scarcity of mitigation banks in some geographic areas. Secondary and tertiary service areas may ensure that third-party compensation is available for more remote impacts, but it may come at a cost to the permittee. The permittee may have to provide additional compensation to offset the lost functions for those projects located in a bank's secondary service area, or the use of the secondary service area may be limited to only projects with minimal impacts to aquatic resources, such as impacts under Nationwide Permits.

The Rule allows the Corps to require a combination of on-site and off-site compensation to offset functions lost through permitting. This implies that each function may have a different geographic and landscape scale (33 C.F.R. pts. 332.3(d) and (e)). So how might service areas be established to reflect the spatial diversity of important function-scapes—or "function sheds"—to better ensure compensation for lost functions? Is it possible to have different service areas associated with different functions that may be the critical function to replace? For instance, might a service area for offsetting losses of biogeochemical functions differ from service areas for losses of habitat functions? These questions are central to consideration of a watershed approach, which the Mitigation Rule fully supports in compensatory mitigation decisions. ■

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THE AUTHORS RESPOND

Driving Ecologically Significant Site Selection

By Paul Amato

Several considerations are presented that help demonstrate the complexities of determining service areas under the Mitigation Rule. It will always be a challenge to do so in a way that ensures mitigation projects fully offset impacts. After all, it is an inherently challenging situation and one best avoided by reducing the need for mitigation in the first place. Under current practices, there is likely great variability among and even within U.S. Army Corps of Engineers districts and interagency review teams with regard to setting service areas. But steps can be made to improve our understanding and to improve consistency and certainty. Ideas from the different perspectives can be combined to outline a possible framework for improvement.

At the foundation is the need to better understand and execute a watershed approach that identifies priority resources to preserve and locations where mitigation efforts will have the greatest ecological benefits. Efforts like California's statewide policy for wetland and riparian protection[1] may help to further our understanding by requiring that decisionmaking consider watershed profiles of the abundance, diversity, and conditions of aquatic resources in a watershed, as well as watershed and regional planning efforts like habitat conservation plans. Other efforts to implement the watershed approach are described in the previous issue of this newsletter.[2] As our understanding improves and more tools are developed that enable the effective implementation of the watershed approach, so too will our ability to scale proper service areas.

Regulators and the mitigation banking community could benefit from the quantitative assessment tool proposed by Holland and DeYoung as a way of evaluating the regional benefits of a mitigation site. Key to this is doing so in the context of watershed planning efforts. Benefits could include a defensible prioritization of potential mitigation projects within a watershed and, hopefully, a driver for the implementation of projects at the most ecologically significant locations. Regional significance based on location and priority restoration outcomes should be factored into both the credit allocation and the geographic reach, or service area, of a project.

A quantitative assessment tool could include a process that factors in the rather novel and provocative question raised by Martin and Brumbaugh whether it is possible to have different service areas associated with different functions. Admittedly, the idea that one project could have several function-based service areas adds another layer of complexity to the process, but ecological, economic, and regulatory arguments can be made in favor of sizing service areas based on the reach of a project's functional gains.

Doyle raises critical research questions, though answering them before more money is spent on mitigation projects is not necessarily practical in the regulatory setting where good compensation projects are always needed. Any framework for setting service areas will benefit from a better understanding of past practices and the demonstrable benefits of mitigation projects in a regional watershed-planning context. ■

Endnotes

1. California Environmental Protection Agency, State Water Resources Control Board, California's Wetland and Riparian Area Protection Policy, *available at* http://www.waterboards.ca.gov/water_issues/programs/cwa401/wrapp.shtml.
2. *See* 35 Nat'l Wetlands Newsl. 1 (Jan.-Feb. 2013).

Flexible Service Areas Could Allow Regulators to Reward Success

By Martin Doyle

This series of articles, pivoting on the rationale laid out by Martin and Brumbaugh, draws attention to the much-ignored issue of geographic service areas. These authors make us step back and think about the landscape, economic, and regulatory realities that should inform and constrain future decisions.

Amato lays out sound principles for regulators to consider for establishing service areas. My primary concern is that emphasis continues to be placed at the front end rather than at the back end. That is, service areas for projects are set at the planning stage and by watershed plans and by negotiations early in the process, and there is less emphasis given to potentially modifying the service area based on ecological performance as empirical evidence rolls in. Perhaps this is the next needed policy step: establish a range of possible service areas that can be expanded if the site performs certain functions during the monitoring period, and contracted or left static otherwise.

This appears to be in line with some of the thinking in Holland and DeYoung, who emphasize some flexibility. Holland and DeYoung rightfully note two things: first, that all banks cannot be treated equally, as some produce more important ecological outcomes than others, and some of these functions are more important in some regions than others. Second, that there are different risk trade offs associated with bankers and regulators, a topic that several of my colleagues have begun to analyze as an essential element of mitigation banking and ecosystem service markets generally (BenDor et al. 2011). I strongly agree that the contrasting sources of risk need greater consideration—and appreciation—by all parties involved.

Addressing risk and addressing nuances of individual trade offs may be directly addressed by having a temporally malleable service area. During the project planning, the geographic service area and the monitoring program could be more formally linked, and the service area could be contingent upon performance of the project through the monitoring period. This would be a way of acknowledging sources of risk and rewarding performance. Setting a small service area at the beginning of the project reduces risk on the regulator, but the opportunity to have a larger service area potentially offsets the long-term risk that entrepreneurs must be willing to take on for larger, ecologically significant projects. But having larger service areas contingent on performance in turn balances risk: entrepreneurs may only be willing to have this long-term reward if they have sufficient confidence in their proposed project. The expansion of a service area could be contingent on specific functions meeting specific, quantifiable metrics of success that are in line with regional goals of regulatory agencies and broader society. Setting a small service area at the start then at least sets a base-case for the entrepreneur, but allowing expansion gives regulators a useful tool to reward those genuinely, demonstrably successful projects. ■

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Balancing Ecological and Economic Needs With Planning Frameworks

By Hal Holland and Greg DeYoung

The greatest strength of mitigation banking is its reliability as an implementation tool. In 2001, the National Research Council identified that many of the failures of mitigation stemmed from faults in implementation (e.g., mitigation was not even completed 34% of the time). Subsequent to the 2008 Mitigation Rule, banking incorporates clear performance standards and success monitoring to create lasting restoration projects with easements and long-term funding.

We disagree with Doyle's assertion that most mitigation is limited in scale and currently ineffective at improving watershed functions, at least with respect to post-Rule mitigation banks; however, we concur that more emphasis needs to be placed on the mitigation components Doyle identified. Regulators currently attempt to address these factors when evaluating the types of projects that can utilize bank credits (ecological relevance) and the number of credits required (temporal and spatial calculations). This can be a subjective process, and belies a larger issue; mitigation overall is operating in a resource planning vacuum. For example, Doyle suggests that spatial proximity is critical to evaluating mitigation site effectiveness, but if watershed-scale historical degrada-

tion is added to the evaluation, less proximate sites may actually contribute most to a watershed's functional improvement.

Amato accurately states the need for "a blueprint of compensatory needs." The 2008 Rule requires a compensatory planning framework for in-lieu fee (ILF) programs; this is precisely what is needed for the banking program, and the interagency review team agencies are best qualified and positioned to undertake this effort. Amato calls for national and regional service area guidance; this could help direct the compensatory planning framework approach.

Banking and ILF programs have the benefit of forethought in where and how restoration projects are established. Compared to other forms of mitigation, banking has the additional advantage of reliable implementation and reduction of temporal loss. If this power of forethought and implementation could be combined with the benefit of watershed planning and prioritization, the results could be significant for all stakeholders.

A compensatory planning framework for banks could provide the foundation for service areas that address the watershed and ecoregional needs, while fostering a system of mitigation banks that have a fair shot at being economically viable. Doyle's three key qualities—ecological, spatial, and temporal—combined with Martin and Brumbaugh's focus on functions ("function-scapes") could be the conceptual grid upon which we arrange our service area building blocks. Bank sponsors would then know what is expected and what would generate a large service area supporting large, ecologically significant restoration projects.

If we are fortunate enough to create these compensation blueprints, a major issue still remains: how do Habitat Conservation Plans and related Regional General Permits fit in? The imposition of these administrative boundaries, truncating existing and future bank service areas, undermines the economic viability of banks that have been established based on the types of watershed and ecoregional blueprints to which we aspire. This is a current issue that will need to be addressed as we strive for national and regional guidance on service areas. ■

Searching for Approaches to Stretch Limited Resources

By Steve Martin and Robert Brumbaugh

To paraphrase Paul Amato, there is no single way to establish a geographic service area. Appropriately sized service areas should reflect the types and magnitudes of functions expected to be lost at impact sites and may vary by watershed/landscape position, climate, and aquatic resource type. Often, the distribution of impacted resources is not tied to watersheds, for example, California vernal pools. Alternative organizing features such as landform or ecoregion may be more appropriate depending on the mitigation resource.

Service area establishment should be addressed early in the development of third-party compensatory mitigation. It can affect the viability of the enterprise and the degree to which impacted functions can be offset. We should consider whether third-party mitigation sited using a landscape perspective may be more ecologically successful than small, scattered permittee-responsible mitigation projects and make better use of limited agency resources. The suggestion to establish regional (or watershed-based) priorities for functions provided by mitigation projects and to assign service areas based on expected outcomes is consistent with the Mitigation Rule, although it entails the allocation of scarce resources to planning.

Empirical documentation of ecological performance of mitigation projects in the context of a watershed or other landscape unit is important. More are undertaking that effort, for example, Dr. Doyle's work in eastern North Carolina. More effort is needed to examine the landscape perspective as it relates to mitigation projects and their intended functions. These studies may improve our ability to establish meaningful service areas. We have a growing capability to evaluate project performance through assessment methods (hydrogeomorphic, condition assessments, etc.), but more work is needed to better consider aquatic resource functions at a landscape level. It is important to examine whether compensatory mitigation is providing expected functions regionally. Womble and Doyle (2012) identifies trade offs in sizing a service area. A small service area may better ensure that the functions of permitted impacts are offset at the mitigation bank site but limit use of the bank. A large geographic service area may ensure use of the bank as compensatory mitigation but reduce its potential to fully replace lost functions at a landscape level.

One approach (Womble & Doyle 2012; Layne 2011) is credit bundling where a mitigation credit may be used to offset impacts to multiple resources or functions (nutrient loading, habitat, etc.) associated with a permitted impact, but once debited is retired (no "double dipping"). This approach has worked well for providing compensation for wetland and endangered species impacts. This could lead to different service areas for different functions, or "function-scapes."

There are constraints to the development of better ecological criteria for establishing geographic service areas. Better use of limited resources could be made through coordination between agencies in approving research. There may be creative options for funding research, for example, dedicating a portion of credit proceeds to fund mitigation research. Development of appropriate service areas is an ongoing process. Regulators, bank sponsors, and researchers should periodically examine performance and scientific issues, question their assumptions, and apply the lessons learned. ■

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Challenges in Mitigating Wetland Impacts of Large-Scale Hardrock Mining in Bristol Bay Watersheds

The Clean Water Act often requires compensatory mitigation to offset losses of aquatic resources under the §404 permitting process. But what happens when those impacts occur in ecologically intact environments where there are minimal opportunities for restoration, enhancement, establishment, or preservation? The authors examine this scenario for a proposed large-scale hardrock mine in Alaska.

By Thomas G. Yocom and Rebecca L. Bernard

Compensatory mitigation measures are often required during the Clean Water Act (CWA) §404 permitting process to reduce or offset losses of aquatic resources. Offsetting large-scale impacts in ecologically intact environments, however, may be ineffective in replacing lost wetland and aquatic functions, due to the lack of opportunities for restoration, enhancement, or preservation of similar resources. This article assesses the potential compensatory mitigation options for losses of anadromous fish streams and adjacent wetlands from large-scale hardrock mining in the Bristol Bay region of Alaska, and evaluates the likelihood that any of these options could offset impacts of the magnitude that would likely result from such a mine, as required under the CWA.[1]

The specific focus of this article is the Pebble Mine, proposed for construction in the headwaters of the Koktuli River and Upper Talarik Creek within the greater Nushagak and Kvichak drainages, respectively. Permitting the Pebble Mine poses particular challenges with respect to compensatory mitigation because of its size, the largely pristine environment around the ore deposit, and the ecological functions of the headwater streams and wetlands that would be lost. Nonetheless, the analysis should have relevance to other potential large-scale hardrock mines in other Bristol Bay drainages, given the significance of the entire Bristol Bay Basin as highly productive and sustainable salmon habitat.

This article does not address the likelihood that large-scale hardrock mining could comply with other §404 restrictions concerning less damaging alternatives, water quality standards, endangered species, or significant degradation, but these restrictions are additional potential stumbling blocks for proposed new mines.[2] We also do not address the likelihood that impacts to water quality or stream flows could be mitigated to permitted levels, but we recognize that these mitigation challenges could be even greater than those we assess here.

Regulatory Background

The CWA prohibits discharges of pollutants into "waters of the United States," except as specifically allowed by the Act.[3] Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (the Corps) to issue permits for the discharge of dredged or fill material,[4] defined as a pollutant under the CWA regulations.[5] In determining whether to issue such permits, the Corps applies CWA regulations promulgated jointly by the Corps and the U.S. Environmental Protection Agency (EPA) (the §404(b)(1) Guidelines or Guidelines).[6]

The goal of the Guidelines is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" through the control of discharges of dredged or fill material.[7] Although the primary mechanism for achieving this purpose is avoidance of impact, unavoidable impacts of the discharge to the physical, chemical, and biological integrity of those waters must be minimized and offset.[8] The Guidelines prohibit the authorization of discharges where:

(1) A practicable alternative would have less adverse impact on the aquatic environment;
(2) The discharges would violate an applicable state water quality standard or toxic effluent standard, jeopardize the continued existence of an endangered or threatened species, or violate any requirement imposed to protect a marine sanctuary;
(3) The discharges would cause or contribute to significant degradation of waters of the United States; *or*
(4) Appropriate and practicable measures have not been taken to minimize and/or offset potential adverse impacts of the discharge on the aquatic ecosystem.[9]

In 2008, the Corps and EPA promulgated the Mitigation Rule, which supplements the Guidelines, to strengthen the implementation of compensatory mitigation requirements.[10] The Mitigation Rule confirms the "avoid, minimize, and offset" sequence for mitigation and emphasizes that a permit may not be issued where there is a "lack of appropriate and practicable compensatory mitigation options."[11] Under this rule, compensatory mitigation must be determined "based on what is practicable and capable of compensating for the aquatic resource functions that will be lost as a result of the permitted activity."[12] Furthermore, "[c]ompensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular [§404] permit."[13]

Restoration is the preferred method of compensatory mitigation, but other acceptable methods are enhancement, establishment, and preservation;[14] preservation, however, is acceptable only where five stringent criteria are met, including that the resources to be preserved are threatened with destruction.[15]

The Mitigation Rule emphasizes a watershed approach,[16] with the goal of "maintain[ing] and improv[ing] the quality and quantity of aquatic resources within watersheds . . . ."[17] Selection of mitigation sites focuses on replacing lost functions;[18] in-kind mitigation is preferred over out-of-kind mitigation.[19] In-kind "rehabilitation, enhancement, or preservation" is particularly emphasized for difficult-to-replace resources like streams.[20]

The compensatory mitigation required must be "to the extent practicable, sufficient to replace lost aquatic resource functions."[21] A compensation ratio greater than one-to-one is required where, among other things, the mitigation method is preservation, the likelihood of success is in question, the aquatic resources lost and replaced are different, the mitigation site is distant from the impact site, or the lost functions are difficult to restore.[22] The Mitigation Rule also requires that compensatory mitigation generally occur in advance of or concurrent with the permitted impacts, and that the permittee provide financial assurances.[23]

Although the Mitigation Rule recognizes the continuing applicability of a 1994 interagency policy that compensatory mitigation is not always required in Alaska,[24] subsequent guidance by the Corps, Alaska District clarifies that some types of projects always require compensatory mitigation.[25] These include projects, like the Pebble Mine, requiring "[f]ill placed in anadromous fish streams and wetlands adjacent to anadromous fish streams." This Alaska guidance also establishes compensatory mitigation ratios. For waters in the "high" compensation category, as those in the Koktuli River and Upper Talarik Creek headwaters would likely be, the required ratio is at least 2:1 for restoration and/or enhancement and at least 3:1 for preservation.[26]

The Unique Ecological Functions of Headwater Streams

In the North and South Fork Koktuli Rivers and Upper Talarik Creek Watersheds, headwater streams comprise more than twice the kilometers of mainstem habitat.[27] Headwater streams, defined as low order and intermittent streams at the fringes of watershed boundaries,[28] perform unique ecological functions that should be the focus of compensatory mitigation in the region.

Headwaters provide thermal refuges to juvenile fishes during extreme conditions,[29] determine downstream nutrient dynamics,[30] and support primary and secondary producers (e.g., algae and aquatic macroinvertebrates)[31] adapted to freezing and intermittent flow conditions.[32] The diversity and abundance of headwater species provide source populations for colonization of downstream habitat and prey for downstream invertebrates and fishes.[33] Headwater streams are often exploited by resident and migrant fish,[34] including salmonids, which may use them as rearing[35] and spawning habitat.[36] In a survey of 105 low-gradient headwater streams in the Nushagak and Kvichak drainages, 96% of the streams supported resident fish and 75% supported salmonids.[37]

Delineating the Watershed

Although the Corps has flexibility in defining the scale of the watershed for compensatory mitigation purposes, the scale should "not be larger than is appropriate to ensure that the aquatic resources provided through compensation activities will effectively compensate for adverse environmental impacts resulting from activities authorized by [§404] permits."[38] For example, compensatory mitigation projects should be located "where [they are] most likely to successfully replace lost functions and services . . . ."[39]

The most appropriate watershed scale in compensating for unavoidable impacts from permitted discharges within the North Fork and South Fork Koktuli Rivers and/or Upper Talarik Creek drainages would be these same drainages, as this would maximize the likelihood of replacing the specific aquatic resource functions lost due to permitted discharges. Mitigation projects within these specific drainages would also protect habitat for the particular salmon stocks that originate in these drainages, preserving the diversity that is critical to the stability of the overall fishery.[40] Where no reasonable or practicable mitigation measures exist in these drainages, the Corps and/or EPA should require compensatory mitigation within the closest "hydrologic units" as defined by the U.S. Geological Survey (USGS), in this case the Mulchatna River and Lake Iliamna Watersheds.[41]

EPA's Draft Bristol Bay Watershed Assessment (BBWA) examines the much broader Nushagak and Kvichak River drainages because this is where large-scale hardrock ore deposits have been identified. However, this geographic scope is an inappropriate watershed scale for compensatory mitigation under §404. The Nushagak and Kvichak River systems drain an area about the size of West Virginia. Defining the watershed this broadly would fail to meet the fundamental requirement of the Mitigation Rule that aquatic resources provided through compensation effectively offset the adverse environmental impacts of permitted discharges.

A paper submitted to EPA by Pebble Mine proponent Pebble Limited Partnership (PLP) offers an even more expansive view of "watershed" for mitigation purposes. It endorses The Conservation Fund's division of the state of Alaska into five large in-lieu fee (ILF) provider service areas:

> Under that program, the Bristol Bay watershed, the Kuskokwim River watershed, Kodiak Island, and the Alaska Peninsula are grouped into one service area called Southwest Alaska. The regional scale of this "watershed" makes sense because development projects are scattered across an extensive and sparsely populated area, the ecological resources are similar, and mitigation opportunities can be clustered for greater ecological benefit.[42]

Such a broad watershed definition may be reasonable in the context of small development projects scattered across an extensive area, which is how ILF programs are generally used, but is unreasonable for impacts from a very large project like the proposed Pebble Mine. Because the regulations require a more

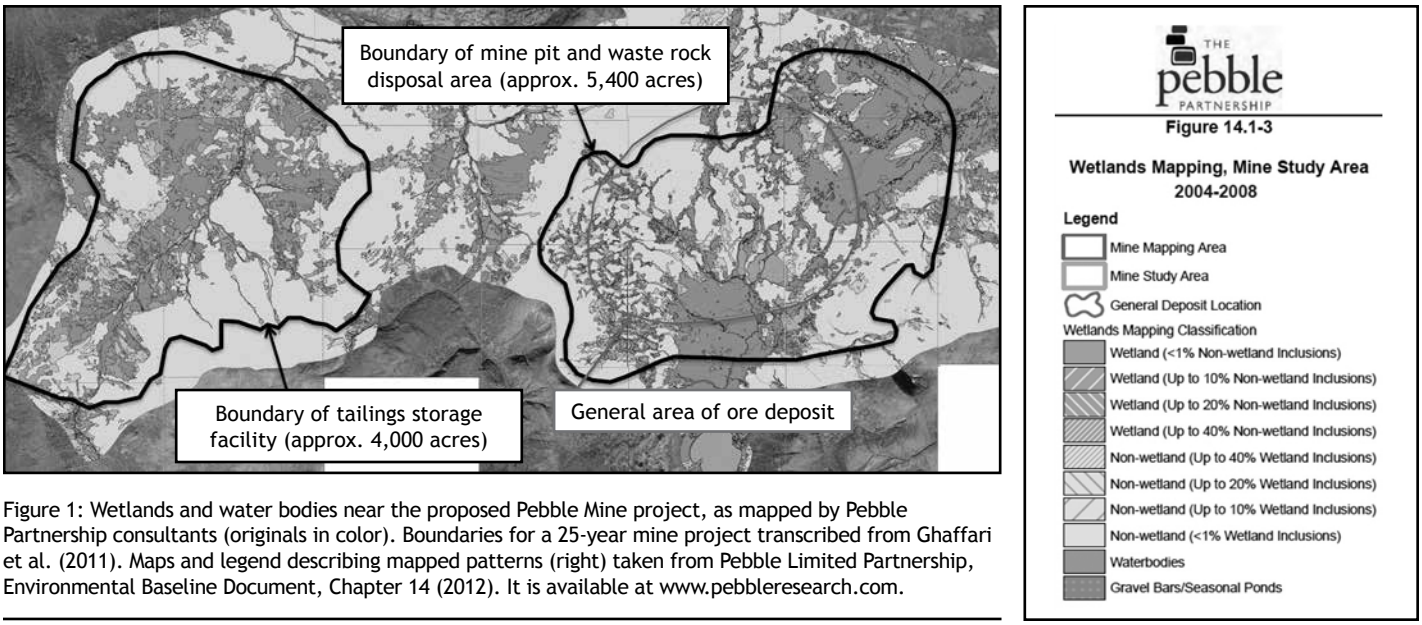

Figure 1: Wetlands and water bodies near the proposed Pebble Mine project, as mapped by Pebble Partnership consultants (originals in color). Boundaries for a 25-year mine project transcribed from Ghaffari et al. (2011). Maps and legend describing mapped patterns (right) taken from Pebble Limited Partnership, Environmental Baseline Document, Chapter 14 (2012). It is available at www.pebbleresearch.com.

precise focus,[43] we assess potential mitigation options within the specific affected watersheds and within the closest recognized hydrologic units.

The Magnitude of Impacts Requiring Compensatory Mitigation

Pebble Mine proponents have conducted environmental and engineering studies since at least 2004.[44] Based on these studies, PLP partner Northern Dynasty Minerals (NDM) published a preliminary mine plan in a 2011 report prepared in compliance with Canadian public disclosure regulations.[45] This report describes three potential phases for mining the Pebble deposit, including a 25-year, a 45-year, and a 78-year mine.[46] It includes drawings showing the locations and footprints of the 25-year mine pit and an associated tailings storage facility in an unnamed tributary drainage of the North Fork Koktuli River.[47]

EPA has been criticized for using this plan as the basis for the "hypothetical mine scenario" that it assesses in its Draft BBWA.[48] This criticism is unfounded; the preliminary plan is a proper basis for both EPA's assessment of impacts and our estimate of the magnitude of impacts for which compensatory mitigation would be required. Inasmuch as NDM published its 2011 mine plan to comply with public disclosure laws, it is reasonable to use that information to assess potential impacts of mining on wetland and aquatic areas. It is also appropriate to use this plan because (a) the location of the ore deposit is known, (b) the wetlands and water bodies that overlie the deposit have been mapped and published by Pebble proponents,[49] and (c) the size and location of the initial tailings storage facility are based on environmental studies concluding that use of that drainage would minimize harm to fishery resources compared with other feasible sites.[50]

The 25-year mine plan includes a mine pit and waste rock disposal area covering approximately 5,400 acres and an associated tailings storage facility covering approximately 4,000 acres.[51] Our estimates of project impacts are based on the diagrams of these two areas and exclude other probable facilities, including access roads, processing facilities, pipelines, a power plant, and a proposed deep-water port on Cook Inlet. Thus, the figures used herein likely underestimate impacts significantly.

In its voluminous Environmental Baseline Document (EBD), PLP concluded that roughly 33% of its "mine mapping area" is wetlands and aquatic areas.[52] PLP did not correlate this figure to any specific project footprint, but its wetland maps (unverified by the Corps or EPA) show areas overlying the known Pebble ore deposit as well as the site of a likely tailings storage facility as containing a high percentage of wetland and aquatic sites (Figure 1). Although likely an underestimate,[53] we use PLP's 33% figure to estimate the project acreage that might require compensatory mitigation. Applying 33% to the estimated 9,400-acre footprint of the 25-year mine, over 3,000 acres would require compensatory mitigation. This number would increase significantly if the mine operates for 45 or 78 years, as the preliminary plan indicates is likely.[54]

Under the Mitigation Rule, the appropriate compensatory mitigation could be quantified using a Corps-approved functional or conditional assessment of aquatic resource functions that would be lost if the mine were built. In the absence of such an assessment, the compensation ratio for the headwater streams and wetlands destroyed by discharges of dredged or fill material would be at least 2:1 if the mitigation method is restoration or enhancement, and at least 3:1 if the mitigation is preservation.[55] For the initial 25-year phase of the mine, this equates to over 6,000 acres of compensatory mitigation for restoration or enhancement, and over 9,000 acres of compensatory mitigation for preservation.

Potential Options for Compensatory Mitigation

The PLP paper referenced earlier lists types of compensatory mitigation that might be available to offset impacts from one or more large-scale hardrock mines in the Bristol Bay Watershed:

> Compensatory mitigation for wetlands impacts could, for example, take the form of anadromous fish habitat restoration, property acquisition for conservation easements, water quality improvements, remediation of contaminated sites, biodiversity offsets, funding for research and education, or other options. There may be opportunities for development organizations to join with local tribal governments and non-governmental organizations to create wetland mitigation banks or endowment funds to manage fish and wildlife, water quality, and preservation of undeveloped natural resources for generations to come.[56]

These measures could, on a case-by-case basis, offset project impacts, though habitat restoration and enhancement are more effective at offsetting direct permanent losses of wetland and aquatic habitats than preservation of existing habitat. We examine opportunities to mitigate impacts of the Pebble Mine within the Mulchatna River and Lake Iliamna Watersheds, including some of the actions suggested above,[57] under the Mitigation Rule.

Mitigation Banks

The Mitigation Rule considers mitigation banks less risky and more effective than permittee-responsible mitigation and prefers their use where available and appropriate.[58] The Corps, Alaska District has approved four mitigation banks, but none serves the Bristol Bay region.[59]

Establishing a new mitigation bank could be a possible compensatory mitigation measure, but there is a lack of appropriate restoration, enhancement, or preservation sites within the affected watersheds. The Mulchatna River and Lake Iliamna Watersheds are largely unaltered by human activities. There are no degraded habitat areas of similar function and adequate size within the Upper Talarik Creek or Koktuli River drainages or within the greater Mulchatna River or Lake Iliamna Watersheds that could be restored or enhanced. Nor are there appropriate preservation sites within these drainages (i.e., sites that are large enough, perform similar aquatic functions, and are under threat of development) other than the Pebble site itself.

There are some scattered restorable sites within the more-distant Lower Nushagak Watershed,[60] but these would not provide the acreage or ecological function that would be lost at the Pebble site. Moreover, some are old mines that would require resolution of liability and contamination issues in advance.[61] Preservation options are also limited in the Lower Nushagak Watershed because of the sheer number of acres that would be required and the difficulty of finding sites to offset the lost functions of pristine headwater streams and wetlands.

An additional challenge is that land ownership in the region is a combination of state, federal, private, and Alaska Native allotments. Although public lands can provide compensatory mitigation in some circumstances, credit for such mitigation is limited to "aquatic resource functions provided by the compensatory mitigation project, over and above those provided by public programs already planned or in place,"[62] and credit for preservation is given only where the mitigation site is under threat.[63] Further, preservation in this context, especially downstream from the proposed Pebble project, would be effective only if upstream waters are not degraded by mining or other activities. These limitations would preclude most sites of adequate acreage and similar aquatic function from serving as acceptable mitigation sites for the Pebble project.

ILF Programs

Where no mitigation bank is available, use of ILF credits is generally preferred over permittee-responsible mitigation.[64] The Corps, Alaska District lists three ILF sponsors,[65] one of which (The Conservation Fund) is actively acquiring conservation easements within the Bristol Bay region as part of its Southwest Alaska Salmon Habitat Initiative.[66] One potential mitigation avenue for the Pebble project might be the use of such an ILF program, although the magnitude of potential project impacts might preclude such a mechanism. However, we found no efforts to purchase conservation easements within the Mulchatna River or Lake Iliamna Watersheds specifically.

The Conservation Fund has generally identified "[o]pportunities for compensatory mitigation through wetlands preservation [such as] the purchase of strategic in-holdings in Wood-Tikchik State Park, Togiak, Becharof, Alaska Peninsula Izembek and Kodiak National Wildlife Refuges, Afognak and Shuyak Island State Parks, Katmai and Lake Clark National Park and other state and federal conservation units."[67] These areas are far from the Pebble Mine site, and only the Wood-Tikchik State Park reaches, though barely, into the USGS Lower Nushagak hydrologic unit. The Wood-Tikchik State Park land use plan indicates that within the park there are only 27 small Native allotments and nine small private in-holdings.[68] Moreover, habitat preservation in these distant locations to mitigate for impacts in the Mulchatna River and Lake Iliamna Watersheds would be inconsistent with the emphasis in the Mitigation Rule on providing ecological benefits close to the site of impact.

Permittee-Responsible Compensatory Mitigation

For permittee-responsible compensatory mitigation, the Mitigation Rule provides the following order of priorities: a watershed approach is preferred, followed by on-site, in-kind mitigation, and finally off-site, out-of-kind mitigation.[69]

Fish Passage: Road Crossings

One measure that might be considered compatible with a watershed approach is to provide fish passage across man-made features, such as roads crossing streams. Virtually all streams near the Pebble deposit support anadromous and resident fish.[70] Because stream crossings can impact spawning, rearing,[71] and refuge habitats,[72] they can reduce genetic diversity,[73] thereby reducing long-term sustainability of salmon populations.[74] Limited fish passage is commonly associated with declines in salmon and other fish populations throughout the United States,[75] including Alaska.[76] Presumably, a compensatory mitigation measure for a large-scale hardrock mining project could be to replace crossings at non-project sites that serve as barriers to fish with crossings that improve fish passage.

Offsite improvement of fish passage is inappropriate, however, if another party is already responsible for maintaining fish passage.

Moreover, quantifying compensatory mitigation credits for any particular fish-passage improvement requires complex assessments of existing conditions and potential improvements in habitat functions. Further, such improvements would need to be permanent and include long-term maintenance in perpetuity.

Fish Passage: Beaver Dams

Although PLP identified beaver dams of ≥0.25 meters as potential barriers to fish passage,[77] scientific evidence suggests otherwise.[78] Studies indicate that beaver dams are semipermeable and may limit fish movement temporarily during low stream flows[79] but generally do not constitute significant barriers to salmonid migration.[80] Thus, removing beaver dams would not appear to be appropriate compensatory mitigation for habitat losses at the proposed Pebble mine.

Fish Passage Structures

Thousands of structures have been installed worldwide in efforts to reverse continued human-caused extirpation or extinction of fish species.[81] Most North American fishways seek to facilitate upstream passage of a single life stage of one or a few species (e.g., adult salmon), although the number of fish successfully passing relative to the number that attempt to pass is rarely monitored.[82] Even with this limited focus, these structures still delay or prevent upstream passage of both target and non-target species,[83] which can cause delayed mortality or reduced spawning success.[84] Inasmuch as fishways require constant maintenance and repair,[85] their suitability as mitigation for long-term or perpetual project impacts seems questionable.

Hatcheries

Proposals to use hatchery production to offset fishery losses would not be viewed favorably. Wild salmon populations have declined dramatically over the past several decades, "despite, and perhaps sometimes because of, the contribution of hatcheries. . . . With this decline has come an increased focus on the preservation of indigenous wild salmon stocks."[86]

Hatchery-produced salmon lack genetic diversity,[87] which is essential to the sustainability of salmon.[88] Hatchery fish also compete with wild salmon for food and habitat in both freshwater and marine environments, and sometimes prey directly on wild salmon.[89]

Preservation of wild salmon has broad political support in Alaska. In introducing legislation in 2011 with Sen. Maria Cantwell (D-Wash.) to create a public-private partnership focused on sustaining strong wild salmon populations, Sen. Lisa Murkowski (R-Alaska) remarked: "Through the creation of a public/private partnership and grant program, it is my hope that we can ensure that these salmon strongholds will continue to produce abundant wild salmon runs long into the future."[90]

Conclusion

There appear to be few, if any, reasonable and practicable measures within the Mulchatna River or Lake Iliamna Watersheds that could offset the enormous losses of headwater wetland and aquatic habitats associated with the proposed Pebble Mine. Direct losses of habitat could be thousands of acres, and offsetting these losses would require a multiple of that acreage figure. There are neither mitigation banks nor in-lieu fee projects serving these watersheds. Inasmuch as the habitats that would be destroyed are pristine, there are no known means of recreating such areas, and preserving similar habitat elsewhere would not offset permanent losses.

Compliance with CWA restrictions pursuant to §404 will likely be challenging for large-scale hardrock mines in the Bristol Bay Basin with regard to alternatives, water quality, and significant degradation. Our assessment of the likelihood for compliance with restrictions associated with compensatory mitigation alone leads us to conclude that a large-scale mine such as the Pebble Mine would not qualify for permitting under §404 of the CWA. ■

Acknowledgements

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Endnotes

1. In a sense, this paper attempts to fill a gap in the draft Bristol Bay Watershed Assessment (BBWA) released by the U.S. Environmental Protection Agency (EPA) in July 2012. *See* U.S. EPA, External Review Draft, An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay (May 2010), *available at* http://yosemite.epa.gov/R10/ECOCOMM.NSF/bristol+bay/bristolbayreport. The draft BBWA assessed the potential impacts of one or more large-scale hardrock mines in the Nushagak and Kvichak drainages within the Bristol Bay region but did not address the potential for offsetting those impacts through compensatory mitigation measures. Indeed, in the Final Peer Review Report for the Draft BBWA, released by EPA on November 9, 2012, one peer reviewer noted that the Draft BBWA identifies mitigation measures to minimize impact but no compensatory mitigation measures: "This is a concern, for I wonder if compensatory mitigation for the example mine is even possible in the watershed." *See* Versar, Inc, Contract No. EP-C-07-025, Task Order 155, Prepared for the U.S. EPA, Final Peer Review Report, External Peer Review of EPA's Draft Document, An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska 49-50 (2012) (comment by Paul Whitney, Ph.D.), *available at* http://www.epa.gov/ncea/pdfs/bristolbay/Final-Peer-Review-Report-Bristol-Bay.pdf.
2. *See* William M. Riley & Thomas G. Yocom, Report Prepared for Bristol Bay Native Corporation and Trout Unlimited, December 2011. Mining the Pebble Deposit: Issues of 404 Compliance and Unacceptable Environmental Impacts (Dec. 2011). The Corps or EPA could determine, for example, that there are less-damaging alternative sites including alternative ore deposits, or that a large-scale hardrock mine in this area could result in unacceptable risks to water quality.
3. *See* 33 U.S.C. §§1311(a) (discharge prohibition); 1362(12) (defining "discharge" to make the prohibition specific to "navigable waters"; 1362(7) (defining "navigable waters" to mean "the waters of the United States").
4. *See id.* §1344(a).
5. *See* 40 C.F.R. §122.2 (for purposes of the CWA, "pollutant" means "dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials . . . , heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.").
6. 33 C.F.R. pt. 332 (Corps); 40 C.F.R. pt. 230 (EPA).
7. 33 U.S.C. §1251(a); 40 C.F.R. §230.1(a).
8. 40 C.F.R. §230.1(c) ("Fundamental to these Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.").
9. *Id.* §230.10(a)-(d).

10. *See* 40 C.F.R. §§230.91-230.98 (EPA) and 33 C.F.R. §§332.1-332.8 (Corps).
11. *Id.* §230.91(c)(3). "Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." *Id*. §230.91(c)(2).
12. *Id*. §230.93(a)(1) (emphasis added). In determining what compensatory mitigation will be "environmentally preferable," the Corps "must assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project." *Id.*
13. *Id.*
14. *Id*. §230.93(a)(2).
15. *Id.* §230.93(h). The other criteria are that the resources to be preserved provide important physical, chemical, or biological functions for the watershed, the resources to be preserved contribute significantly to the ecological sustainability of the watershed, preservation is determined by the district engineer to be appropriate and practicable, and the preserved site will be permanently protected through an appropriate real estate or other legal instrument.
16. *Id*. §230.93(b)(1); *see also id.* §230.93(c)(1) (the Corps must use a watershed approach to compensatory mitigation where appropriate and practicable).
17. *Id.* §230.93(c)(1).
18. *Id.* §230.93(d)(1).
19. *Id.* §230.93(e)(1).
20. *Id.* §230.93(e)(3).
21. *Id.* §230.93(f)(1).
22. *Id.* §230.93(f)(2).
23. *Id.* §230.93(m), (n).
24. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, 73 Fed. Reg. 19594, 19619 (Apr. 10, 2008) (citing *Statements on the Mitigation Sequence and No Net Loss of Wetlands in Alaska*, Memorandum from Robert H. Wayland III (EPA) and Michael L. Davis (Army) to Alvin L. Ewing, Alaska Operations Office, EPA Region 10 (May 13, 1994).
25. Alaska District Regulatory Guidance Letter, RGL ID No. 09-01 at 8 (U.S. Army Corps of Engineers, Alaska District, 2009) (Alaska RGL), *available at* http://www.poa.usace.army.mil/Portals/34/docs/regulatory/AKDistrictMitigationRGL0901.pdf.
26. *Id.* app. B. "High functioning wetlands" include those that "are undisturbed and contain ecological attributes that are difficult or impossible to replace within a human lifetime, if at all. . . . The position of the wetland in the landscape plays an integral role in overall watershed health." *Id.* app. A, at 3. They also include those where "[s]pawning areas are present (aquatic vegetation and/or gravel beds)." *Id.* app. A, at 6. The headwater wetlands in the Koktuli and Upper Talarik Watersheds fit these descriptions, as the subsequent section indicates.
27. Headwater streams comprise 746 kilometers and mainstem streams 306 kilometers. Personal Communication with Marcus Geist, formerly Spatial Data Manager, The Nature Conservancy (Mar. 15, 2012). Calculations based on U.S. Geological Survey National Hydrographic Dataset.
28. *See* Judy L. Meyer et al., *The Contribution of Headwater Streams to Biodiversity in River Networks*, 43 J. Am. Water Resources Ass'n 86-103 (Feb. 2007); J. David Allan & Maria M. Castillo, Stream Ecology: Structure and Function of Running Waters (2d ed. 2007).
29. *See* G. Power et al., *Groundwater and Fish—Insights From North America*, 13 Hydrological Processes 401-22 (Feb. 1999).
30. *See* John S. Richardson et al., *Organic Matter Dynamics in Small Streams of the Pacific Northwest*, 41 J. Am. Water Resources Ass'n 921-34 (Aug. 2005).
31. Robert A. Progar & Andrew R. Moldenke, *Insect Production From Temporary and Perennially Flowing Headwater Streams in Western Oregon,* 17 J. Freshwater Ecology 391-407 (Sept. 2002).
32. *See* John G. Irons III et al., *Ecological Adaptations of Aquatic Macroinvertebrates to Overwintering in Interior Alaska (U.S.) Subarctic Streams*, 71 Canadian J. Zoology 98-108 (Jan. 1993).
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34. *See* Meyer et al., *supra* note 28.
35. *See* Thomas G. Brown & Gordon F. Hartman, *Contribution of Seasonally Flooded Lands and Minor Tributaries to the Production of Coho Salmon in Carnation Creek, British Columbia*, 117 Transactions Am. Fisheries Soc'y 546-51 (1988); Parker J. Wigington Jr. et al., *Coho Salmon Dependence on Intermittent Streams*, 4 Frontiers Ecology & Env't 513-18 (Dec. 2006).
36. Meyer et al., *supra* note 28.
37. Carol A. Woody & Sarah L. O'Neal, Fish Surveys in Headwater Streams of the Nushagak and Kvichak River Drainages, Bristol Bay, Alaska 2008-2010 (The Nature Conservancy 2010).
38. 40 C.F.R. §230.93(c)(4).
39. *Id.* §230.93(b)(1).
40. *See, e.g.,* Daniel E. Schindler et al., *Population Diversity and the Portfolio Effect in an Exploited Species*, 465 Nature 609-12 (2010).
41. *See Mulchatna River Watershed—19030302*, U.S. EPA (last visited Jan. 17, 2013), http://cfpub.epa.gov/surf/huc.cfm?huc_code=19030302 and *Lake Iliamna Watershed—19030206*, U.S. EPA (last visited Jan. 17, 2013), http://cfpub.epa.gov/surf/huc.cfm?huc_code=19030206. The USGS hydrologic units are identified in the 2008 Mitigation Rule as an appropriate basis for determining the service area of an in-lieu fee provider. *See supra* note 24. Thus, it seems reasonable to use them to define the watershed scale for compensatory mitigation purposes where no practicable mitigation options exist in the specific drainages affected by the permitted discharges.
42. Christopher Wrobel et al., White Paper No. 5: Offsetting Potential Wetlands Impacts Through the Permitting Process 3-4 (July 23, 2012), *available at* http://www.pebblepartnership.com/perch/resources/plp-white-paper-series1.pdf.
43. *See supra* notes 38-39 and accompanying text.
44. *See* Pebble Limited Partnership, Environmental Baseline Document (EBD) (2012) (last visited Jan. 17, 2013), available at http://www.pebbleresearch.com.
45. Hassan Ghaffari et al., Preliminary Assessment of the Pebble Project, Southwest Alaska, Prepared for Northern Dynasty Minerals Ltd., By WARDROP (A Tetra Tech Company), Document 1056140100-REP-R0001-00 (2011). *See also* Riley & Yocom (2011), *supra* note 2 (discussing Wardrop report). The Canadian regulation is National Instrument 43-101 (Standards of Disclosure for Mineral Projects), promulgated by the British Columbia Securities Commission. *See* British Columbia Securities Commission, National Instrument 43-101, Standards of Disclosure for Mineral Projects, *available at* http://www.bcsc.bc.ca/mining.asp.
46. *See* Ghaffari et al., *supra* note 45.
47. As recently as January 25, 2013, a diagram showing these same facilities appears on the Pebble Mine website of Northern Dynasty Minerals, one of the PLP partners. *See* Northern Dynasty Minerals Ltd., Preliminary Assessment 2011 (last visited Jan. 25, 2013), http://www.northerndynastyminerals.com/ndm/Prelim_A.asp.
48. *See, e.g.,* Comment Submitted by John Shively, Cheif [sic] Executive Officer, The Pebble Limited Partnership (PLP), on An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska, *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-ORD-2012-0276-5419 (last visited Jan. 17, 2013).
49. *See* EBD, Chapter 14, *supra* note 44.
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51. Ghaffari et al., *supra* note 45. *See also* Preliminary Assessment 2011*, supra* note 47.
52. *See* EBD, Chapter 14, *supra* note 44.
53. *See* Thomas G. Yocom, Review Comments on EPA's Bristol Bay Watershed Assessment: Habitat Loss. Prepared for Bristol Bay Native Corporation (July 23, 2012), *available at* http://www.regulations.gov/-!documentDetail;D=EPA-HQ-ORD-2012-0276-4145.
54. *See* Ghaffari et al., *supra* note 45; *see also The Pebble Project, The Future of U.S. Mining and Metals*, Northern Dynasty Minerals Ltd. (Sept. 2012) (last visited Jan. 18, 2013), http://www.northerndynastyminerals.com/ndm/Presentations.asp.
55. Alaska RGL, app. B, *supra* note 25.
56. Wrobel et al., *supra* note 42, at 1.
57. Some of the ideas described in the NDM white paper are not addressed herein because they would not offset the habitat losses caused by the proposed Pebble Mine and therefore would not be suitable as primary compensatory mitigation. These include rehabilitating chum and coho stocks in the southeastern Bering Sea through measures like mist incubation, rehabilitating sockeye stocks through lake fertilization, and funding research efforts or joint ventures.
58. *See* 40 C.F.R. §230.93(b)(2).
59. *Alaska District Approved Mitigation Banks*, Corps, Alaska District (last visited Jan. 18, 2013), http://www.poa.usace.army.mil/Portals/34/docs/regulatory/AlaskaDistrictApprovedMitigationBanks.pdf.
60. *See Lower Nushagak River Watershed—19030303*, U.S. EPA (last visited Jan. 17, 2013), http://cfpub.epa.gov/surf/huc.cfm?huc_code=19030303. The Lower Nushagak hydrologic unit as defined by the USGS does not coincide with the physical boundaries of the lower Nushagak River Watershed, as it separates the Wood River drainage into a separate hydrologic unit.

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Building Floating Wetlands to Restore Urban Waterfronts and Community Partnerships

Floating wetlands are a new technology that some cities are exploring as a means to provide potential habitat and water quality benefits. The author looks at a small-scale pilot project in Baltimore's Inner Harbor and discusses the potential benefits and challenges of floating wetlands for urban waterfronts.

By Chris Streb

As America's urban waterfronts have transformed from industrial shipping centers into mixed use and public open space, more attention has been given to the poor water quality and limited habitat value of these modified ecosystems. Cities like Philadelphia, Baltimore, and New York, to name a few, have deployed small-scale pilot projects using floating wetland (FW) technology to restore ecological services once provided by marshes and living shorelines.

FWs are designed and constructed ecosystems that mimic naturally occurring floating wetlands observed in various waterways around the world. Since land in urban areas is unavailable or difficult to reshape in a way that restores natural shorelines, FWs hold the promise of returning functions like pollutant uptake and transformation, wave attenuation, habitat, and aesthetic beautification. The measured benefits associated with the technology are still being quantified and will vary widely, depending on the application. A recent FW pilot project in Baltimore, which involves the largest installation of FWs in Maryland, has yielded notable benefits not easily measured.

Baltimore, like most cities along the Atlantic seaboard, developed into an urban area because it surrounds a harbor. At the edge of the Piedmont physiographic province, land gently slopes into relatively deep, calm tidal waters. Prior to Baltimore's development, its harbor was lined with a ribbon of tidal marshes. The marshes likely expanded during the earliest stages of Baltimore's development as sediment washing down from newly deforested colonial farms deposited along the intertidal zone. By the end of the Industrial Revolution, however, the Harbor's natural, vegetated edges had become hardened with bulkheads and piers.

In 2009, only one bit of vegetated shoreline remained along the Northwest Branch of the Patapsco River, an area known as the "Inner Harbor." Though the Inner Harbor is considered Baltimore's top destination and tourist attraction, this small stretch of vegetated shoreline was neither highly visible nor promoted as a feature. In 2010, two separate FW installations tripled the areal coverage of wetlands. By 2012, the coverage increased fivefold from 400 square feet to 2,000 square feet.

But the story of Baltimore Harbor's FWs is about more than increased acreage. It touches upon challenges and opportunities faced by Baltimore, and by many other urban, post-industrialized waterfront communities. While the Baltimore Harbor FWs hold value in that they represent a microcosm of wetlands that existed prior to colonial settlement, with ecological services that can be measured, they have also yielded social benefits that are harder to quantify. The mere act of designing, permitting, building, installing, and monitoring FWs revealed a cultural ecology of problem solving that touched upon issues ranging from water quality, ecology, and regulatory policy, to neighborhood health, civic engagement, public education, and the power of partnership.

Permitting a New Technology

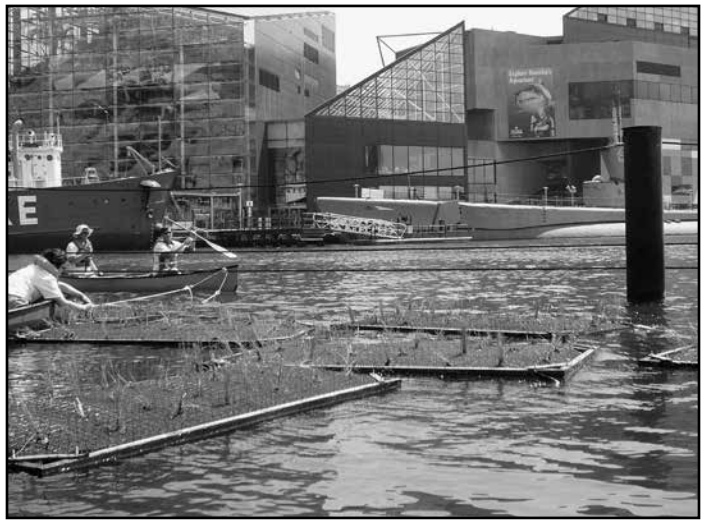
Although treatment FWs have been employed to a limited extent for at least two decades, this novel technology is in its infancy as an acceptable best management practice (Burgess & Hirons 1992). The idea to install FWs in Baltimore began in 2009, when the National Aquarium of Baltimore (NAB) and the city's Office of Sustainability developed plans for a small, 200-square-foot installation in a highly visible location of the Inner Harbor. The plans required a Tidal Wetlands and Waterway permit from the Maryland Department of the Environment (MDE). Since the technology was so novel, regulators used considerable prudence, requiring the applicants to provide more information to ensure useful outcomes that could benefit future applicants and regulatory consideration.

Just a few months later, additional pressure to permit FWs came about when another applicant submitted plans in the heart of the Inner Harbor. The Waterfront Partnership of Baltimore (WPB) is the entity responsible for managing and maintaining the Inner Harbor. The organization had long recognized the negative impression that the Harbor's poor water quality and trash were making and wanted to be proactive in its restoration. In 2010, the WPB retained Biohabitats (the author's employer) to prepare the Healthy Harbor Initiative, which set out a vision to make the harbor swimmable and fishable by the year 2020. FWs were selected as the first pilot project and a symbolic gesture to raise awareness and proactively demonstrate that big problems can be solved through creativity, education, and partnership.

Before issuing permits, the MDE had concerns regarding the technology. The most significant concern was that FWs would not be recognized as a substitute for natural wetlands. This could lead to the slippery slope of agencies or developers seeking to mitigate impacts to jurisdictional wetlands with FWs, particularly when

land is expensive, as it is near waterfronts. Further, with commercial FW vendors claiming their products possess more surface area than natural wetlands for biofilm growth and water treatment potential, one could see how this new technology might lead to FWs being pushed as technology that is better than natural wetlands. Another cited concern was that the FWs might shade or displace submerged aquatic vegetation (Mallison et al. 2001). This was not considered a problem in the Inner Harbor, but certainly applied to shallower waters around the Chesapeake Bay. Although FWs are generally thought to improve water quality, the MDE pointed to literature citing potentially deleterious effects, including lower dissolved oxygen, excessive organic loadings from detritus and concentration of metals or other contaminants. There were also concerns that the FWs would attract waterfowl that could add to the bacterial loadings already impairing the Harbor. Invasion by terrestrial weeds, long-term buoyancy, and overall durability were also concerns.

To address these concerns, the MDE limited both FW installations to 200 square feet each and required, as part of the permit, that a monitoring program be set in place. With permits in hand, both the NAB and the WPB set off on implementing two separate FWs at their respective and highly visible locations. Although the author was only involved in the WPB FW design and implementation, the permits were linked by the requirement to monitor both installations while preparing one report on the findings.



Newly planted floating wetlands. Photo courtesy of Biohabitats Inc.

The FW Systems

Understanding the benefits of FWs is challenging for a variety of reasons, but perhaps most significant is the variety of ways to manufacture FWs. The NAB purchased the proprietary Biohaven™ Floating Island, which is constructed of recycled plastic mesh (made from polyethylene terephthalate) and buoyant marine foam. The Biohaven™ was planted by community volunteers and deployed in a canal between Piers 3 and 4, adjacent to the aquarium's entrance and tethered in place with a duckbill anchor.

The WPB took a different approach, with the intent of maximizing community engagement, education, and outreach. They hired Biohabitats to design an FW based on the idea that it could serve to illuminate the connection between the everyday actions of people living in the watershed and the quality of Baltimore Harbor's water. During the development of the Healthy Harbor Initiative, Biohabitats suggested that FWs could be constructed using floating plastic bottles collected from the Harbor itself.

There was a general sense that there was power in this simple idea; that a problem plaguing the city (trash washing from streets into the Harbor through the storm drains) could be used as a material source for building an ecologically engineered solution to improve water quality and habitat. Biohabitats' FW design consists of buoyant plastic soda bottles sandwiched by planting media. The media is retained within two frames of wood and plastic mesh. Biohabitats patented this design to keep the system open source for nonprofits or other grassroots watershed groups to employ (Streb 2010). For purposes of this article, although we have never branded the system, we will refer to them as Bio-flotsam FWs.

Education and Partnership

Although the premise behind the Bio-flotsam FWs was to maximize educational opportunities, an unexpected outcome was the degree to which partnerships with other entities developed. Funding for the first installation of Bio-flotsam FWs came from a grant obtained by Harbor WaterKEEPER (now housed within Blue Water Baltimore (BWB)) for a stormwater project that was deemed infeasible. The Bio-flotsam FWs served the goals of both the WPB and WaterKEEPER and initiated an ongoing relationship between the groups.

To build the Bio-flotsam FWs, the WPB and Biohabitats began working with the Living Classrooms Foundation (LCF), an organization dedicated to educating city youth with hands-on, experiential education. With their campus on the Inner Harbor, the LCF also provided a base station for Bio-flotsam FWs construction.

The first step for constructing was to collect plastic bottles from the Harbor. The dread of picking through Baltimore City's skimmer boats was averted with help from Clearwater Mills LLC. They had recently installed a unique trash intercept at one of the local outfalls. Clearwater Mills' innovative design uses a waterwheel to turn a conveyor which lifts floatable materials from the water and deposits them in a dumpster. By simply standing at the conveyor during a storm, bottles with lids were selected from the screen.

With buoyancy and other materials required for the Bio-flotsam FWs in hand, LCF students (4th to 8th grade) were prepped for assembly. The bottles became a tangible vehicle for education. Many of these students had never considered that runoff from their neighborhoods drains to the Harbor, carrying litter from the streets. They also learned that wetlands serve as nature's water filter and provide important habitat for fish, birds, and terrestrial wildlife. Most importantly, the students helped assemble the FWs, and in the process, gained a sense of ownership of the Bio-flotsam FWs that is renewed every time they see the grasses floating on the surface of the Harbor.

Performance

The intent of FW installations is to restore some of the environmental services once provided by historical tidal marshes. These services

Floating wetlands in Baltimore's Inner Harbor. Photo courtesy of Biohabitats Inc.

include nutrient removal, nutrient processing and metabolism, reduction of the effects of eutrophication, heavy metal sequestration, carbon sequestration into plant biomass, improved water clarity, food, structure and refuge for fish and nekton, and habitat for insects, birds, and other biota (Nemerson 2011).

To determine if the FWs provided any of these services, the NAB and the University of Maryland's Sea Grant Extension Program monitored the two FWs in the Inner Harbor. Since the small footprints of the FWs were deployed in an open water body of significant volume and area, it was recognized that direct measurements of water quality differences would yield insignificant results.

To assess the potential for nutrient uptake and reduction, the NAB created and installed microcosms of the FWs. These microcosms consisted of the primary media used in both the Biohaven and Bio-flotsam FWs. Once installed in the Inner Harbor, the microcosms were quickly colonized by a host of organisms, including bryozoans, hydras, and various protists. Filter feeders, such as false dark mussels, set in mid-summer and polychaete worms became established by late summer. The microcosms were taken into the lab and evaluated for their ability to absorb nutrients. The populations of filter feeders were estimated for the FWs based on densities of organisms found on the subsamples.

It was observed that the colonized microcosms of FW media rapidly drew nutrients from the surrounding waters and assimilated them into the biofilm. The study was not able to conclude the fate of the nutrients or the long-term behavior of the ecosystem with respect to nutrient reduction, but it appears that the FWs provide a means for transferring nutrients and particulates to higher trophic levels where they are at least temporarily sequestered. The FWs were also observed to become favorite refuge for fish and crabs. Waterfowl, such as night heron, were observed on multiple occasions, perched on the FWs seeking prey.

From a durability standpoint, the FWs held up reasonably well over time. The Bio-flotsam FWs were damaged by Hurricane Irene due to their lateral tethering and exposure to high winds. This led to the development of simple adaptations to the design and tethering system that would dramatically improve durability. The success of the pilots encouraged the WPB to scale up the Bio-flotsam FWs installation, and they obtained a revised permit for 2,000 square feet of Bio-flotsam FWs.

Scaling Up

Increasing the footprint of the Bio-flotsam FWs tenfold required a more significant interorganizational effort and additional fundraising. Local corporations, looking for volunteer opportunities, played a significant part in the scale-up. The LCF received donations of materials and volunteer hours to build Bio-flotsam FW platforms. Again, the FWs served as an educational tool and a means of building awareness regarding the state of the Harbor, with adults as the students. They have also adopted the Healthy Harbor Initiative as a whole and built a curriculum around the theme for teaching science, technology, and math.

The Bio-flotsam FWs were installed as a high-profile Earth Day event in April 2012. The effort became an exercise in organizational partnership. Between the WPB, the NAB, the BWB, the LCF, and Biohabitats, we coordinated and worked with almost 200 volunteers of all ages to construct and install the Bio-flotsam FWs in front of Baltimore's World Trade Center.

The installation became a media event, even garnering national recognition from cable networks. The excitement included

the mayor of Baltimore, as well as state and federal officials, all supporting the civic goal of restoring the Harbor to swimmable and fishable conditions. Students from the LCF prepared remarks for these media events, demonstrating the power of children to voice a sense of hope and optimism in the face of extraordinary environmental challenges.

The 2,000 square feet of Bio-flotsam FWs were installed without a hitch and have had a full growing season. They survived Hurricane Sandy and other wind events and continue to attract attention. An interpretive sign has been installed to educate all passersby and help build greater civic awareness. The FWs continue to be monitored and we will have a growing understanding of their value. But perhaps the most impressive aspect of the Baltimore Harbor FW installation is the way this small gesture of intention (toward the big goal of restoring the Inner Harbor) has had such a positive, communitywide effect. ■

Acknowledgements

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61. One example is the Red Top Mine on Marsh Mountain just east of Aleknagik, which produced about 120 flasks of mercury through 1970 and apparently has not been in production since then. *See* Donald J. Grybeck, USGS, Alaska Resource Data File, New and Revised Records Version 1.5, at 564-66 (2008), *available at* http://ardf.wr.usgs.gov/ardf_data/1225.pdf. Although the acres of impact are not identified in the Alaska Resource Data File (ARDF), it can be inferred from the 10,000 feet of surface dozer trenching and about 1,480 feet of underground workings described in the ARDF that the acreage is fairly small. The ARDF description of the mine's geology gives no indication of any aquatic resources similar to those at the Pebble site.
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In the News

Strong CWA Advocate Passes Away

Earthjustice Attorney Joan Mulhern passed away at age 51 on December 18, 2012, due to liver disease. Mulhern had worked for Earthjustice since 1999 and was known for her dedication to fighting for clean water and against mountaintop removal mining. She was scheduled to write the Law & Policy Viewpoint column for this issue of the *Newsletter*. The Environmental Law Institute extends its deepest sympathies to Ms. Mulhern's family and friends. An obituary is available on Earthjustice's blog and in the *Washington Post*. Matt Schudel, *Joan Mulhern, Environmental Activist at Earthjustice, Dies at 51*, Wash. Post, Dec. 26, 2012.

N.Y. Governor Proposes Buyouts for Sandy-Damaged Homes

New York Gov. Andrew M. Cuomo proposed a $400-million-buyout plan in February that would demolish the remnants of homes destroyed by Hurricane Sandy and repurpose those areas for conservation. Flood-prone areas could be used to restore wetlands, dunes, or other natural storm buffers. The proposal requires federal approval and is one of a number of competing ideas being suggested for protecting the New York and the broader Atlantic Coast against future storms. The proposal has strong incentives to encourage homeowners to sell, including offering the house's pre-storm value, and would be one of the largest buyout efforts in U.S. history. For further details, see Thomas Kaplan, *Cuomo Seeking Home Buyouts in Flood Zones*, N.Y. Times, Feb. 3, 2013.

New Report Seeks Increased Visibility of Wetlands' Value to Society, Ecosystems

A new report from the Economics of Ecosystems and Biodiversity initiative highlights case studies on wetlands and water to help raise the visibility of the economic value that wetlands provide to society through the provision of ecosystem services. The report calls for improvements in three key areas of wetland conservation: (1) better measurements to estimate quantitative, qualitative, monetary, and spatial benefits; (2) incorporating those measurements into policy frameworks, such as integrated water resource or coastal zone management or payments for ecosystem services; and (3) transitioning management activities to better link conservation and restoration with poverty alleviation. The co-authoring organizations published the report on World Wetlands Day in February. It is available at www.teebweb.org. Kelli Barrett, *New TEEB Report Integrates Wetland Value and Economic Policy*, Ecosystem Marketplace, Feb. 7, 2013.

San Francisco Bay the Latest U.S. "Wetland of International Importance"

The U.S. government designated the San Francisco Bay a Wetland of International Importance under the international Ramsar Convention. The Bay becomes the 35th U.S. Ramsar site. It is the largest estuary on the U.S. Pacific Coast, spanning more than 600 square miles and making up more than three-fourths of California's perennial estuarine wetlands. A complete list of all U.S. Ramsar sites is available at www.ramsar.org > documents > the ramsar list. *U.S. Places San Francisco Bay-Estuary Under Treaty Protection*, Env't News Serv., Jan. 30, 2013.

Ducks Unlimited and USA Rice Federation Announce Partnership

In February, Ducks Unlimited and the USA Rice Federation announced a partnership where the organizations would examine mutually beneficial rice production, waterfowl, and water conservation projects, programs, and policies. Rice serves as a useful working lands crop, because the winter flooding of many rice fields in the southeastern United States provide valuable resting and foraging habitat along an important flyway for migratory birds. In 2012, farmers planted more than 2.5 million acres of rice, providing ample potential benefits by identifying areas where rice farming can support migratory bird habitat during winter migrations. Press Release, Ducks Unlimited, USA Rice Federation, Ducks Unlimited Form Historic Partnership (Feb. 4, 2013).

World's Largest Wetland in Antarctica?

A U.S. science exploration team has discovered "a vast ecosystem of microscopic life in underground lakes in Antarctica," according to a report from the *N.Y. Times*. The team drilled one-half mile through a sheet of ice to reach Lake Whillans, which is five feet deep and spans 23 square miles, and discovered cells metabolizing energy from water and sediment samples. The leader of the expedition believes the team has found a previously unknown ecosystem, presenting a transformative finding for how scientists understand the Antarctic continent. It is possible that the area under the Antarctic glaciers could comprise the world's largest wetland, a view held by the exploration team's leader, Dr. John C. Priscu of Montana State University. James Gorman, *Scientists Find Life in the Cold and Dark Under Antarctic Ice*, N.Y. Times, Feb. 6, 2013.

In the Agencies

Blueprint for Gulf Coast Restoration Released

The Gulf Coast Ecosystem Restoration Council, charged with designating the restoration funds collected through Clean Water Act penalties from the 2010 Gulf oil spill, released its initial plan for how it intends to do so. The report, *The Path Forward to Restoring the Gulf Coast: A Proposed Comprehensive Plan*, is an initial comprehensive plan that will be developed further in July. It details five main priorities for the Council: (1) habitat restoration and conservation; (2) restoring water quality; (3) replenishing and protecting living coastal and marine resources; (4) enhancing the resilience of local communities; and (5) revitalizing the Gulf economy. Further information, including a detailed time line, is available at www.restorethegulf.gov.

Transocean Agrees to Plead Guilty, Pay CWA Penalty

In January, the U.S. Environmental Protection Agency announced that Transocean Deepwater Inc. agreed to plead guilty for violating the Clean Water Act (CWA) and pay penalties totaling $1.4 billion for its role in the 2010 *Deepwater Horizon* oil spill in the Gulf of Mexico. The structure of the criminal resolution presented to the U.S. District Court in the Eastern District of Louisiana would dedicate $150 million of the penalty for marine and coastal conservation efforts. The $1 billion in civil penalties agree to for CWA violations is unprecedented, and those funds will be subject to the RESTORE Act of 2012 that directs CWA penalties toward Gulf states restoration projects. Press Release, U.S. Environmental Protection Agency, Transocean to Pay Record $1 Billion in Civil Penalties and $400 Million in Criminal Fines (Jan. 03, 2013).

FWS Awards $20 Million to Conserve Coastal Wetlands

The U.S. Fish and Wildlife Service awarded $20 million in grants for 24 coastal wetland conservation and restoration projects. The projects will receive an additional $21.3 million from partner organizations through matching funds. The 2013 projects will protect, restore, or enhance almost 300,000 acres of wetland habitat. A complete list of projects is available at www.fws.gov. Press Release, U.S. Fish and Wildlife Service, Fish and Wildlife Service Announces $20 Million in Grants to Conserve Coastal Wetlands (Jan. 29, 2013).

EPA Revising Bristol Bay Assessment

The U.S. Environmental Protection Agency announced in February that it would be seeking a review of its revised Bristol Bay Watershed Assessment and additional public comment. The report looked at potential impacts to the watershed from a proposed mining operation and reviewers expressed concerns with the potential negative effects on salmon habitat. The peer reviewers that raised concerns last year will have an opportunity to evaluate the Agency's revisions. The Agency received 230,000 comments from the public regarding the report, which are available through its Region 10 office's website. Carey Restino, *EPA to Release Draft Bristol Bay Assessment in Spring*, The Bristol Bay Times, Feb. 8, 2013.

Sandy Supplemental Funds Repairing Refuges

The U.S. Fish and Wildlife Service will receive nearly $70 million in congressional funds through the Hurricane Sandy Supplemental funding bill. The money will be used to help make repairs to 25 national wildlife refuges and three national fish hatcheries among Atlantic states. Ecosystem restoration is one of the cleanup priorities for the projects. A list of the projects is available at www.fws.gov/hurricane/sandy/projects.html. Press Release, U.S. Fish and Wildlife Service, Sandy Emergency Supplemental to Fund Repairs at Refuges, Hatches (Jan. 31, 2013).

In the Courts

Los Angeles County Flood Control District v. Natural Resources Defense Council, No. 11-460 (S. Ct. Jan. 8, 2013). The U.S. Supreme Court reversed a lower court decision holding a water district liable under the Clean Water Act (CWA) for violating its municipal separate storm sewer system permit. The lower court ruled that the violations occurred when the polluted water detected at the monitoring stations flowed out of concrete-lined portions of the Los Angeles and San Gabriel Rivers, where the monitoring stations are located, into lower, unlined portions of the same rivers. But the flow of water from an improved portion of a navigable waterway into an unimproved portion of the same waterway does not qualify as a "discharge of a pollutant" under the CWA. In *South Florida Water Management District v. Miccosukee Tribe*, 541 U.S. 95 (2004), the Court held that the transfer of polluted water between "two parts of the same water body" does not constitute a discharge of pollutants under the CWA. The lower court's decision cannot be squared with this holding. Ginsburg, J., delivered the opinion of the Court, in which Roberts, C.J., and Scalia, Kennedy, Thomas, Breyer, Sotomayor, and Kagan, JJ., joined. Alito, J., concurred in the judgment.

Rose Acre Farms, Inc. v. NC Department of Environment & Natural Resources, No. 12-CVS-10 (N.C. Super. Ct. Jan. 4, 2013). A North Carolina court held that the state's environmental agency has the authority to require an egg farm to obtain a national pollutant discharge elimination system permit to prevent airborne pollutants from reaching state waters. The egg farm does not make any direct discharges into state waters, but ammonia and other pollutants may enter state waters via feathers and dust through the hen house's ventilation fans. The farm argued that its egg production facility is exempt as an agricultural stormwater discharge. But the agricultural exemption applies to pollutants that have been applied to land, not to pollutants that reach state waters from expulsion by ventilation fans. The agency, therefore, has the authority to require a permit. In addition, the record established a genuine issue of material fact as to whether pollutants from the farm enter state waters. On remand, the court must hold an evidentiary hearing to determine whether the permit at issue is valid.

Virginia Department of Transportation v. EPA, No. 1:12-CV-775 (E.D. Va. Jan. 3, 2013). A district court held that the U.S. Environmental Protection Agency (EPA) cannot regulate stormwater as a pollutant under the CWA. According to the court, the language of CWA §303(d)(1)(C) is clear. EPA may set total maximum daily loads (TMDLs) to regulate pollutants, and pollutants are carefully defined. Because stormwater runoff is not a pollutant under the Act, EPA may not regulate it via TMDLs. Claiming that the stormwater maximum load is a surrogate for sediment, which is a pollutant and therefore regulable, does not bring stormwater within the ambit of EPA's TMDL authority. The court, therefore, held that EPA lacked authority when it used stormwater flow-based limits as a surrogate for sediments in establishing a TMDL for a creek in northern Virginia.

Waterkeeper Alliance v. Hudson, No. 10-487 (D. Md. Dec. 20, 2012). A district court dismissed an environmental group's Clean Water Act action against a poultry farm claiming that it illegally discharged chicken litter into tributaries of the Chesapeake Bay. The group claimed that chicken litter, which is alleged to contain various pollutants, was discharged without a permit from the farm into the Pocomoke River. The group claimed that chicken litter is either blown out through the chicken house exhaust fans or tracked out on shoes and equipment coming in and out of the chicken houses. But ultimately, the group failed to meet its burden of establishing that there was a discharge of pollution from the poultry operation. In addition to confined poultry units, the farm raises cattle. And in contrast to the tons of cattle manure that were observed at the farm, what was observed outside of the chicken houses, and identified as actual chicken litter, was quite limited.

Arkansas Game & Fish Commission v. United States, No. 11-597 (S. Ct. Dec. 4, 2012) The U.S. Supreme Court held that government-induced flooding that is temporary in duration may constitute a takings and is not automatically exempt from Takings Clause inspection. The case arose after the U.S. Army Corps of Engineers extended flooding from a dam into the Dave Donaldson Black River Wildlife Management Area's peak timber growing season. The Arkansas Fish and Wildlife Commission, which owns and manages the management area, filed suit, arguing that the temporary deviations constituted a taking of property that

entitled it to compensation. The Commission maintained that the deviations caused sustained flooding during tree-growing season, and that the cumulative impact of the flooding caused the destruction of timber in the area and a substantial change in the character of the terrain, necessitating costly reclamation measures. The trial court held in favor of the Commission, but the appellate court reversed, holding that government-induced flooding can give rise to a takings claim only if the flooding is permanent or inevitably recurring. The Supreme Court disagreed. None of the Court's decisions authorizes a blanket temporary-flooding exception to the Court's Takings Clause jurisprudence, and the Court found no solid grounding in precedent for setting flooding apart from other government intrusions on property. Rather, when a regulation or temporary physical invasion by the government interferes with private property, time is a factor in determining the existence of a compensable takings, as well as the degree to which the invasion is intended or is the foreseeable result of authorized government action, the character of the land at issue, the owner's reasonable investment-backed expectations regarding the land's use, and the severity of the interference. The case was therefore reversed and remanded. Ginsburg, J., delivered the opinion of the Court, in which all other members joined, except Kagan, J., who took no part in the consideration or decision of the case.

Michigan v. United States Army Corps of Engineers, No. 10 C 4457 (N.D. Ill. Dec. 3, 2012). A district court dismissed a lawsuit brought by five states seeking an order requiring the U.S. Army Corps of Engineers (the Corps) to create physical barriers in the waterways connecting Lake Michigan and the Mississippi River Basin in order to prevent bighead and silver carp from migrating into the Great Lakes. The states argued that the Corps' failure to install physical barriers to separate the waterways will cause a public nuisance—namely, invasion of the Asian carp—resulting in grave and irreversible environmental and economic harm to the entire Great Lakes region. But the primary action that states demand to abate the nuisance alleged—hydrologic separation of the Chicago Area Waterway System from Lake Michigan—lies outside of the limits of the Corps' congressionally delegated authority to act. In the absence of a constitutional violation (and none is here alleged), the court may not order parties to take action that would directly contravene statutory mandates and prohibitions, and the common law recognizes that actions required by law do not give rise to liability for nuisance. If the states want to remove these congressional impediments to hydrologic separation and to replace them with effective barriers between the waterways, they must do so by means of the legislative process, not by alleging that the Corps' acts and/or omissions, required by federal statutes, violate federal nuisance common law and therefore justify an override of those statutes by the courts. The states' complaint, therefore, was dismissed.

Hillside Environmental Loss Prevention, Inc. v. United States Army Corps of Engineers, No. 11-3210 (10th Cir. Nov. 28, 2012). The Tenth Circuit upheld a U.S. Army Corps of Engineers (Corps) dredge and fill permit allowing a railroad company to build a terminal on land outside Kansas City, Kansas, that contains streams and wetlands. Environmental groups argued the Corps inadequately considered alternatives to the selected site under the Clean Water Act. But the Corps successfully rebutted the presumption that less environmentally damaging practicable alternatives to the preferred site existed. All but two of the proposed alternative sites were impracticable. Of those two, the site chosen by the Corps contained fewer wetlands and were of a lesser quality. In addition, the Corps' decision not to prepare an environmental impact statement (EIS) under the National Environmental Policy Act was not arbitrary or capricious. The Corps' finding that there will be no significant impact from fugitive dust emissions at the facility was not arbitrary and capricious. The railroad company entered into a mitigation agreement with the state that requires it to monitor the site and to adopt mitigation measures if dust emissions exceed levels specified in the agreement. The record also supports the Corps' conclusion that water impacts from the facility are insignificant. Nor was the project "highly controversial" to warrant the preparation of an EIS.

In the Congress

Sandy Relief Bill Passed

In late January, President Barack Obama signed a $50.5 billion relief measure for states hit by Hurricane Sandy last fall. About $4 billion is dedicated for Sandy-specific projects, while the rest will be shared amongst a range of efforts that include but are not limited to Sandy victims for federal disaster relief, community block grants, and New York and New Jersey transit repairs. The bill follows an initial Sandy relief bill signed into law in early January, which primarily replenished funds for the National Flood Insurance Program to help it respond to the more than 100,000 claims that have been filed since Sandy. Associated Press, *Obama Says He'll Sign $50.5B Superstorm Sandy Aid Bill as Soon as It Hits His Desk*, Wash. Post (Jan. 29, 2013).

Farm Bill Extension Passed; Zero Baseline for Conservation Remains

The U.S. Congress passed a nine-month extension to parts of the 2008 Farm Bill, as part of the bipartisan financial package to prevent the so-called fiscal cliff at the end of 2012. The deal maintained direct payments for some commodities, but did not extend any funds to conservation programs, such as the wetlands reserve program, that have been without baseline funding since the bill's original expiration in September 2012. Among the possible outcomes for conservation measures in the next Farm Bill are linking conservation compliance to crop insurance payments; insurance may replace direct payments, which would change the compliance mechanism for the Swampbuster and Sodbuster provisions that have been a staple of Farm Bill conservation efforts for nearly 30 years. Hearings and markups of Farm Bill legislation are anticipated to begin in the Spring. *See* 2013 Conservation Policy Agenda of the Theodore Roosevelt Conservation Partnership at www.trcp.org, and *see also* David Rogers, *Fiscal Cliff Deal Includes Farm Bill Extension*, Politico, Jan. 1, 2013.

Bill Introduced to Limit EPA Veto of Corps Permits

Several lawmakers introduced H.R. 524, which would bar the U.S. Environmental Protection Agency (EPA) from retroactively vetoing approved U.S. Army Corps of Engineers permits. In 2011, under the authority of Clean Water Act §404(c), EPA vetoed an approved mountain-top mining permit for Arch Coal Inc. in West Virginia. Manuel Quinones, *Lawmakers Float Bill to Limit EPA's Army Corps Permit Vetoes*, Greenwire, Feb. 7, 2013.

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