APPENDIX B: SCIENCE PANEL REPORT

CITY OF PORTLAND
ENVIRONMENTAL SERVICES
1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204 ▪ Dan Saltzman, Commissioner ▪ Dean Marriott, Director

MEMO

November 1, 2010

To: Sallie Edmunds, Bureau of Planning and Sustainability

From: Kaitlin Lovell, Bureau of Environmental Services

Subject: River Plan / North Reach Science Panel Summary

As you know, the River Plan / North Reach, unanimously adopted by City Council on April 15, 2010, allows applicants for development in the River Environmental Zone to pay for off-site mitigation under certain circumstances. The off-site mitigation payment will be paid to the City in the form of a fee-in-lieu until a mitigation bank is operating in the North Reach. Both the fee-in-lieu and the mitigation banks require an open, transparent and scientifically valid quantitative method for assessing the impacts to the natural resources in the river overlay zone. City staff and consultants have been developing the method and then used that method on proposed restoration sites to determine the mitigation fee. This memo summarizes how an expert science panel was used to inform that process, as directed by Council in Resolution #36778.

City staff wanted the habitat impact assessment method to be 1) open and transparent; 2) represent the best available science - well tested on multiple habitat types and suitable for the Willamette River; 3) publicly available (non-proprietary); 4) allow for "in kind" tracking (i.e.: in-water restoration for in-water impacts); 5) accepted by multiple state and federal agencies; and 6) allow mitigation to stay in the North Reach service area. The City proposed a combined approach using the Habitat Equivalency Procedure (HEP) used the Fish and Wildlife Service and the Army Corps of Engineers to populate the Habitat Equivalency Analysis (HEA) used by the National Marine Fisheries Service.

City staff convened a science panel in July, 2010 to review and provide feedback on the scientific integrity of the City's proposed HEP/HEA approach. The City sent out a call for nominations of scientists (see attachment 1), and selected a panel that collectively had experience with habitat valuation in the types of habitat found in the North Reach. The following panel members were chosen:

- Derek Booth, PhD, PE, PG, President, Stillwater Sciences, Inc/University of Washington
- Bobby Cochran, Executive Director, Willamette Partnership
- Doug DeHart, PhD, Fisheries Biologist (retired, USFWS/ODFW)
- Brent Hadaway, ICF/ Jones and Stokes
- Jimmy Kagen, Director, Oregon Natural Heritage Information Center, OSU
- Mary Kentula, PhD, Wetland Ecologist, EPA
- Brian Lightcap, Wetland Ecologist, (retired, Army Corps of Engineers)
- Randy Moore, Department of Fisheries and Wildlife, OSU
- Stan van de Wetering, Siltez Tribes

The panel met on June 18, 2010 for 4.5 hours. There was one public comment period prior to the panel's deliberations, and a public report out session following the deliberations. The entire deliberation was videotaped and made available to the public. The City asked the panel to provide responses to a variety of questions at the meeting and in writing. In general, the scientists provided the following feedback: they could not suggest a better alternative method and said that the proposed HEP/HEA approach could work; the HEP/HEA model could be improved if the City focused on an ecosystem function approach rather than a species-based approach; adaptive management should be used to maintain the model; weighting factors for specific criteria could be used; and the City should include a broader landscape-level evaluation. Please see attachments 2 – 6 for background information provided to the panelists, more information on the science panel discussion and public comments submitted at the panel meeting.

The City analyzed the scientists' comments and presented a response at a public briefing on July 27, 2010 (see attachment 7 for City response). The City responded to the feedback by revising the model to focus on ecosystem functions and services rather than species and their key habitats. The City sent the revised model back to the scientists for further comment. Two scientists responded reemphasizing the need for monitoring and the broader landscape-level evaluation. The City provided information on the City's comprehensive monitoring program (see attachment 8) that will be launched in the Willamette in 2011. We agree in the value of a pre-implementation and regular evaluation of the landscape conditions to see if the City is meeting its goal of no net loss of ecological function. We will work with the Office of Healthy Working Rivers and the North Reach Advisory Committee to evaluate the feasibility and required resources to conduct a baseline evaluation prior to the initiation of the mitigation bank.

Attachments

1. **Call for nominations form (p. 1-3)**
2. **River Plan introduction for Science Panel (p. 4-5)**
   Introductory information provided to Science Panel members
3. **Science Panel meeting notes (p. 6-11)**
   Meeting notes from the June 18, 2010 Science Panel discussion
4. **Written responses (p. 12-35)**
   Science Panel members' written responses to the panel questions
5. **Panel response summary (p. 36-46)**
   Detailed summary of Panel members' written and oral responses
6. **Public comments recorded at the meeting (p. 47-57)**
   Summary of oral and written comments submitted at the June 18, 2010 meeting
7. **City's draft response to Science Panel recommendations (p. 58-60)**
   Draft responses to the Science Panel's questions and recommendations
8. **City of Portland's Watershed Monitoring (p. 61-69)**
   Monitoring information provided to the scientists as follow-up information

Call for Nominations
Dated: *March 22, 2010*

Summary: The City of Portland, Bureau of Environmental Services (BES), Science, Fish, and Wildlife is seeking nominations of independent experts to conduct a peer review regarding the formulation of the City of Portland's proposed "North Reach Willamette River Mitigation Bank".

Dates: Nominations should be submitted by *April 23, 2010* per the instructions below.

For Further Information Contact: Any person wishing further information regarding this request for nominations may contact Ms. Kaitlin Lovell, Designated City Representative (DCR), Bureau of Environmental Services, by telephone/voicemail at (503) 823-7032; by fax at (503) 823-6995 or via e-mail at: kaitlin.lovell@portlandoregon.gov. General information concerning the City of Portland Watershed Plan can be found at the City of Portland's website at: http://www.portlandonline.com/bes/index.cfm?c=32184, and information regarding the City of Portland's River Plan, North Reach can be found at: http://www.portlandonline.com/bps/index.cfm?c=42540

Supplemental Information:

Background: In order to address the on-going issues in the North Reach of the Willamette River, City staff, with the input of several stakeholder and community committees, has developed the first phase of the River Plan focusing on the North Reach. The River Plan / North Reach focuses on balancing the competing goals of:

- Maintaining a prosperous working harbor,
- Protecting and enhancing natural resources,
- Facilitating the clean-up of hazardous substances, and
- Providing public access to, along and across the river.

Purpose:

As a tool to help achieve these goals, the City is developing a City of Portland programmatic mitigation bank for the Lower Willamette River, specifically the North Reach of the Willamette River from RM 0 to RM 11.5 (approximately the Broadway Bridge). This mitigation bank will allow individual private or public banks to be certified to offer natural resource mitigation under the City's River Code (formerly the Greenway Code). Information developed by this panel of experts will be used to certify and establish mitigation banks that directly mitigate for development within the North Reach of the Willamette River with the possibility of expanding the geographic range as the River Plan addresses the Central and South Reaches of the Lower Willamette River within the City of Portland. Specifically, panel members will:

- Provide peer review and comment on the City's proposed valuation/quantification of habitat and its application in the North Reach;
- Provide direction for implementation, and identify any gaps;
- Advise the City on the potential need for additional biological factors for consideration.

Qualification Requirements: The City of Portland is seeking nomination of experts with regionally recognized expertise, knowledge, and experience for their work in comprehensive Habitat Evaluation Procedure (HEP), Habitat Equivalency Analysis (HEA), habitat quantification modeling, hydrology, hydrogeology, ecology, or aquatic or wildlife biology. Nominees with experience or expertise in the Willamette River are preferred, and must be qualified, independent scientists. Scientists from academic institutions, or non-regulatory scientists from state, federal or tribal agencies such as but not limited to the NOAA Northwest Fisheries Science Center, U.S. Forest Services Pacific Northwest Research Center, Columbia River Inter-Tribal Fish Commission, or Northwest Power and Conservation Commission Fish and Wildlife Program, are encouraged to apply. Qualified scientists who may have a pecuniary or financial interest in the development or application of the mitigation bank, or who have a direct or indirect conflict of interest in the process will not be considered.

Process and Deadline for Submitting Nominations: Any interested person or organization may nominate qualified individuals in the areas of expertise described above for possible selection and subsequent service on this expert ad hoc Panel. Nominations should be submitted in electronic format (which is preferred over hard copy). Self nominations are acceptable.

The City of Portland, BES, Science, Fish, and Wildlife Program requests:

- Contact information for the person making the nomination
- Contact information for the nominee
- Disciplinary and specific areas of expertise of the nominee
- The nominee's curriculum vita
- Sources of recent grant and/or contract support
- A biographical sketch of the nominee indicating current position, educational background, research activities, and recent service on other advisor committees or professional organizations.

Persons having questions about the nomination process should contact Ms. Kaitlin Lovell, the DCR, as indicated above in this notice. Nominations should be submitted in time to arrive no later than *April 23, 2010*. The City of Portland, BES, Science, Fish, and Wildlife program will acknowledge receipt of nominations.

Selection Process

The City of Portland will select, from those nominated, a balanced review panel which includes candidates who possess the necessary domains of knowledge, the relevant scientific perspectives (which, among other factors, can be influenced by work history and affiliation), and the collective breadth of experience to adequately address the charge.

The Science, Fish, and Wildlife Program will appoint a selection committee to review the pool of nominees. Due diligence will be conducted for all nominees to ascertain a nominee's level of impartiality, and/or lack of competing or conflicting pecuniary interests (including private and public activities) with regards to the outcome of the mitigation bank. The nominee is charged with bringing forth any possible affiliations or activities that could possibly be construed (either by the City or the public) as pecuniary interests.

Selection of qualified candidates will be based from information provided by the candidates themselves, and background information gathered by the City's, Science, Fish, and Wildlife Program. Selection criteria to be used for Panel membership include: (a) Scientific and/or

technical expertise, knowledge and experience (primary factors); (b) availability and willingness to serve; (c) absence of financial conflicts of interest or appearance of partiality;; and (d) skills working in committees, subcommittees and advisory panels; and, for the Panel as a whole, (f) diversity of scientific expertise and viewpoints. The City of Portland values and welcomes diversity. In an effort to obtain nominations of diverse candidates, the City of Portland encourages nominations of women and men of all racial and ethnic groups.

Commitment, this review panel will require approximately 20 hours of work, including a 4-6 hour workshop held in Portland with the balance comprised of review and report writing. The workshop will be facilitated and recorded by EnviroIssues. Travel reimbursement is possible but otherwise no compensation will be expended for these services.

Introduction to the North Reach Mitigation Bank Science Panel:

The City of Portland is revising its environmental regulation along the Willamette River. Known as the River Plan, it is a comprehensive, multi-objective plan for land along the Willamette River that strives to balance jobs, natural resources, access to the river and livable communities. The first application of the River Plan is in the North Reach of the Willamette River, which extends from the Freemont Bridge to confluence with the Columbia River. The North Reach Plan creates a new "river zone" that serves to protect and conserve natural resources while allowing certain types of industrial development. (Code language 33.475.400 et seq. and 33.865 et. seq.). The river zone applies to both the river itself as well as key upland areas. These natural resources have been inventoried in the Natural Resources Inventory, and given a broad ranking of High, Medium or Low (Volume 3A). The river zone applies to those areas that received a medium or a high ranking. In addition, the new code language requires development to protect the identified "functions and values" of the natural resources.
One way to protect the identified functions and values is through mitigation. The code allows two types of mitigation: onsite and offsite. The offsite mitigation allows for the purchase of credits from a City certified mitigation bank.

The North Reach Mitigation Bank Science Panel is being convened to advise the City on the accounting of the functions and values of the natural resources for use in the mitigation bank. The City is proposing to use a hybrid model that combines a Habitat Evaluation Procedure (HEP) with a Habitat Equivalency Assessment (HEA). The City is proposing to use Habitat Suitability Indices to populate the HEP. While the City is not required to use these methodologies, we are specifically targeting habitat accounting that is: 1) open and transparent; 2) represents the best available science - is well tested on multiple habitat types and suitable for the Willamette River; 3) publicly available (non-proprietary); 4) allows for "in kind" tracking (ex: in water impacts are not mitigated by upland restoration); 5) is widely accepted by multiple state and federal agencies (to minimize doubling mitigation requirements); and 6) allows mitigation to stay in the North Reach service area.

With that background, we are asking this esteemed panel to inform the city on the following questions:

1) To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?
2) Did we get the right species? Are we missing a species or habitat?
3) We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?
4) By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size,

or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

5) Others?

Material provided will include:

- Volume 1A of the North Reach Plan - weblink
- Pertinent sections of the Code (see citations above) – photocopies/e-copies
- Volume 3A (Natural Resources Inventory) – for reference – web link
- Draft Accounting documentation – e copies
- NRDA Trustees Executive Summary from their Science Panel – e copies

North Reach Science Panel
June 18, 2010
Meeting notes

Participants:

Expert panel members in attendance: Jimmy Kagen, OSU/PSU/ORNHIC; Brian Lightcap, (ret.) USACE; Randy Moore, OSU; Derek Booth, Stillwater Sciences/UW; Mary Kentula, EPA; Brent Haddaway, ICF/Jones & Stokes; and Bobby Cochran, Willamette Partnership

Invited experts who could not attend (input provided as attachment to this meeting summary): Doug DeHart, (ret.) USFWS/ ODFW; and Stan van de Wetering, Siletz Tribes

City staff: Kaitlin Lovell, Paul Ketcham, Chris Prescott, Ann Beier, Kevin Kilduff, and Patti Howard

Consultant: Darlene Siegel, Tetra Tech

Facilitator: Julie Wilson, EnviroIssues

Meeting purpose:

The North Reach Science Panel was convened to advise the City of Portland on the accounting system used in the North Reach mitigation bank. The following questions were sent to expert panel members to consider prior to, and discuss at, the meeting:

1. To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified?

2. Did we get the right species? Are we missing a species or habitat?

3. We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

4. By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

Public testimony:

At the request of the Mayor, the science panel meeting was preceded by a 1-hour opportunity for public comment. Two people spoke during the public comment period. Those comments can be obtained by

viewing the DVD recording of the meeting. At the end of the meeting there was a 30-minute session when the public could hear a summary of the proceedings and ask questions.

Meeting summary:

Kaitlin Lovell introduced the City staff, and provided background and context for the meeting. She also explained that the two fish biologists invited to participate (Dehart and van de Wetering) were unable to attend. The city is revising its Greenway Code and the first location is for the North Reach of the Willamette River. The North Reach is a designated industrial sanctuary, and protective of river dependent industrial uses. A new River Zone has been added, in which any environmental impacts need to be avoided or minimized. If they cannot be avoided or minimized, they need to be mitigated, in the following order: on-site (on same tax lot[1]), or offsite (in "the Pearls", which are public and private properties with ecological value or potential). On-site is currently preferred, if meaningful, to discourage fragmentation. The Pearls serve a dual purpose as mitigation and restoration sites. Mitigation alone is intended to maintain function. Restoration provides the added lift by requiring any site requesting development, regardless of location, to landscape 15% of their site or pay an in-lieu fee for off-site revegetation.[2] Mitigation must be in-kind for lost functions, to result in no net loss of functions. Paul Ketcham added that more fish use has been identified in the North Reach than previously thought, and that many of the sites within this area are contaminated; the harbor is a Federal Superfund site. Mitigation for past damages is not part of this effort. Kaitlin also indicated that the mitigation "accounting" system should adhere to the following criteria: it should be open (not proprietary), it should be aligned with state and federal government systems (so as to not require double mitigation), and it should incorporate the best available science, with the latter being the driver.

Questions 1 and 2 To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified? Did we get the right species? Are we missing a species or habitat?*:*

Derek Booth asked for clarification as to whether the city was proposing two conceptual frameworks; an ecosystem based approach (with the Pearls), and a non-contextual valuation of conditions (e.g., if you remove 2-feet of buffer there, you must replace 4-feet of buffer there). If so this is a conflict. Chris Prescott agreed, indicating that some of this is due to a limitation in the tools used, such as with connectivity. Derek asked why the group was not committed to one framework. Jimmy Kagen suggested that context must be included in the measures to resolve the framework conflict. Even if different tools need to be used, results can be evaluated spatially. There was some discussion about including Pearls outside of the North Reach area, such as Smith and Bybee lakes, which are highly

[1] Correction by the City 7-26-2010: it is the same ownership, regardless of tax-lot.

[2] Correction by the City 7-26-2010: The restoration/landscaping requirement is up to 1% of project value with a cap of $200,000 per permit.

valuable habitats whose enhancement could provide large ecological benefits. Kaitlin responded that other Pearls are identified in other planning efforts, but they will all be integrated into restoration efforts. Smith and Bybee is part of the Columbia Corridor planning area. Bobby responded that planning boundaries don't make sense if the goal is to mitigate for function. Later in the discussion Darlene Segal explained that the intent of this process is to provide fair and equitable scores for development projects so that value is not lost, not necessarily to provide ecological lift in the area. Paul added that the decision to do this and focus on mitigating within the North Reach was done in a citywide context. Other areas of the city – tributaries and stormwater - are being mitigated and restored through other programs and efforts. Derek asked about the regulatory environment. Washington State Department of Ecology wants to see net gains in brownfields, not just to minimize functional loss. Chris responded that the biggest driver is development review, since the bank is to mitigate for loss due to development.

The grouped discussed whether the proposed HEP-HEA methodology was appropriate for their focus, which is on retaining function. Mary Kentula asked for clarification about how habitat and function are being used in the model. City staff responded that habitat is a surrogate for function, and that habitat is essentially land cover and the features, such as riprap, on them. Mary indicated that if you use a habitat model like HSI, then you are using habitat in a different way, for organisms to measure the ecological value of the habitats on the landscape. Bobby added that Oregon Department of State Lands' definitions are that function is the ability of the site to perform, value is its ability to perform the function within context (usually based upon where it is in the landscape), and function + value is the service. Randy Moore explained that if you are trying to mitigate for yellow warbler habitat by using the HSI, the value is determined by existing habitat information. This may or may not capture the true value of what we are trying to mitigate for.

With regard to whether the proposed model is the best, Jimmy indicated that the Willamette Partnership has a model that could be considered. Bobby indicated that it may be too early to say whether the Partnership's model is the right one, but he recommended looking at a North Carolina Ecosystem Enhancement program model. However, he felt that reaching the program's goals within the spatial constraints and in-kind requirements placed upon them is independent of the methodology. The spatial extent of mitigation should be either the Reach boundaries (of all three reaches) or City of Portland boundaries, which is a policy question. Prioritization of in-kind or out-of-kind should be based on ecological goals with flexibility built in. Also, the sequencing that Kaitlin described in the introduction is different from the federal and state sequencing, which is to avoid, minimize and then perform *off*-site mitigation. With these three things decided, many methodologies will work.

Brian Lightcap asked where costs would be considered. He suggested that the mitigation depends upon the funding package. Brian suggested that the city review the Florida model that was used at Ramsay Lake. With regard to costs of development, an estimate of the economic value of development investment in the North Reach, based upon the last ten years, is $700M. The first mitigation proposal was to put 1% of development costs into a fund for restoration in designated areas. The result of this proposal reduced environmental funding from economic investment to $7M. In addition, a big

uncertainty is that Superfund liabilities have not yet been resolved. Landowners of contaminated sites don't yet know what they will be required to do.

Jimmy indicated that if the goal is to mitigate for specific species, the HEP-HEA model is as good as any other. If the goal is to mitigate for generalized habitat and function, then perhaps it is not the best model. Bobby suggested that the city not use the HEP-HEA model for grasslands and around streams, and that functional assessments might be better for these. Having two methods is acceptable, as long as the score is correct. The important thing is that the results are repeatable and stand up in court. HSI will not provide functions and values, but could improve the process, which does not have to be perfect. Incorporating landscape context into the score will be very helpful. Mary added that a National Research Council report on mitigation found that decisions made on a site by site basis without landscape context were, in part, why some of the projects did not work. They were good projects in the wrong places. Wetlands in a landscape provide the functions and values; few can be attributed to individual sites. She went on to comment about using the HSI. It is difficult to suggest any better method because all have some problems. The limitations of whatever method is used need to be understood.

Kaitlin summarized the group's response that they support the model's focus on functions, but that a weakness may be that the model reduces the functions assessment to the species level. Species is a surrogate for habitat, and habitat is a surrogate for function. She asked how we close the gap? Randy suggested using (for example) yellow warbler as an index for conserving other bird species. This is more direct than using the model to create habitat elsewhere for yellow warbler and other birds. Kaitlin agreed that this would reduce the danger of layering surrogates. Brent added that each of the city's factors is measured subjectively. User error and scoring variability could be magnified at each step, which is only slightly reduced even with group training. He suggested using a range of mitigation requirements rather than a specific DSAY score. The assessment puts a project score within a category. This approach is less accurate but correct more often, and helps address variability of the models. Also, to help explain this approach to stakeholders, the city can respond that scores are presented in ranges because precision of the model cannot be known. Bobby indicated that Washington Department of Ecology thinks it gets better restoration with ranges. Potential manipulation of the final range assignment would not be any worse than potential manipulation of the DSAY score. Mary provided an example of a court case that stood up to review because the final score utilized categories. The Willamette Partnership assumes all score will be +/- 15%. To account for this, landowners are required to purchase 15% more credits. Bobby agreed to help develop the justification for use of ranges for assessments.

The group discussed whether the proposed indicators were representative of the habitats. Jimmy responded that they appeared to be representative for all habitats except for uplands. There are too many indicators for the uplands, and dividing upland habitats as the city has done may not be useful.

Current species of concern are addressed in the NRI, which gives these habitats the highest value, and would be represented as a function and value to include in the assessment to replace. The NRI and the

HSI are not one-to-one. One could attribute a higher value than the other. Bobby suggested that the city could pre-calculate the mitigation value for the North Reach, since it is not a large area. This would increase predictability for business. Jimmy recommended that only major upland types be identified, and that shallow water habitat be distinguished from deeper water. The group moved towards the thinking that a functional assessment (using the NRI as a basis) and a species assessment (i.e., the HEP-HEA model) combination might be preferable. Brian suggested that the city prepare an example assessment comparing how the NRI would score a site, and then perform an assessment of what actually exists using the model and then compare the evaluations for variability. Kaitlin indicated that the city has done this for one site and can send the results to the group. Brian suggested that they also do this for one site "not on the radar". Kaitlin and Paul will identify a site.

Derek noted that coho habitat has been reduced to two factor types, which is very limited compared to current scientific understanding of actual needs. He suggested that the city either select a number of species or keystone species. Otherwise, habitat for one threatened fish species could conflict with that of another fish species. Bobby asked if the city had reviewed the Willamette Partnership's salmon metric, which is based upon coho. It is a functional assessment; it does not address context. Bonneville Environmental Foundation is currently testing it for validity and repeatability. Derek thought that there are too many habitats to capture them all in the model. The more that the city tries to refine and perfect the model runs counter to current understanding. He suggested simplifying the model rather than try to make it more complicated, since there is no justifiable approach. Derek referred to mitigation ratios as a way to simplify the approach. Brian agreed, suggesting that this would make transparency easier, because flaws are known and can be admitted.

Mary asked about the city's plans to evaluate whether the model is working. There was a recent violation on the Missouri River, and the court questioned whether anyone had evaluated the models to see if they worked. Experts invited by the court to review the model found serious flaws. The evaluation should be built in, and adaptive management should be included. She also stated that other groups have collected so much data and then wondered what to do with it all, so it is important to have a plan for the use of the information collected. Kaitlin responded that they are requiring monitoring in the bank. She agreed that they should add something, perhaps build in stops to evaluate whether objective and progress are being met. Derek added that monitoring and outcomes need to be included from the start to be able to manage adaptively.

Question 3 We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?*:*

Kaitlin asked the group for feedback on the use of "gray literature" (which is not published in a peer-reviewed journal but may be otherwise peer reviewed). The group generally agreed that using gray literature was acceptable, as long as they do not ignore peer reviewed literature. Gray literature is often peer reviewed. Mary indicated that she had a list of documents that she could provide, including one that compares various methods.

Question 4 By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?:

Kaitlin questioned how to build context and rarity into the accounting. Jimmy recommended prioritizing the whole area to show which places matter most in the context of the entire region and weighting those. There are many existing tools for prioritizing, such as one by the Nature Conservancy. Grassland has context variables that determine the values. Bobby added that, for riparian, start with ORWAP and build from there. Mary asked whether the city was using reference sites. Randy indicated that what is between patches and patch shape can be more important than patch size (e.g., linear versus globular). Brian added that succession to forest should be factored in. Rivers control succession by flooding, but uplands are more difficult.

Kaitlin asked how to build in uncertainties, such as river rise. Bobby recommended maintaining a programmatic reserve of credits using an uncertainty factor, and preventing such responses as riprapping to protect riparian areas. Mary reminded that projects need to allow systems to move as waters rise, such as *Spartina* marshes, which have to move up as sea levels rise. Brian recommended getting good stewardship agreements from landowners for the foreseeable next 20 years.

Introduction to the North Reach Mitigation Bank Science Panel: Jimmy Kagen

The City of Portland is revising its environmental regulation along the Willamette River. Known as the River Plan, it is a comprehensive, multi-objective plan for land along the Willamette River that strives to balance jobs, natural resources, access to the river and livable communities. The first application of the River Plan is in the North Reach of the Willamette River, which extends from the Freemont Bridge to confluence with the Columbia River. The North Reach Plan creates a new "river zone" that serves to protect and conserve natural resources while allowing certain types of industrial development. (Code language 33.475.400 et seq. and 33.865 et. seq.). The river zone applies to both the river itself as well as key upland areas. These natural resources have been inventoried in the Natural Resources Inventory, and given a broad ranking of High, Medium or Low (Volume 3A). The river zone applies to those areas that received a medium or a high ranking. In addition, the new code language requires development to protect the identified "functions and values" of the natural resources.
One way to protect the identified functions and values is through mitigation. The code allows two types of mitigation: onsite and offsite. The offsite mitigation allows for the purchase of credits from a City certified mitigation bank.

The North Reach Mitigation Bank Science Panel is being convened to advise the City on the accounting of the functions and values of the natural resources for use in the mitigation bank. The City is proposing to use a hybrid model that combines a Habitat Evaluation Procedure (HEP) with a Habitat Equivalency Assessment (HEA). The City is proposing to use Habitat Suitability Indices to populate the HEP. While the City is not required to use these methodologies, we are specifically targeting habitat accounting that is: 1) open and transparent; 2) represents the best available science - is well tested on multiple habitat types and suitable for the Willamette River; 3) publicly available (non-proprietary); 4) allows for "in kind" tracking (ex: in water impacts are not mitigated by upland restoration); 5) is widely accepted by multiple state and federal agencies (to minimize doubling mitigation requirements); and 6) allows mitigation to stay in the North Reach service area.

With that background, we are asking this esteemed panel to inform the city on the following questions:

1) **To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?**

   I feel that the HSI quantification makes very good sense, as does the general approach. As was pointed out in the discussions, there should be some way to weight HSI or the final results to allow for ecological context to be included in the weighting, to prevent extensive mitigation from occurring in small and potentially isolated patches which will be able to provide only a limited amount of ecological benefits. The method has identified larger sites already, and adjacency to these sites or other restoration areas can

be included. Historically, HEP alone has often been extremely subjective, but using it with HEA helps considerably.

2) **Did we get the right species? Are we missing a species or habitat?**

   You did an excellent job of identifying the right species, for all of the habitats except for "upland". However, in my view, it is impossible to identify a species or species for "upland", because this does not really represent a habitat, but a broad category of habitats represent many, very different vegetation, landcover and habitat types, ranging from conifer forests, hardwood-conifer forests, oak savannas, grasslands, and upland shrublands, all of which would have been found in small amounts in the project area. I believe that the initial natural resources assessment provides better opportunities to identify meaningful habitats and species within the areas defined by "upland in the plan.

   I would like to put in a personal request for the consistent use of habitat definitions. Currently, habitats can be named and defined by anyone. For example, in the Final Siltronic Grassland report, URS defined 4 grassland "habitats", which were, 1) Herbaceous cultivated, 2) Herbaceous natural/semi-natural, 3) Shrubland cultivated and 4) Shrubland natural/semi-natural. When habitats are named in an ad-hoc fashion, there is no way to establish meaningful priorities as to their local, state, regional or national significance. Nor is there a meaningful way to establish standard measures of quality or importance. A number of organizations are working to develop standard habitat names and definitions. Short of this, using any kind of published names or classes is strongly recommended.

3) **We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?**

   Aside from the salmon work, which has been fairly well discussed, and for which I have no expertise, we didn't discuss this much at the workshop. I do not believe there are any well articulated HSI's, aside from the Prairie model which has been recently updated by the Willamette Partnership (which may be able to be used for oak savanna) and the ORWAP model you've already identified. This is ongoing work to attempt to develop a HSI for older conifer forests, but I don't believe it will be developed in a timely enough way for you to be able to use it in this process. I have no guidance as to what to do in situations where you lack an HSI.

4) **By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?**

   At the meeting, many of us were clear that the "in kind" and "in place" approach had significant limitations, particularly in relation to making developers replace not very

important habitats in areas where they might not have historically occurred, and are likely not going to provide viable ecosystem benefits over time. However, we all agreed that two of the factors listed above, proximity to other habitats and patch size, are important. Also important is place, but this mostly is important as it allows for protected areas to provide connectivity to adjacent natural habitats, and larger and more viable natural habitats.

I don't believe that habitat diversity is even remotely important, since the overall size of all of these habitats is exceptionally small. I do think that it is important for habitat rarity or importance factors to be addressed, and would like a consistent approach for defining these to be used. The idea of using priority habitats in the Oregon Conservation Strategy makes good sense, as would using ecological systems with priority plant associations as defined by NatureServe.

5) Others?

At the meeting, the idea of providing a "place" importance factor was bought up in a general way, and I, like other members of the panel, believe this is possible and useful, especially when addressing mitigation that can't occur in place. However, perhaps this has been addressed in the plan with the designation of your priority areas. However, the use of locational priorities to measure conservation benefits is an idea who's time is near, if it hasn't already come yet. The Willamette Partnership and others are working on making this work for wetlands and other restoration needs, but at this point, perhaps the exact methodology is not suitable.

Response to Questions: Mary Kentula

1) To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

I am not an expert in habitat evaluation. I do know that HEP and HSI have been used for a number of years and are generally accepted. Since habitat provision is key to the objective of this effort, these methods seem appropriate. Because habitat is also being used as a surrogate for restoration success and ecosystem quality, I think it is important to evaluate how well this approach is working with independent measures. I recommend that you consider an assessment of overall ecological condition as the check. Condition is easier to measure than all the various ecological functions. It is related to system function because both condition and functional assessments are ways to assess ecological integrity. An ecosystem in good ecological condition should perform the functions one would expect for a system of that type in that location. (See the discussion in Fennessy et al. (2007).)

The State of Ohio won a major court decision a few years ago when their use of a rapid assessment method in permitting decisions was challenged. They use the Ohio Rapid Assessment Method (ORAM), which assesses condition, to determine the regulatory category of a wetland being considered for a permit action. Because of their extensive testing, Ohio EPA was able to demonstrate to the court that decisions based on ORAM were legitimate. ORAM assesses wetland condition. See the two figures below from Mack et al. (2000) showing some of their data and how it is used to set categories for regulatory responses. Also, note the "gray" areas in the second figure. ORAM scores falling in these ranges require more information to make a decision as to which regulatory category pertains to the case.

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Fennessy, M. S., A. D. Jacobs, et al. (2007). "An evaluation of rapid methods for assessing the ecological condition of wetlands." Wetlands **27**(3): 543-560.

Mack, J. J., M. Micacchion, et al. (2000). Vegetation Indices of Biotic Integrity (VIBI) for Wetlands and Calibration of the Ohio Rapid Assessment Method for Wetlands v. 5.0. Columbus, OH, Wetland Ecology Unit, Division of Surface Water, Ohio Environmental Protection Agency**:** 79.

For publications and information on ORAM see
http://www.epa.state.oh.us/dsw/wetlands/WetlandEcologySection.aspx#ORAM.

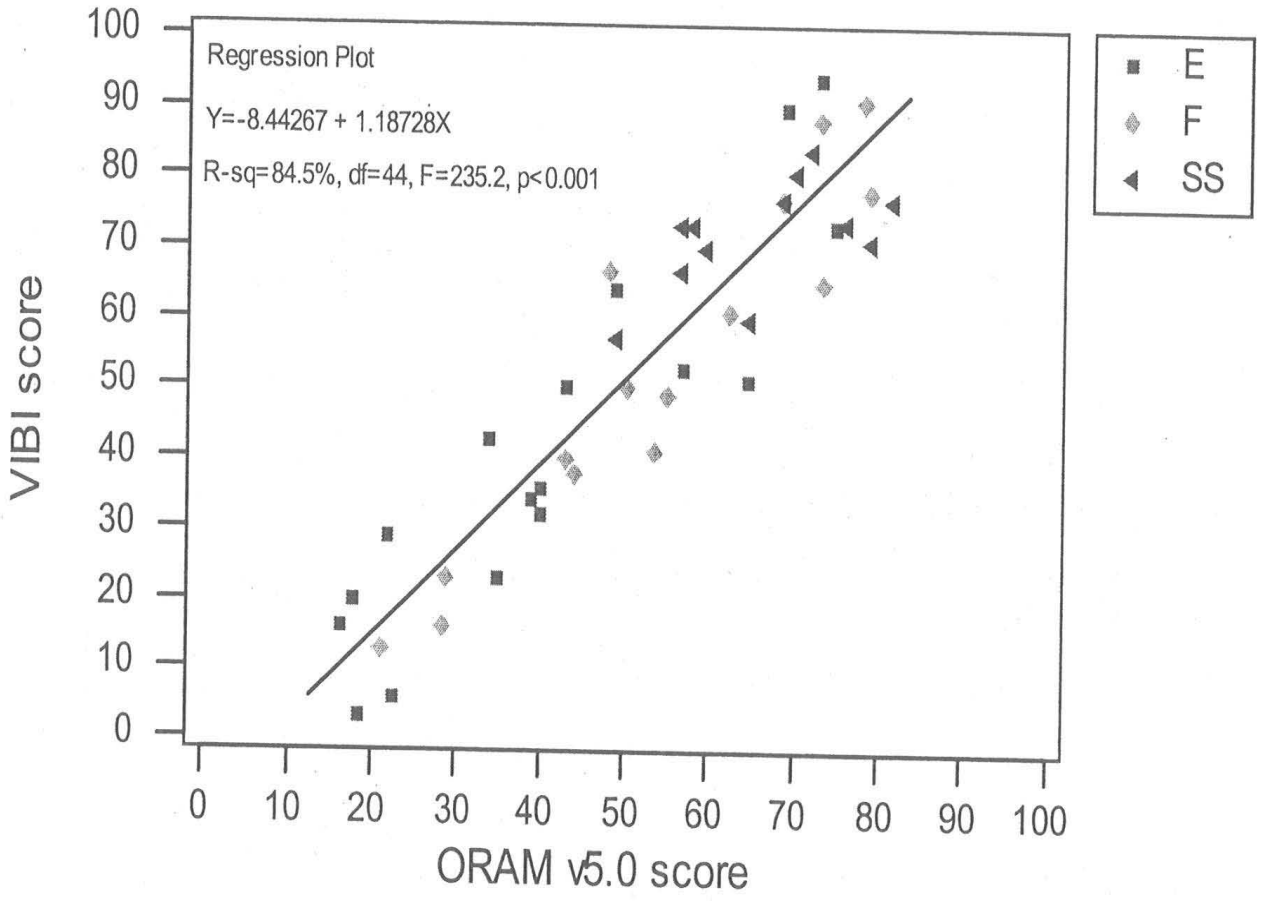

Figure from Mack et al. (2000) showing the relationship between ORAM version 5.0 and a Vegetation Index of Biological Integrity (VIBI) for emergent (E), forested (F) and shrub-scrub (SS) wetlands.

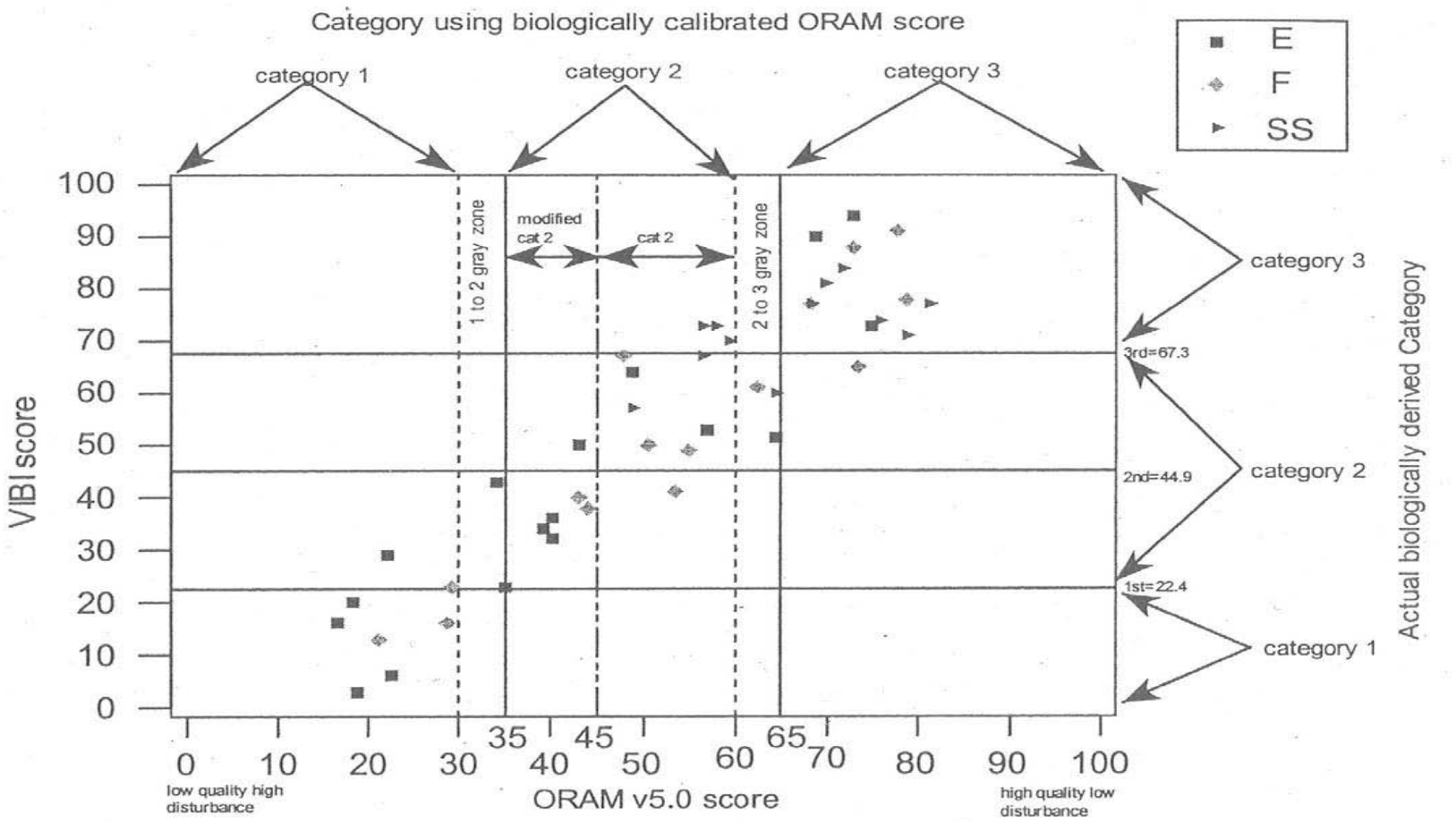

Figure from Mack et al. (2000) showing how the relationship between ORAM and VIBI scores from the preceding figure were used to define regulatory categories and account for uncertainties by using "gray areas."

Below is a list of papers from the work on monitoring and assessment aquatic systems produced by scientists from the branch at EPA's Corvallis lab to which I belong and their collaborators.

On reference site selection:

Hawkins, C. P., J. R. Olson, et al. (2010). "The reference condition: predicting benchmarks for ecological and water-quality assessments." JOURNAL OF THE NORTH AMERICAN BENTHOLOGICAL SOCIETY **29**(1): 312-343.

Herlihy, A. T., S. G. Paulsen, et al. (2008). "Striving for consistency in a national assessment: the challenges of applying a reference-condition approach at a continental scale." J. N. Am. Benthol. Soc. **27**(4): 860-877.

Stoddard, J. L., D. P. Larsen, et al. (2006). "Setting expectations for the ecological condition of streams: the concept of reference condition." Ecological Applications **16**(4): 1267-1276.

Whittier, T. R., J. L. Stoddard, et al. (2007). "Selecting reference sites for stream biological assessments: best professional judgment or objective criteria." JOURNAL OF THE NORTH AMERICAN BENTHOLOGICAL SOCIETY **26**(2): 349-360.

On screening metrics and creating indices:

Jacobs, A. D., M. E. Kentula, et al. (2010). "Developing an index of wetland condition from ecological data: An example using HGM functional variables from the Nanticoke watershed, USA." Ecological Indicators **10**(3): 703-712.

Sifneos, J., A. T. Herlihy, et al. (in press). "Calibration of the Delaware Wetland Rapid Assessment Protocol to a more comprehensive measure of wetland condition." Wetlands.

Stoddard, J. L., A. T. Herlihy, et al. (2008). "A process for creating multimetric indices for large-scale aquatic surveys." JOURNAL OF THE NORTH AMERICAN BENTHOLOGICAL SOCIETY **27**(4): 878-891.

Whittier, T. R., R. M. Hughes, et al. (2007). "A structured approach for developing indices of biotic integrity: three examples from western USA streams and rivers." Transactions of the American Fisheries Society **136**: 718-735.

On determining the weights for the metrics composing an index:

Jacobs, A. D., M. E. Kentula, et al. (2010). "Developing an index of wetland condition from ecological data: An example using HGM functional variables from the Nanticoke watershed, USA." Ecological Indicators **10**(3): 703-712.
Sifneos, J., A. T. Herlihy, et al. (in press). "Calibration of the Delaware Wetland Rapid Assessment Protocol to a more comprehensive measure of wetland condition." Wetlands.

On evaluating assessment methods with independent data:

Jacobs, A. D., M. E. Kentula, et al. (2010). "Developing an index of wetland condition from ecological data: An example using HGM functional variables from the Nanticoke watershed, USA." Ecological Indicators **10**(3): 703-712.
Sifneos, J., A. T. Herlihy, et al. (in press). "Calibration of the Delaware Wetland Rapid Assessment Protocol to a more comprehensive measure of wetland condition." Wetlands.
Wardrop, D. H., M. E. Kentula, et al. (2007). "Assessment of wetland condition: an example from the Upper Juniata Watershed in Pennsylvania, USA." Wetlands **27**: 416-430.

2) Did we get the right species? Are we missing a species or habitat?

The choice of species makes sense to me, however, species as indicators of habitat quality is not my expertise.

3) We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

I don't have any suggestions. This is not my expertise.

4) By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

I think that it is important to preserve the landscape profile, *sensu* Bedford (1996), as applied in Gwin et al. (1999). I know that this work is wetland centric, but the concept and importance of preserving the hydrogeomorphic character of an area applies to Portland's effort. When I began studying wetland mitigation in the Portland area, I was told by those involved that ponds were being created as mitigation projects for primarily two reasons. First, they were a type of wetland that was possible to create, given the current state of the craft. Second, permanent open water was rare, so these actions were increasing a rare resource. As we came to find out, as reported in Kentula et al. (2004), the biota typical to the region had adapted to the paucity of permanent open water in the region and the increases in that habitat reported in Gwin et al. (1999) favored

alien species. The example given in Kentula et al. was the bullfrog, which at the time, required permanent open water to reproduce and mature while the native amphibians complete their lifecycle in one year so that permanent water is not required. (Note that there are reports that the bullfrog is adapting to the Pacific Northwest and some populations do not need two years to mature.) Magee et al. (1999) and Magee and Kentula (2005) report on the effect on plant communities.

Restoration and creation practices should be consistent with the hydrogeomorphologic character of the landscape. This will increase the probability of success because projects will be appropriate to the setting. This point was echoed in the National Research Council's (2001) first technical recommendation on wetland mitigation. This approach also recognizes that while some wetland functions (e.g., habitat) may be defined at the scale of individual wetlands, most functions and values (e.g., biodiversity and maintenance of populations, water-quality improvement, flow moderation) depend on the type, abundance, and distribution of wetlands across a watershed or landscape (Detenbeck et al. 1999 and references cited therein).

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Bedford, B. L. (1996). "The need to define hydrologic equivalence at the landscape scale for freshwater wetland mitigation." Ecological Applications **6**(1): 57-68.

Detenbeck, N. E., S. M. Galatowitsch, et al. (1999). "Evaluating perturbations and developing restoration strategies for inland wetlands in the Great Lakes Basin." Wetlands **19**(4): 789-820.

Gwin, S. E., M. E. Kentula, et al. (1999). "Evaluating the effects of wetland regulation through hydrogeomorphic classification and landscape profiles." Wetlands **19**(3): 477-489.

Kentula, M. E., S. E. Gwin, et al. (2004). "Tracking changes in wetlands with urbanization: sixteen years of experience in Portland, Oregon, USA." Wetlands **24**(4): 734-743.

Magee, T. K., T. L. Ernst, et al. (1999). "Floristic comparison of freshwater wetlands in an urbanizing environment." Wetlands **19**(3): 517-534.

Magee, T. K. and M. E. Kentula (2005). "Response of wetland plant species to hydrologic conditions." Wetland Ecology and Management **13**: 163-181.

National Research Council (2001). Compensating for Wetland Losses Under the Clean Water Act. Washington, DC, National Academy Press.

North Reach Willamette Mitigation Bank Review – Brent Haddaway

1. To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

Pro's: Rapid (relatively low cost), simple assessments to make. Performing this work will not require a high degree of expertise.

Cons: The method is simple, yet prescribes precise mitigation requirements, which means it is often incorrect in the mitigation requirements it prescribes. Sites are assessed into broad habitat categories that are subjective to varying degrees. These habitat assessments are tied to numeric scores, which are then entered into a mathematical model to generate mitigation requirements. At each level modeling, the subjectivity in the initial assessments are multiplied to further decrease accuracy. The resulting decisions and mitigation commitments are therefore based on multiple layers of assumptions, and should not be relied upon to provide precise mitigation requirements.

I know of no other suitable habitat assessment methodology that would be better suited for the City's needs. I therefore support the use of the HEP- HEA, but recommend the lack of precision be addressed in the generation of mitigation requirements. BES could either "lump" HEP-HEA scores into groups to calibrate the results in recognition of the imprecise results. Another option would be to factor in a mitigation ratio, such as 2:1 area replacement, to assure no net loss of habitat has been achieved.

2. Did we get the right species? Are we missing a species or habitat?

I'm not familiar enough with the sites to comment, although the relationship habitat, species, and functions are somewhat cluttered. I would suggest identifying specific habitat types to be protected and mitigated, and clearly justify the selection process. The selection should likely be based on historic habitat losses, the types of wildlife that use the habitats, and the suitability of the reach to support specific habitat types. The habitat models should generate scores in the fewest number of steps and include the fewest number of calculations. The current model considers the habitat needs of multiple species that are compiled to generate a single habitat score. As stated above, each assessment step adopts a possible user error or subjectivity and multiplication of scores magnifies the potential discrepancies between users.

3. We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

Same comments as above, and the HSIs are all weighted equally in the model, which seems skewed. An HSI could have a fairly high score, but still lack a critical habitat component (ie: 4 parameters score maximum, the 5th scores minimum, the average is still high).

4. By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

I would defer to others on what other factors should be included in the habitat models. I think it is logical to include any attribute that contributes to habitat quality in a meaningful way such as size or connectivity.

Derek Booth's responses to "the 4 questions" (July 12, 2010)

1. To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified?

I do not have much prior experience with this style of approach, but I recognize that it has the advantage for a local municipality that it is well-established and transparent. There may be a "better" approach, but you cannot be faulted for using the same approach that everyone else also has. It is not optimal—it reflects an approach to species conservation over three decades old, where the metric of value is "habitat area" independent of contextual needs, spatial relationships, or species interactions. It is thus prone to easy complaints about specific metrics for specific species (e.g., the use of just two factor types for coho, as noted during the panel discussion). Most challenging for the city, however, is the implicit conflict between a spatially explicit and ecosystem-based approach, as articulated in other policy documents and the identification of "pearls," and this fixed-ratio, habitat-area framework. My suspicion is that either framework would would provide net environmental benefits: but the former without the latter will be difficult to implement, and the latter without the former will fall far short of ever achieving its overarching goals. Pragmatism would suggest that the City has made a prudent decision to embrace the HEP/HEA approach but would be misguided to believe that it has "achieved" its stated policy goals as a result. This is just the first step…

2. Did we get the right species? Are we missing a species or habitat?

As a non-biologist, it would be presumptuous for me to tell you what species, or habitats for specific species, are missing. I can note, however, that "habitat area" alone will never capture all of the life-history needs of key species, and that a simple arithmetic combination of factors, no matter how numerous for any given species, is unlikely to "add up" to a coherent plan for conservation or recovery. See my answer to #1 above—the approach is a defensible, credible first step but cannot be expected to yield successful outcomes in isolation. As for the list or number of species, my comments during the meeting were to consider *fewer*, not more, but to develop a more nuanced characterization of their habitat needs. The guiding ecological principle should be that healthy landscapes provide the ecological processes that yield both functional habitat and the species they support. Just "building habitat" without such a landscape context will not achieve sustainable results.

3. We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

This question lies outside my areas of expertise. I will encourage you, however, that as you are striving to do a good job with this characterization don't get lost in the weeds. Any critical shortcomings with this approach will not be in choosing an "incorrect" boundary between suitability index values but in the inappropriate application of the overall approach to a real landscape.

4. By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

I don't believe that an algebraic adjustment of the index will address the concern you raise here (which is entirely consistent with my responses to the previous questions). Because the panel was not asked to review the process by which (for example) your key areas (a.k.a. 'pearls') were identified, it's not immediately obvious how the results of an HEP/HEA analysis might be incorporated into that landscape-scale evaluation. I do think, however, that trying to integrate those two approaches and scales of landscape/habitat analysis will prove more successful in the long run than keeping them entirely independent. I believe this is already recognized by the City, but the panel wasn't given enough information to yet offer any useful suggestions as to how that might occur.

8 July 2010

Questions Posed to North Reach Advisory Panel
Preliminary Responses by D. DeHart

1. To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

I believe that the methodology you have selected is sound and well supported by the scientific literature. The real issues are parameter values and weighting factors used in your application.

2. Did we get the right species? Are we missing a species or habitat?

Addressing aquatic species only, I believe there is a weakness. Certainly the emphasis on salmonids and a few associated species is understandable. These are the species formally identified as "at risk" and the ones where the most information is available. On the other hand, there are probably few, if any, native aquatic species in the North Reach area that are presently healthy and abundant. I think there is value in identifying several non-salmonid native species that are likely indicators of aquatic condition and which occur in healthy lower Columbia Basin habitats (i.e. long nose dace, reticulate sculpin, brook lamprey, native crayfish, freshwater mussels, etc).

3. We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

Some native species which were likely historically abundant in the North Reach area do not have complete or well documented HIS information. It will be necessary to utilize representative species where information is most readily available, but I would suggest you use an expert panel process to identify preliminary values for some species as needed.

4. By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

Certainly proximity and diversity are important factors for aquatic habitats. As you note, a weighting to recognize such critical attributes would be appropriate. In reference to native aquatic species, you clearly understand the serious adverse factor posed by introduced warmwater predatory fish species in the North Reach area. Availability of cover and habitat

types which provide protection from predation of this kind are factors which could be considered in such weightings.

5. Others?

I believe some additional thought as to objectives for aquatic habitat restoration is appropriate. As I mentioned above, the emphasis on salmonids is understandable but may be misleading. I believe the near-term goal should be the restoration of aquatic habitats likely to support limited assemblages of native aquatic species. This is an achievable goal and one whose success can be readily measured. It is also an ecologically sound approach to restoring the water quality and habitat structure ultimately necessary for reestablishing a broader array of species/habitats for identified species at risk including salmonids.

Introduction to the North Reach Mitigation Bank Science Panel:

With that background, we are asking this esteemed panel to inform the city on the following questions:

1) To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

I placed a call with Yvonne Vallet to see if she could get a copy of the Ramsey Lake assessment that was based on Florida's USACE method. I know that Smith Bybee Lake is reserved for the Columbia reach, but it's important to note there is no connection to the Columbia and the lakes are isolated from that river by the industrial sanctuary. As far as the use HEP is concerned, It's often associated with larger habitat matters, and as such it was used (modified) by PGE and the USACE when PGE had plans for developing West Hayden Is. And, now that I think of it, West Hayden Island is a better fit for Columbia River mitigation. At the time of their proposal, I had PGE do a aquatic habitat evaluation of Oregon Sl. since it was relatively shallow and likely had a high concentration of benthic infauna (which it did, based on actually sampling). Unlike the Willamette, extensive reaches of Oregon Sl. have not been dredged in a long time.

2) Did we get the right species? Are we missing a species or habitat?

I know we used yellow warbler for the PGE HEP, but they also nest way away from the rivers. Maybe northern oriel, willow fly catcher, or yellow throat would be better. Does USFWS have those models available?

3) We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

4) By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

Is the factor of delay in achieving the target habitat currently factored in ? I also think that the width of the upland buffer is a factor. The upland buffer really isn't so hard to imagine. On the east side of the river used to be highly flood prone, the forest habitat type examples are adjacent to Oregon Sl. on West Hayden Is. and further on down in Multnomah Channel. On the West side, ignoring that Guild's Lake was been gone 100 years, there is less ash for more cedar, white and Douglas fir. I'd mention maple, too, except successful maple planting will quickly out complete other planted species. Alder is also more prevalent and beaver don't like the taste of the wood and cambium.

5) Others?

Material provided will include:

- Volume 1A of the North Reach Plan - weblink
- Pertinent sections of the Code (see citations above) – photocopies/e-copies
- Volume 3A (Natural Resources Inventory) – for reference – web link
- Draft Accounting documentation – e copies
- NRDA Trustees Executive Summary from their Science Panel – e copies

Introduction to the North Reach Mitigation Bank Science Panel: Stan Van DeWetering

The City of Portland is revising its environmental regulation along the Willamette River. Known as the River Plan, it is a comprehensive, multi-objective plan for land along the Willamette River that strives to balance jobs, natural resources, access to the river and livable communities. The first application of the River Plan is in the North Reach of the Willamette River, which extends from the Freemont Bridge to confluence with the Columbia River. The North Reach Plan creates a new "river zone" that serves to protect and conserve natural resources while allowing certain types of industrial development. (Code language 33.475.400 et seq. and 33.865 et. seq.). The river zone applies to both the river itself as well as key upland areas. These natural resources have been inventoried in the Natural Resources Inventory, and given a broad ranking of High, Medium or Low (Volume 3A). The river zone applies to those areas that received a medium or a high ranking. In addition, the new code language requires development to protect the identified "functions and values" of the natural resources.
One way to protect the identified functions and values is through mitigation. The code allows two types of mitigation: onsite and offsite. The offsite mitigation allows for the purchase of credits from a City certified mitigation bank.

The North Reach Mitigation Bank Science Panel is being convened to advise the City on the accounting of the functions and values of the natural resources for use in the mitigation bank. The City is proposing to use a hybrid model that combines a Habitat Evaluation Procedure (HEP) with a Habitat Equivalency Assessment (HEA). The City is proposing to use Habitat Suitability Indices to populate the HEP. While the City is not required to use these methodologies, we are specifically targeting habitat accounting that is: 1) open and transparent; 2) represents the best available science - is well tested on multiple habitat types and suitable for the Willamette River; 3) publicly available (non-proprietary); 4) allows for "in kind" tracking (ex: in water impacts are not mitigated by upland restoration); 5) is widely accepted by multiple state and federal agencies (to minimize doubling mitigation requirements); and 6) allows mitigation to stay in the North Reach service area.

With that background, we are asking this esteemed panel to inform the city on the following questions:

1) To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

I have limited experience in using any of the three proposed methods but I generally agree with the rating process that is shown in the June 3 Habitat Valuation System doc. A few comments regarding the aquatic fish species – because we don't have habitat suitability indexes for Pacific lamprey I suggest we follow those outlined for chinook salmon. Based on my experience with juvenile lamprey habitat preferences, the chinook indices are most applicable. I would also like to comment on how those indices fit or are typically nested into non-disturbed habitats. When

examining the chinook work cited in the Valuation doc we must realize that shoreline shallow areas adjacent to deeper waters can occur at a significantly greater rate when the reach as a whole contains greater complexity. That is to say, when hard structures (wood and rock) are present to form scour and fill then we see more bars and islands and thus more preferred shoreline habitats. In turn when we are considering both the chinook and the lamprey and our suggested preference for shallower waters with fine substrates or rather limited rip rap hard structures, we should think about the following. In many instances we may be required to approach habitat restoration and mitigation through the use of substrates and structures that currently correlate to low index scores within our habitat matrix. If we wish to consider all our options when restoring shallow water sandy substrates for chinook and lamprey we should consider building new islands, bars and peninsulas with these substrates. These approaches may allow us to significantly increase our mitigation ability by creating complex flow patterns followed by complex depths and substrates resulting in our desired chinook/lamprey habitat. I believe this could increase our opportunity to create the miles of habitat we need whereas if we only examine those sites that currently meet the depth and substrate composition we are targeting, our potential will be significantly less. Thinking through our options to work with the sediment that needs to be removed from the main channel via dredging and for shipping lane purposes, we could in turn direct those sediments toward island and bar building. To close this thought, in addition to creating these habitats away from future development we might also want to consider how we can adapt those areas that currently have hard structure in place and or those that might need it in the future for development, to increase our opportunity to create the desired fish mitigation and restoration options. Tiering existing hard banks by creating multiple levels of hard rock to support fine sediments at shallow depths could be considered as an approach to modify existing low value shore line habitats. If the approaches turned out to be of value then we might be able to adjust our options for onsite mitigation within the immediate zone of proposed or existing development. Land owners could bank mitigation credits by modifying existing bank habitats and or pulling back existing banks edges and thus loosing some acreage to new habitats.

2) Did we get the right species? Are we missing a species or habitat?

I do not feel completely qualified to comment here but it appears to me that the species listed in the review docs cover a broad enough range of habitats that the plan should cover additional species not mentioned by way of your focus on retaining and restoring historic habitats in general. I feel strongly that as long at the approach includes a focus toward overall complexity each time a mitigation or restoration occurs, that individual as well as multiple species will benefit.

3) We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

I have one general comment regarding coho salmon and steelhead trout. When considering restoring habitat we should be reminded of the significant differences we might observe in water quality conditions and exotic species in the lower river within mainstem backwater and wetland vs thalweg habitats. An example is the following - If an offsite mitigation is suggested for a

lowland tributary development that contains coho salmon and that mitigation is directed at mainstem habitats, we need to realize there will likely be a loss in value when transferred from one to another. This will be especially true on a seasonal scale. The example project would be pitched as enhancing mainstem off channel habitat to benefit age zero coho winter and summer rearing. Two issues would likely arise. First, the mainstem wetland might be used by age zero coho during the winter months at a very low rate due to broader distribution patterns. Second, the summer habitat could be by default too warm or have too low of DO to allow for adequate coho summer rearing. Exotic species could in turn benefit from the warm slow water habitat created through the mitigation. I would therefore suggest the coho and steelhead mitigation work keep a focus within the tributary zones where the permit is issued rather that move offsite using the theory that there will be specific benefits to the tributary fish. Where water quality and exotic species are not problems these issues would be of less concern.

4) By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

Habitat mitigations that are targeted for specific species should provide a temporal rate of access that is similar to the period of presence of the species. For example if targeting spring chinook smolts within a mainstem off channel wetland project we need to ensure that project is maintained over time to allow access to those habitats based on mean flows during the observed period of chinook presence. My experience leads me to believe that when working in an environment such as below the falls that so many of the natural processes have been manipulated by humans that we must build our restorations with the ability to maintain them over time. In this instance maintenance could include activities such as adding woody structures at regular intervals, dredging soils that fall out in slow water areas designed for overwinter habitat, keeping inflow and out flow areas open from aquatic weed growth and or sediment accumulations, etc. As maintenance requirements increase weighting toward mitigation value would need to be adjusted.

5) Others?

We understand that habitat loss has played a large role in the reduction in numbers of many of our species in our North West river systems. I believe that in the future the quality of our water within our surviving habitats will prove to play an even more significant role in the final fight for survival of these same species. I think there would be value in considering how to improve and redirect runoff capture basins within industrial complexes. If outdated facilities exist then updating could count toward partial mitigation. If new facilities exist then expansion of treatment beyond conservative standards could count toward partial mitigation. If we worked toward capture basins that provided clean water and on site seasonal refuge to a range of species, that could be viewed as providing a higher value of mitigation when compared to certain offsite options. This might be particularly appropriate at sites that have been occupied for several

decades, where flood plain relief was the optimal historic use, where larger tributary systems don't occur and where continued industrial occupation is expected.

Piped systems – do we have any opportunities to remove these systems and bring them to the surface and still move water to the river? This sort of activity could provide reduced runoff time and create small wetland areas that might add additional habitat when summed across the complete North Reach. Mitigation credits could again be banked by completing this sort of work.

Increasing flood area at regular intervals on both banks – removing old fill to create minimum flood area wetland like channel basins could improve storm event stress for juvenile fishes. These areas could be associated with hard surface clean water runoff that have been engineered for mitigation as well. Providing small pockets of low velocity clean water feeding into the main stem channel during storm events could reduce stress and increase survival. These areas should not be thought of as constant rearing sites but rather storm related refugia wetland channels.

Material provided will include:

- Volume 1A of the North Reach Plan - weblink
- Pertinent sections of the Code (see citations above) – photocopies/e-copies
- Volume 3A (Natural Resources Inventory) – for reference – web link
- Draft Accounting documentation – e copies
- NRDA Trustees Executive Summary from their Science Panel – e copies

July 12, 2010

City of Portland
Bureau of Environmental Services
1120 SW 5th Ave., Room 1000
Portland, OR 97204-3713

Re: City of Portland Comments on the North Reach Mitigation Strategy

Dear Kaitlin:

Thank you for the opportunity to participate on the technical review panel and provide some comments. You all have done an enormous amount of work in a pretty tightly constrained space. You should feel pretty proud of that. The comments below include both some general comments and specific comments tied to the questions you asked.

Overall, you heard a lot from the review panel that the most important thing is to tie the overall mitigation framework AND the functional assessments to the priorities identified in a conservation strategy. The River Plan has a lot of these outlined, and you seem to have done a good job identifying the restoration and conservation priorities within the North Reach in terms of the mapped pearls. I would strongly urge the City to consider three alterations to the overall mitigation framework to tie the program more effectively to conservation priorities.

1. Expand the service area for mitigation to cover the entire City. If this is not feasible, then expand the service area to cover all the areas that will include a similar zoning overlay in the foreseeable future. Staff mentioned upcoming plans for the Columbia and Central/South Willamette reaches. Staff made the point that the North reach sites are the most difficult to fund with existing restoration programs. This is may be a valid reason for constraining the service area, but you would need to include a couple of paragraphs in whatever document is most appropriate describing that.

2. Don't tie yourself so closely to in-kind requirements for mitigation at the project-by-project scale. Staff has done a wonderful job articulating priority restoration sites. Let those be your guide. You can track "no net loss" of functions at the programmatic scale across habitat types. You could even track this across different funding programs.

3. Similarly, I would strongly suggest you reconsider your mitigation hierarchy. I support avoidance and minimization as the first two steps, but I would suggest you consider offsite mitigation before onsite for two reasons. First, you have clearly mapped priorities that you want to steer investment toward. Second, you are setting yourself up for a tugging match with other

mitigation programs (e.g. Clean Water Act 404), which favors off-site mitigation within the 4th Field HUC. You don't want the City pushing a permittee to one site and the Corps to another. If nothing else, I would get documentation from the other agencies supporting the City's decisions on mitigation hierarchy, service areas, and in-kind rules to make sure there is consistent implementation across programs.

SPECIFIC COMMENTS

1) To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

HEP/HSI and HEA are two different beasts. The advantage of both is the overall frameworks have been used by federal agencies and tested in court. It's important to note that these are just frameworks. The HEP/HSI methodology being proposed here is new in a lot of ways. The most advanced application of HEP in the region is the modified version Bonneville Power uses for its fish and wildlife program. This has been well-tested, but has its difficulties too.

HEA provides for consideration of temporal losses, and its use may make it easier to coordinate impacts with NRD requirements. However, HEA does not prescribe how functions are calculated. On its face, there is nothing wrong with HEP so long as the right indicator species are used. However, HEP will never provide an estimate of the functions gained or lost at a site. This point was made at the meeting. It can be a good proxy for habitat condition, but may not caputure other functions of interest (eg water quality).

It's also important to note that you are proposing to use HEP for only the riverine, upland, and riparian habitats. You are using a functional assessment for wetlands and a modified functional assessment for grasslands. These methods are getting at really different things. I think the panel's advice to move all methods toward functional assessments is sound. The indicators you have so far are a good start, but there are some other sources to explore.

25 agencies and groups that participated in the Counting on the Environment process have approved four functional assessment methods for pilot use in the Willamette. You are already using the ORWAP assessment, and there are pieces of the prairie metric being used for the grasslands assessment. The salmon stream metric is also available. It is a functional assessment that captures information on 7 functions and provides a score of 0 to 1 as a % of optimal functioning habitat. Both the salmon metric and prairie metric are undergoing sensitivity, repeatability, and variation testing this summer with results by September 2010. I would encourage the City to run the salmon/prairie metrics side-by-side with their proposed HEP/HIS methods on at least two sites to compare results.

In general, any metric you choose should be:

- Valid. This means it is sensitive enough to capture changes from pre to post restoration on an annual or other regular time period. You need to be able to differentiate between sites too. A metric needs to be repeatable. Finally, it needs to accurately capture the dynamic functions that drive ecosystem health.
- Practical. A metric needs to be accessible. For the Willamette Partnership, this means that a trained watershed council or soil and water conservation district professional can apply the method on a site in less than a day after just 2-7 days of training. Methods need to be rapid, visual assessments for most applications.

An ideal metric would:

- Confirm that you are in a particular habitat type
- Roll the contextual value, condition, and management of a site into a score
- Look at the multiple functions and values provided
- Consider historic impacts and future site potential
- Be connected to environmental goals. Ultimately you want your metric to help you drive behavior and investment toward the things your plan wants to achieve.

2) Did we get the right species? Are we missing a species or habitat? We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated?

Based on my comments above, the panel commented that a species-based approach will not connect you to your goal of ensuring no net loss of functions and values. In this sense, I would focus on asking if you are capturing the appropriate indicators of function. The indicators you have now are a start, but you also heard from the panel that the indicators you have now are incomplete for many habitat types. The beauty of what you have now is that calculation is simple with so few indicators. The challenge is that this may inhibit the sensitivity of the metrics and your ability to really get at the functions lost and gained.

3) Are there species/habitats that do not have HSIs? What process should we use in those situations?

See response to Question 2. In terms of process, the City needs to think about adaptive management of both the program and the metrics. I think there is already language saying the City will revisit the program at regular intervals. I would encourage Staff to develop an adaptive management strategy that includes testing on the metrics, a process for updating metrics, and a predictable way that those changes move into City ordinances. For the Willamette Partnership, metric construction includes: Goal setting—Metric construction—Expert review—Field testing & modification—Adaptation over time.

4) By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

I would look directly at the "Values" sections in ORWAP and the Prairie Calculator. These should get you decent ideas of indicators for values. The City could make an enormous contribution by articulating value indicators and metric for the riverine systems.

For the riverine system, you will want to look at fish passage barriers and constraints.

Ideally, you could use the exact same metrics for other reaches and parts of the City.

Sincerely,

Bobby Cochran
Willamette Partnership, Executive Director

MEETING SUMMARY PER QUESTION

Prepared by EnviroIssues
July 23, 2010

1. To the extent known, or within your particular area of expertise, what are the pros and cons of using a combination of HEP and HEA and the HSI quantification? Are there other methodologies we should consider that meet or exceed the criteria identified above?

In general, panel members supported use of HEP/HSI and HEA. It is a well established, transparent, relatively low cost and accessible tool that it widely used; however, panel members observed that it also reflects an approach to species conservation that is somewhat dated in that "habitat area" is the metric (independent of contextual needs, spatial relationships, or species interactions). It was also noted that HEP/HSI and HEA have been used by federal agencies for some time, and tested in court, but they are really frameworks to which different approaches could be applied. The City's combined approach is new in many ways. While the methods themselves are supported by the scientific literature, panel members noted that the "real issues" relate to the parameter values that capture ecological functions (versus habitats or species), weighting factors selected for use, and monitoring to ensure outcomes validate expectations.

Limitations to these frameworks noted by individual panel members included:

- The outcome of use of the methods are specific mitigation requirements, which may not meet the City's purposes. The reason the mitigation requirements may not be correct is that sites are assessed into broad habitat categories that are subjective to varying degrees. These assessments are tied to numeric scores, which are then entered into a mathematical model to identify mitigation requirements. At each level of modeling, subjectivity is multiplied and accuracy decreases. Resulting decisions and mitigation commitments are based on multiple layers of assumptions and likely should not be relied upon exclusively to identify mitigation requirements.
- While HEA provides for consideration of temporal losses, and its use may allow for easier coordination with NRDA requirements, it does not prescribe how functions are calculated.
- These frameworks do not consider an "ecosystem-based approach", and if not adjusted for this consideration, could fall short of achieving overarching goals. HSI itself, or the final result, should be weighted in some manner to allow for consideration of ecological context, prevent excessive mitigation from occurring in small and potentially isolated patches which will be able to provide for only a limited amount of ecological benefit, and allow for consideration of proximity of larger sites to each other and to other restoration areas.
- HEP is fine as long as the correct indicator species are used; however, it will not provide an estimate of the functions gained or lost at a site. It can serve as a good proxy for habitat condition, but it may not capture other functions of interest at a site (e.g. water quality). Using HEP alone has often been subjective, but using it with HEA helps considerably.

The City had originally proposed to use HEP only for the riverine, upland, and riparian habitats, to use a functional assessment for wetlands, and to use a modified functional assessment for grasslands. One of the panel members pointed out that these methods are getting at really different things, and advised moving toward use of functional assessments for all habitat types. This panel member noted that the 25 agencies and groups that have participated in the "Counting on the Environment" process have

approved four functional assessment methods for pilot use on the Willamette. One of these methods (ORWAP) is already being used by the City, and there are pieces of the prairie metric proposed by the City for use in the grasslands assessment. A salmon metric is also available, and both it and the prairie metric are undergoing sensitivity, repeatability, and variation testing this summer. The panel member suggested that the City run the salmon/prairie metrics side-by-side with the City's proposed HEP/HSI methods on a couple of sites and compare results.

Another panel member also recommended that the City evaluate their approach outcome against an assessment of overall ecological condition as a check on whether provision of habitat is indeed an appropriate surrogate for restoration success and ecosystem quality. This panel member noted that condition (e.g. water quality) is easier to measure than all the various ecological functions (wetland filtration and hydrology), and that it is related to system function because both condition and functional assessments are ways to assess ecological integrity (an ecosystem in good ecological condition should perform the functions one would expect for a system of that type in that location).

Panel members agreed that the indicators selected by the City were a good start, but that there were other sources that needed to be explored to add to the list.

Panel members suggested that some basic criteria should be used by the City in selecting metrics. Metrics should be valid, i.e., sensitive enough to capture changes from pre- to post-restoration on an annual or other regular time period, and to differentiate between sites. Metric validity also means it is repeatable, and it needs to accurately capture the dynamic functions that drive ecosystem health. Metrics also need to be practical. In being practical, it is accessible (i.e. able to be applied by a professional who receives 2-7 days of training). Practical also implies that for most applications, methods entail a rapid visual assessment. At its best, a metric should:

- Confirm that you are in a particular habitat type;
- Roll the contextual value, condition, and management of a site into a score;
- Consider the multiple functions and values provided'
- Consider historic impacts and future site potential; and
- Be connected to environmental goals, to help drive behavior and investment toward these goals.

2. Did we get the right species? Are we missing a species or habitat?

The panel does not think that use of a species-based approach will allow the City to achieve its goal of ensuring no net loss of functions and values. Rather than focusing on species and habitat, panel members encouraged the City to focus on ensuring that they are capturing the appropriate indicators of ecosystem function. It was noted that accounting only for "habitat area" will not capture all of the life history needs of key species, and that a simple arithmetic combination of factors is unlikely to define a coherent plan for conservation or recovery (simply building habitat without consideration of the larger landscape context will not be enough). In general, panel members did not seem to be as focused on the need for a large number of species to be included, but rather, that they be indicative of good ecosystem function.

Panel members noted that the City had made a good start, but the indicators are incomplete for many habitat types. Fewer species means a less complex calculation, but it also means loss of sensitivity of the metrics and the ability to really identify functions lost and gained. Identification of species for upland habitats was noted as particularly difficult because of the broad range of potential habitat types; this could be supported by the initial natural resources assessment. Suggested potential species to consider for upland habitat included yellow warbler, northern oriel, willow fly catcher and yellow throat. It was noted that with respect to aquatic species, there are probably few, if any, native aquatic species in the North Reach area of the Willamette that are presently healthy and abundant; it was recommended that the City identify several non-salmonid species that are likely indicators of aquatic condition and which occur in healthy lower Columbia River basin habitats (e.g., long nose dace, reticulate sculpin, brook lamprey, native crayfish, freshwater mussel).

3. We are proposing to use peer reviewed HSIs to establish values for the HEP model. Are there some that need to be updated? Are there species/habitats that do not have HSIs? What process should we use in those situations?

The Panel noted that there is already language in the City documents stating that the program would be revisited at regular intervals, and recommended that the City develop an adaptive management strategy for updating HSI values. This strategy should include testing of the metrics, a process for updating metrics, and a predictable way that changes are reflected in City ordinances. An example of such a process for metric construction and review, as used by the Willamette Partnership, includes the following steps:

- Goal setting
- Metric construction
- Expert review
- Field testing and modification
- Adaptation over time

Outside of the Prairie model (recently updated by the Willamette Partnership), and the ORWAP model, few well-articulated HSI's exist. Some native species that were likely historically abundant do not have complete or well-documented HSIs. It was noted that an HSI for older conifer forests is in development, but not yet ready for use. Panel members pointed out that it will likely be necessary to use representative species, for which information is available. It was suggested that an expert panel process be used to identify preliminary HIS values for species as needed.

One panel member pointed out the potential for a problem in that the HSIs are all equally weighted in the model. For example, a HSI could have a fairly high score, but the score could be based on a few high scoring values and a single minimal score, with that minimal score representing a critical habitat component. Further, it was noted that a potential shortcoming could be associated not so much with the HIS's themselves as with their application landscape-wide. Additionally, one of the panel members noted that application of mitigation work in response to modeling results for in-stream habitats may in fact cause other potential issues (such as inadvertent creation of favorable conditions for exotic species) that were not intended; this panel member encouraged full examination of the potential for creation of these issues before taking on mitigation that may be recommended by model results.

4. By utilizing an "in kind" approach, rarity of different habitat types should be addressed. However other factors, such as proximity to other habitats, patch size, or diversity of contiguous habitats are all important ecological concepts that are not captured in this approach. Are there certain additional considerations ("weightings") that should be added?

Panel members agreed that proximity to other habitats and patch size are important. They also identified several specific factors that should be considered:

- "Place" was identified as an important factor, because it can allow to protected areas to provide connectivity to adjacent natural habitats, and larger and more viable natural habitats.
- For aquatic habitats, proximity and diversity (availability of cover and habitat types which provide protection from predation). Diversity was noted by at least one panel member as not being important, because the overall size of these habitats is likely to be small. This individual suggested that "habitat rarity" was a better factor than diversity.
- The amount of time it takes to achieve a target habitat and the width of the upland buffer.
- The likelihood that the results of a given mitigation effort will allow for access to the habitat at the time it is needed, and the amount of maintenance that would be required to allow access to occur at the right time (e.g. spring chinook smolts and mainstem off channel wetland mitigation)
- For the riverine system, fish passage barriers and constraints.

Other potential sources of factors to be considered, as suggested by panel members included the "Values" sections in ORWAP and the Prairie Calculator. It was noted that the City could make a significant contribution by articulating value indicators and metrics for the riverine system. Other suggestions included using priority habitats in the Oregon Conservation Strategy, and ecological systems with priority plant associations as defined by Nature Serve.

Panel members also noted that the weighting approach was not likely to address the need to incorporate the results of a HEP/HEA analysis into a landscape-scale evaluation. They again stressed the importance of this broader evaluation, and their hope that the City could integrate the two approaches and analysis scale. One panel member noted a specific example of where restoration practices were not consistent with the hydrogeomorphologic character of the landscape. The case cited had to do with creation of ponds as a mitigation project in the region, to create a type of wetland and to create permanenat open water, which was rare. In this case, native species had adapted to the reduction in permanent open water in the region over time, and did not as much benefit from more open water available as had exotic species such as the bullfrog. This example illustrates that restoration practices need to be consistent with the hydrogeomorphologic character of the landscape. While some wetland functions, such as habitat, can be defined at the scale of individual wetlands, most functions and values (e.g., biodiversity, maintenance of populations, improvement in water quality, flow moderation) depend on the type, abundance, and distribution of wetlands across a watershed or landscape. Evaluating individual projects within the landscape context will increase the probability of success because projects will be appropriate to the setting.

5. What other things does the City need to consider?

Several suggestions were made by panel members relative to this question;

- Some additional thought on objectives for aquatic habitat restoration is likely needed. Although the current emphasis on salmonids is understandable, it might also be misleading. A readily measured and readily achievable short-term goal might be to restore aquatic habitat to support a limited assemblage of native aquatic species.
- Panel members thought that some manner of weighting for "place" could be useful, especially for cases where mitigation could not happen at the place where the impact was occurring. It was noted that there is increasing effort to use "locational priorities" as a means of assessing conservation benefits (e.g. Willamette Partnership and others work in wetlands). This issue may at least in part be addressed by the City's identification of "the pearls", but should be assessed to determine if more needs to be done in this area.
- One panel member suggested that the mitigation potential associated with upgrading outdated stormwater runoff capture basins within industrial complexes, or with expanding existing new systems, should be looked at. These facilities, if constructed correctly, can contribute to clean water and provide onsite seasonal refuge to a range of species. These facilities could be especially important on sites where flood plain relief was the optimal historic use, where larger tributary systems don't occur, and where continued occupation by industry is anticipated. It was also suggested that the potential to bring piped stormwater systems to the surface be evaluated; if determined to be beneficial, such work could also count toward mitigation credits. Finally, this panel member also suggested that the potential to remove old fill along the river bank in areas where runoff from clean surfaces was also determined to provide clean water to the river. This potential mitigation work could provide small pockets of low velocity clean water feeding into the main stem channel during storm events, providing storm-related refugia, which could reduce stress and increase survival of salmonids.

River Plan / North Reach Science Panel - Public Comments

A River Plan / North Reach science panel met on June 18, 2010. The session included two public comment periods; one prior to and one following the panel's deliberations. The following comments and questions were submitted:

Ron Gouguet, Windward Environmental (also see attached written statement):

- The procedure calls for the same procedure as the Oregon Rapid Wetlands Protocol. It seems unclear why the same model is being used by the City, as it seems to be an additional layer of work.

- The draft speaks to how the credits for a mitigation bank would be developed. It seems that the same model used for the impacts should be used for environmental gains. It is not clear what model would be used on the impact side.

- There is a desire by the City of Portland for the process to be consistent with the process that will ultimately be used by the Natural Resource Trustees. While they will likely use the HEA process, they may instead use other models, such as bio-massing. It is uncertain at this point whether the City's process will be consistent with the Trustees' process.

- It would be useful for the panel to recommend the spacing between the City's proposed mitigation sites that would be desirable/effective habitat for migrating salmon.

Barbara Quinn:

- It is difficult to understand how to put an economic value on impacts, although the need to do so makes sense.

- The historical context of the river needs to be considered in this process. The current industrial impacts are relatively recent in the overall history of the river, which once was rich and full of resource values.

- The panel needs to communicate to industrial partners that they will be responsible for the impacts that they incur.

Attachments: Ron Gouguet's written comments

Testimony of Ron Gouguet
June 18, 2010

Since 2008, I've been an Associate at Windward Environmental, a Seattle consulting firm. Prior to coming to Windward, I had 26 years experience as a natural resource trustee representative with the State of Louisiana and the National Oceanic and Atmospheric Administration (NOAA). At Windward I have continued to employ my knowledge of natural resource damage assessment to develop and scale compensatory NRDA projects.

- The Oregon Rapid Wetland Assessment Protocol (ORWAP) is the functional assessment technique most often conducted to fulfill the needs of state permitting and compensatory wetland mitigation programs. For the wetland habitat areas of the Bank, ORWAP is recommended to conduct the Oregon State Lands' mandatory assessment of the functions and values of wetlands. If Oregon State Lands already requires this model for its purposes, what additional value is attained by the CoP additionally requiring the analysis and evaluating mitigation requirements?

- The proposed June 3, 2010 draft "River Restoration Program Development, Habitat Valuation System" (the City's proposed valuation technique) only seems to address valuation of restoration 'credits' that the proposed River Plan Mitigation Bank may generate. As we previously commented, we believe that the habitat quality of the impacted area must be evaluated to determine how much loss of ecological services may occur due to the proposed action.

- Our evaluation of the desirable habitat attributes for salmonids, lamprey and sturgeon (provided) concluded that if habitats for salmon in the Willamette North Reach are restored lamprey and sturgeon will benefit. The science panel should consider if the HSI for a single species (juvenile Chinook or coho) adequately captures enough of the important habitat attributes in the aquatic habitats to characterize the habitat quality changes that the CoP is trying to address. If not, the panel should identify the minimum characteristics that need to be captured to complete such evaluations.

- The model used to evaluate restoration value should be used to evaluate baseline condition of the potentially impacted areas prior to the action. What is the evaluation method that will be employed at the potentially impacted habitat to determine the baseline condition?

- In the City's previous demonstration of the HSI/HEP approach, shading of water bottom by a project (e.g., an automobile unloading ramp) was considered a detrimental effect. In the proposed valuation method, shading by structures is

not considered in either the Chinook or Coho HSI. Only actions that significantly change depth, bottom substrate or bank vegetation (% cover and composition) have any potential to be captured by the river model in the proposed valuation.

- The Trustees for the Portland Harbor NRDA case have used scientific experts to develop good information about aquatic habitat requirements below ordinary high water. The Trustees will most likely rely on their experts' report rather than the HSIs put forth by the CoP.

- Although, the Trustees have produced a final Natural Resource Damage Assessment Plan for Portland Harbor other resource equivalency techniques (REA) that account for bird or fish biomass are designated therein as possibly applicable in addition to HEA. It is not possible at this time to know what method the Portland Harbor Trustee Council will use to evaluate injury and restoration credit.

- It is unknown what 'spacing' of suitable habitat parcels (aka habitat "pearls") is required by aquatic species. How will the CoP consider the proximity and landscape array value of the impacted or restored habitat parcels?

- It seems that 2.5 hours is not enough time for the invited scientists to even establish the scientific parameters in question and goals much less talk/exchange ideas, reach consensus or issue a final recommendation, etc.

THANK YOU.

Windward environmental LLC

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MEMORANDUM

To: David Harvey, Gunderson LLC

From: Kathleen Hurley, Jenny Buening, Mike Johns, Windward Environmental

Subject: Current Permitting Framework below Ordinary High Water Provides Comprehensive Ecosystem Protection

Date: November 12, 2009

Executive Summary

- Currently, approximately nine state and federal agencies review projects below the ordinary high water mark.
- The existing permit process is robust, extensive, and iterative.
- While agencies often use "keystone" species, usually endangered or threatened species, as targets for their review, they also provide technical advice throughout the process on project design to benefit all species and habitat.
- Salmonids are an example of a relevant keystone species in the Lower Willamette River (LWR) because of their critical importance in the food web and special status.
- Projects below the Ordinary High Water mark do not require another layer of review to enhance natural resources in the LWR.
- A key to enhancing natural resources in the LWR is to pool resources in projects that are viable in the long-term and provide a meaningful and durable habitat enhancement.

Background

This memo summarizes the existing permitting structure for work in wetlands or below the OHW in Oregon. Permitting for work in wetlands and below the Ordinary High Water (OHW) mark in Oregon is a complex and thorough process involving several regulatory agencies. Approximately nine federal and state agencies have jurisdiction in the aquatic permitting process and provide significant oversight related to the protection of ecosystems, species, and habitat. These agencies are specifically

responsible for protection of natural resources and for evaluating the potential impact of a proposed action on endangered species and their essential habitat. Furthermore, these agencies provide technical advice on how to design and implement projects so they are most beneficial to all species using the wetland, aquatic, and riparian environments. It is unlikely that another layer of permitting review will provide substantial benefit to natural resource protection than the current framework. The existing permitting structure is comprehensive and provides more than adequate consideration and protection of habitat and special status species as well as non-endangered species.

In the evaluation, we discuss the efficacy of using keystone species to manage habitat resources. Keystone species are ones that play a critical role in ecosystems, such that if an ecosystem can be restored for the species, it will have a beneficial impact on the other species that depend upon it. In the case of the Lower Willamette River, salmon would be an example of a keystone species. Finally, permitting work in wetlands or below OHW is a thorough, yet lengthy, process in which consideration for most species and/or habitat is included. The diverse responsibilities of the agencies assure a multidisciplinary review for potential impacts to natural resources. In summary, the existing permitting structure is comprehensive and provides more than adequate consideration and protection of habitat and special status species as well as non-endangered species.

Existing permitting framework

This document provides a generalized overview of the agencies that would likely be involved in permitting a project below the ordinary high water mark or in wetlands in the State of Oregon. The framework specifically focuses on permitting of restoration actions in wetlands and below ordinary high water. There are several agencies involved in permitting work in wetlands and/or waterways both on the federal and state levels. These agencies are responsible with protection of natural resources related to water quality, habitat, historic and cultural resources, and endangered species. A summary of information on the various agencies, permits, and general permit conditions that would be expected to be involved with a typical habitat restoration project proposed in a location below the ordinary high water mark or in wetland areas is provided in a summary table at the end of this document.

Approximately nine agencies with broad jurisdictional authority would be involved in permitting a project in wetlands or below the OHW. On the federal level, the U.S. Army Corps of Engineers (Corps), National Marine Fisheries Service (NMFS) which is part of the National Oceanographic and Atmospheric Administration, the U.S. Fish and Wildlife Service (USFWS), and, in some cases, the Environmental Protection Agency (EPA) review and approve proposed projects. Their role in the permitting process is summarized below and in further detail in a comprehensive table (Table 1).

- **Corps:** The Corps' main role is in evaluation of impacts to wetlands and waterways below OHW, determine compliance with Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act, and to direct appropriate mitigation for impacts to natural resources.
- **NMFS:** This agency's mission is the stewardship of living marine and estuarine resources through conservation, management, and promoting the health of the target species' environment. These target species are typically threatened or endangered species and their essential habitat. NMFS will provide technical direction on projects to enhance habitat and improve the health of the target species' environment.
- **USFWS:** This agency will evaluate the potential impacts of a project within the context of their mission to conserve, protect, and enhance fish, wildlife and their habitats.
- **EPA:** In cases where a project occurs on Tribal land or lands with exclusive federal jurisdiction, the EPA evaluates compliance with the Clean Water Act.

In addition to the above federal agencies, several state agencies require permits and/or concurrence in order for a wetland or project below OHW to be approved. These five agencies are responsible for regulating, protecting, enhancing, and evaluating activities in Oregon's wetlands and waterways.

- **Department of State Lands:** Jurisdiction of this agency is in wetlands, waterways to bank full stage, mean high water, or high tide line, or to the line of non-aquatic vegetation, whichever is higher. For biological resources, DSL is responsible for regulating activities in areas designated as "essential anadromous salmon habitat." DSL and the Corps work in conjunction to regulate activities in wetlands and waterways.
- **Oregon Department of Fish and Wildlife (ODFW):** ODFW provides input on any direct physical alteration of stream habitat. Their wildlife habitat project objectives are "to protect, maintain, and enhance wildlife habitat to meet Oregon's Wildlife Policy." During project evaluation, ODFW provides technical advice on how to create projects that generate the greatest benefit to fish and other wildlife associated with aquatic and riparian environments.
- **Oregon Department of Environmental Quality (ODEQ):** ODEQ is responsible for enforcement of water quality standards and the protection, restoration, and enhancement of Oregon's public water resources for a range of uses.
- **Oregon Parks and Recreation Department (OPRD):** OPRD provides compliance with the National Historic Preservation Act in conjunction with the Corps. They are responsible for consultation with the State Historic Preservation Office regarding project impacts to cultural and/or historic resources.

- **Water Resources Division:** If the project requires a temporary or permanent diversion of water for use, then the Water Resources Division must provide approval.

As part of fulfilling their natural resource stewardship responsibilities, federal agencies often use impacts to threatened or endangered species as a way to evaluate the potential positive and negative impacts of a project to habitat resources (when a threatened or endangered species is present in the system). In this way, the threatened or endangered species is used as a surrogate for indicating the quality of a given habitat area for other species. This model of assessment and natural resource planning assumes that restoration of habitat for the threatened or endangered species will have a corollary affect of improving habitat for other wildlife species that would be expected to be present in and use similar habitat types. Furthermore, a surrogate species, such as an endangered species of salmon, is used to provide a clear target for habitat restoration planning and monitoring without resulting in adverse effects to other wildlife species.

The approach of using a representative species to manage habitat resources is broadly used and is based on a number of methods (use of an umbrella species, use of a flagship species, use of an indicator species, or use of a keystone species). In all of these methods, one wildlife species, such as a beaver, a sea star, a fish, or another species, is critically important to the habitat in which they live. In the Pacific Northwest, this approach is often based on the Keystone Principle developed by Robert Paine, a University of Washington researcher, which proposed when an ecosystem that loses its "keystone" species the ecosystem will no longer be able to function optimally because so many other species rely on the presence of the keystone for their own life cycles. In the Lower Willamette and in the Pacific Northwest in general, salmonids are often selected as the keystone species because their importance in the food web; in 2001, a Washington Department of Wildlife study identified 138 species that depend on salmon at some life stage, nine of those 138 depend on salmonids for survival (Cederholm et al 2000). The local abundance and distribution of salmonids in the Pacific Northwest drives community dynamics of ecosystems (Cederholm et al 2000).

The federal and state permitting process is structured to provide a robust and extensive review to determine if a proposed project will accomplish its stated goal. The diverse responsibilities of the agencies assure a multidisciplinary review for potential impacts to natural resources. Throughout the multidisciplinary and iterative process, agencies will improve and enhance project design, planting plans, finish elevations, and other project elements in order to create valuable and viable habitat that will be beneficial to the ecosystem as a whole. In the case of compensatory mitigation, which will likely occur on the LWR, these agencies are responsible for "making the public whole" again for damage or injury to natural resources and thus the goal is to restore the injured habitat. These projects are approved through a rigorous process that requires approval

from the agencies mentioned above as well as the Trustee Council and the Department of Justice.

As part of the extensive technical review in the existing permitting framework, habitat restoration projects in wetlands or below OHW are subject to achievement of long-term benchmarks and monitoring and maintenance. In general, habitat restoration projects are designed to provide a diversity of vegetation and habitat structure, and functioning ecosystem processes (as much as they can be achieved at small project sites in highly developed areas) in addition to the creation of habitat elements for one or two specific species. Evidence of success or failure of the vegetation, habitat, and ecosystem processes is documented through measurements of a diverse body of physical and ecological metrics over time, in many cases up to 10 years. These metrics can focus on habitat development for both the targeted and non-targeted species.

The impacts to species and their essential habitat is evaluated in detail through the federal and state permitting process while habitat metrics and other species are evaluated in monitoring programs, therefore, value added by another layer of review from the City of Portland relative to habitat restoration will not be substantial related to protection of natural resources. If the City of Portland does not believe the existing permitting and review framework is sufficient for evaluation of impacts to habitat and species, any new review required by the City should serve to streamline the process, rather than encumber it, by leveraging the extensive review already performed by other agencies. Finally, it is unclear how the city can assert jurisdiction and/or decision-making over waters already managed at the state and federal levels.

Table 1. Permitting jurisdiction of federal and state agencies for restoration projects below the ordinary high water mark or in wetland areas *

Agency	Permit	Jurisdiction	Agency Role/Permit Function
		Federal Agencies	
US Army Corps of Engineers	Applicable Nationwide Permit	impacts to wetlands and waterways in Oregon below the Ordinary High Water mark, National Environmental Protection Act (NEPA)	To determine impacts of projects within Corps jurisdiction under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act and to direct appropriate mitigation for those impacts. The Corps can and does act as the federal nexus for restoration projects on the Lower Willamette River.
National Marine Fisheries Service (NMFS)- NOAA	Section 7- Endangered Species Act Consultation	any activity with a federal connection, i.e., permitted, funded, or authorized by a federal agency in whole or in part; ESA consultation for marine and estuarine species	Mission is stewardship of living marine and estuarine resources through conservation, management, and promoting the health of the targeted species' environment. Determination of impacts of project action on listed species or their habitat occurs through an informal consultation and submittal of a biological assessment. It is elevated to a formal consultation if the determination shows a likelihood of an adverse impact.
US Fish and Wildlife Service	Section 7- Endangered Species Act Consultation	implementation of ESA for plants, animals, and migratory birds	Mission is to work with others to conserve, protect, and enhance fish and wildlife and their habitats. Provide information on presence of listed species within a project area and support to avoid take or adverse effects.
Environmental Protection Agency	Water Quality Certification	only required if the project occurs on Tribal lands and/or lands with exclusive federal jurisdiction within the state of Oregon	Ensure compliance with the Clean Water Act.
		State Agencies	
Oregon Department of State Lands	Removal-Fill; Proprietary Authorization	projects proposed in wetlands, waterways to the bankfull stage, mean high water or high tide line, or to the line of non-aquatic vegetation, whichever is higher; responsible for activities in areas designated as "essential indigenous anadromous salmon habitat"	Works in conjunction with the Corps in regulating fill and removal activities in wetlands and waterways. Piling placement and removal are also subject to approval by DSL.
Oregon Department of Fish and Wildlife	Determination of in-water work window; habitat mitigation recommendations; Scientific Take Permit	any direct physical alteration of stream habitat	Provide technical advice on how to design and implement projects so that they are the most beneficial to fish and other wildlife associated with aquatic and riparian environments.

Agency	Permit	Jurisdiction	Agency Role/Permit Function
Oregon Department of Environmental Quality	Water Quality Certification; Stormwater Permit	enforcement of water quality standards and protection of beneficial uses	Responsible agency for protection, restoration, and enhancement of Oregon's public water resources for a wide range of uses. In conjunction with Corps, evaluates potential impacts of projects on state waters. Impacts may be temporary, continuing, or cumulative. Stormwater permits are required for construction-related activities involving one acre or more of ground disturbance and the potential for discharge to surface waters.
Oregon Parks and Recreation Department	Section 106 - National Historic Preservation Act consultation	consultation with the State Historic Preservation Office regarding potential impacts to cultural and/or historic resources	Provides compliance with the National Historic Preservation Act in conjunction with the Corps.
Water Resources Division	Water Use Permit	manages diversion and use of state waters	Permits temporary diversion of water for project use.

* This table is intended to be a general representation of the permitting process and not representative of every possible permitting scenario or project.

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WINDWARD COMPANY PROFILE

Windward Environmental LLC is a Seattle-based consulting firm that specializes in environmental science and engineering and serves clients in the regulated community. We develop and apply innovative tools and techniques to solve problems and meet our clients' needs for field studies, laboratory analyses, data interpretation, and support in negotiation and litigation with regulatory agencies.

Windward has a staff of 40 professionals, including senior personnel who are highly respected in their fields of expertise, both regionally and nationally. Windward's six partners have an average of 21 years' experience. Areas of expertise include ecological risk assessment, human health risk assessment, natural resource damage assessment, fisheries, permitting support and compliance, habitat assessment and restoration design, contaminated sediment assessment and remediation, guideline and protocol development, biochemistry, sediment geochemistry, chemical fate and transport, biological assessment, wildlife ecology, risk modeling, and chemical fingerprinting.

Windward was founded on the premise that environmental consultants can best serve clients' interests by providing high-quality, defensible data for use in decision-making. Because our technical approach is based on sound scientific principles, we can identify and investigate environmental problems transparently and without bias. As a consequence, our work is given serious consideration by all parties – even in contested situations. In addition, Windward has a reputation for providing clients with superior service – regardless of the size or complexity of the project.

The City of Portland's initial responses to the Science Panel
July 26, 2010

1. While the scientists identified limitations for using the HEP/HEA and HSI, they did not know of any other model that would better serve the city's needs and goals at this time. All models have limitations and they can be improved upon. The scientists did indicate that combining HEP and HEA actually addressed some of the limitations of those models when used independent of each other.

   However the scientists did also raise considerable suggestions for improvements within the framework of the HEP and HEA approaches. Namely they highly recommended utilizing a functional based approach instead of a species approach.
   The City had used species as a surrogate for habitat and habitat as a surrogate for function but the scientists thought that would not meet the City's goals of no net loss of ecosystem function within the mitigation program. Notably the City did propose using a functional based assessment for the wetland and somewhat in the grassland components.

   Therefore the City is evaluating the use of a functional- as opposed to species_based HSI for HEP and developing HSIs that will include many of the same evaluation criteria as the previous model, but will likely include additional criteria and address broader ecosystem processes that benefit more species. These HSIs will then populate the HEA model. One initial idea is to look to the Portland Watershed Management Plan and the effort to define measures of watershed health for general guidance on functions which includes measures of hydrology, physical habitat, water quality and biological communities. The HSIs would continue to be grouped according to habitat type such as riverine (which may include floodplain), upland, grassland, riparian, wetland and stream. One overriding consideration is that any changes will be acceptable to our federal and state regulatory partners so that the applicant is not "double mitigating" as a result of any changes under consideration.

   The scientists also emphasized the importance of including a score for connectivity and painting a more detailed picture on what the City expects in terms of ecological outcomes for this part of the landscape. These concepts may be more important than rigorous requirements of in-kind and on-site mitigation. We will be looking into this further, but it may require additional work that might not be completed in time for the in lieu fee and may only be incorporated into the mitigation certification rules. In addition, we will better describe the overall landscape context of this effort relative to the city's overall prioritization, other restoration programs within the City including stormwater management, tributary restoration and contaminated site cleanup.

2. The Science Panel had multiple, at times differing answers to these questions. Some thought we should have more aquatic species and more upland species, but others thought we had too many and adding more would add too much complexity. The resounding theme was that we should identify the functions and then determine the species.

The City believes that if we reevaluate the species HSIs, then this question is somewhat moot. If we create functional based HSIs, we can identify which species will most likely benefit from those functions but we will not be mitigating for specific habitat requirements for individual species.

3. The panel agreed that the City should use the best available science, not just peer-review published data. In some cases, best professional judgment may be needed. This guides our ability to develop functional based HSIs.

   The responses to this question really highlighted the need to elaborate on the City's monitoring and adaptive management to ensure that the goals of the mitigation program are met over time (i.e. are we really maintaining no net loss)?
   The City has two types of monitoring strategies. First is the project based monitoring. As restoration projects are built at the Pearls detailed would be required for a period of five years. This is standard permit requirements and will be a requirement for the certification of any mitigation bank. In addition, the City conducts watershed wide monitoring throughout the City, that mirrors the EPA's Environmental Monitoring and Assessment Program (EMAP) methods. This includes sites on the mainstem Willamette and Columbia Rivers that would look at water quality, habitat, fish and benthic communities. It will allow a more robust, contextual analysis of the individual project monitoring sites by providing a comparison to the overall watershed health. The City is considering articulating adaptive management measures within the mitigation bank administrative rules and encourages feedback and ideas on this comment.

   4. In response to this question, the scientists raised many considerations, such as place, size, rarity, quality of habitat in between habitats, temporal, and life cycle needs. The City agrees that these are important and believe that they can be incorporated into the functional assessment for HEP. The temporal component is best addressed by the HEA model. While discussed in response to question 1, the notion of subjectivity or imprecision as an inherent part of the HEP application deserves attention here under question 4. The panelists suggested multiple ways to minimize the impact of that subjectivity on the scores and success in meeting the city's goals. The suggested solutions ranged from simple ratios, to adding uncertainty factors, to providing additional levels of review at different thresholds. We will be looking further into all of these suggestions to determine if one, or a combination of them, are appropriate for either the in-lieu fee or the mitigation bank criteria.

   In the written comments, the scientists suggested reconsideration of the in-kind vs. out of kind and on-site vs. off-site prioritization. Taken together with the repeated theme to consider the landscape and context, the City proposes to include a discussion of the ecological importance of the North Reach to the overall Willamette and Columbia Rivers and within the City of Portland, the prioritization of the "Pearls" within the North Reach, the other efforts throughout the city for restoration and mitigation within the tributaries and in the uplands, such as stormwater management. That discussion will include the historical functions believe to be present and provided for in the North Reach. The City will evaluate whether it makes sense to build in some flexibility to the in-kind and on-site prioritization and if so, how to do so in a way that directly furthers the goal of no net loss of ecosystem function. For example, a project that proposes to impact a wetland may trigger an off-site wetland requirement. However, if none of the Pearls that the City can use for mitigation are appropriate for wetland development because of the hydrology

or other site constraints, then the rigidity of the in-kind requirement might not further the City's goals. It is not the City's intent to build ecological features that won't be successful in the long run.

5. We provided the opportunity for the scientists to add any additional thoughts or considerations and they had a few for us to consider. Many of these were addressed above, including additional aquatic restoration objectives which can be captured in a functional based assessment, the additional consideration of "place" or connectivity, and for stormwater systems which will be addressed by including the larger discussion on the overall landscape and context described above.

Updating Portland's Watershed Monitoring

Summary

The focus of the City of Portland's watershed monitoring has expanded greatly over recent years with the adoption of the Portland Watershed Management Plan (PWMP). As a consequence, Portland's watershed monitoring is being updated into an integrated, coordinated citywide monitoring effort targeted to the city's watershed objectives related to hydrology, physical habitat, water quality and biological communities.

The redesign of citywide watershed monitoring also provides the opportunity to update the methods used to collect watershed data and incorporate the best available science into the monitoring program. The PWMP seeks to manage all city watersheds in a coordinated manner. Portland will use protocols developed by the Environmental Monitoring and Assessment Program, a nationwide monitoring effort, which means that local monitoring will be based on strong statistical design, consistent with nationwide watershed monitoring efforts, using methods designed and reviewed by national monitoring experts. The proposed monitoring changes will:

- coordinate monitoring across all city watersheds, so that information can be more easily compared across the watersheds,
- refocus monitoring so that it more evenly and synergistically addresses the four watershed goals – hydrology, habitat, water quality and biological communities
- expand the efforts to include systematic monitoring of terrestrial habitats, and
- increase the rigor, accuracy and efficiency of the monitoring design.

Watershed Monitoring Needs and Uses

Watershed monitoring is the central foundation on which adaptive management rests, and will be used to evaluate progress towards watershed objectives and compliance with environmental laws. Ultimately, it will be the primary determinant of when the city has met its watershed objectives. More immediately it will indicate how and why we are not meeting our objectives, and the actions needed to do so.

Findings from watershed monitoring have been documented in watershed characterizations[1], technical reports and notes[2], natural resource inventories[3], data summaries, web pages[4] and databases. They have formed the knowledge base on which the PWMP, the Framework, the individual watershed management plans, NRDA restoration planning, salmon recovery planning and the North Reach River Plan have been designed. In addition, natural resource inventories are the foundation on which city planning and resource management codes are founded.

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[1] Columbia Slough: http://www.portlandonline.com/bes/index.cfm?c=36081& , Johnson Creek: http://www.portlandonline.com/bes/index.cfm?c=33212&a=214368 , Fanno & Tryon creeks: http://www.portlandonline.com/bes/index.cfm?c=43097& , Willamette River: http://www.portlandonline.com/bes/index.cfm?c=31806 .

[2] For example, Willamette Fish Study: http://www.portlandonline.com/bes/fish/index.cfm?&a=76759&c=34287 , ODFW Trib Study http://www.portlandonline.com/bes/fish/index.cfm?c=51049&a=280352 ,

[3] Planning Bureau Natural Resource Inventories: http://www.portlandonline.com/bps/index.cfm?c=40437 .

[4] http://www.portlandonline.com/bes/index.cfm?c=31806

Current City Monitoring

The City of Portland currently conducts issue-driven environmental monitoring to support a broad set of responsibilities that ranges from watershed protection to sewage treatment to drainage infrastructure construction and maintenance. The monitoring tied to these objectives includes pollutants within water, stormwater, sediment and tissue for compliance with the Clean Water Act, Safe Drinking Water Act and Superfund; fish and habitat quality monitoring for response to the Endangered Species Act; flows for the protection and design of infrastructure and stream restoration; and wildlife and terrestrial habitats to address broader ecosystem objectives identified in the Portland Watershed Management Plan.

The accumulated data from this monitoring has produced a body of information that has been essential in the selection, design, implementation and evaluation of management actions developed to address Portland's watershed objectives. Monitoring has helped to:

- identify limiting factors for salmon in Johnson and Tryon creeks,
- document key pollutants and areas of concern in the Columbia Slough and Portland Harbor,
- identify improving water quality trends in Fanno and Stephens creeks,

As described in the previous section, watershed monitoring has been an essential component of all of the city's plans for protecting and restoring natural resources.

Improvements needed in current monitoring

While existing monitoring provides a wealth of valuable information, there are areas where monitoring elements need stronger coordination or designs need to evolve. The increasing need for watershed data in natural resource planning has highlighted the need for several strategic improvements in the current monitoring approach that will also improve cost efficiency:

Integration - The city's watershed objectives and monitoring have grown in range and complexity over time. As monitoring responsibilities broaden, periodic efforts are needed to adjust monitoring design so that the growing number of parts works more efficiently towards an integrated, well-designed whole. The expansion of watershed objectives into terrestrial habitats represents a key opportunity to reintegrate the broad components of the watershed monitoring approach.

Comparability across measures - One of the biggest challenges in evaluating the current data on watershed conditions is that different watershed measures are not always collected in a comparable manner. Water quality is sampled once a month at a few locations; macroinvertebrates are sampled once a year at a large number of locations. Stream habitat was assessed citywide, but the surveys have not been repeated in the 10 years since these were conducted. One of the most important benefits of the new monitoring approach is that related watershed measures will be collected at the same times and locations.

Sampling Efficiency – the value and rigor of the data currently collected can be greatly improved by use of a probabilistic sampling approach. This allows findings to be generalized beyond the stations and locations sampled to broader watershed-wide patterns. Probabilistic sampling is used in voter polling, for example, where the responses of 1,000 individuals are extrapolated to a nation of 300 million with an accuracy of $\pm$ 3%.

Efficiency can also be increased by adjusting sampling frequency to the rate of change observed in each measure. Most water quality sampling will transition from monthly to quarterly, but sampling will occur at a larger number of locations to better capture spatial variability. In contrast, temperature and dissolved oxygen are two water quality indicators that will be monitored continuously throughout the summer months to adequately characterize their condition.

Comparability across watersheds - A key strategy of the PWMP is managing within and across city watersheds in a consistent and coordinated manner to detect trends and manage watersheds adaptively. The existing monitoring program for each watershed has responded to the long history of issues, regulations and priorities that have evolved in each watershed. The results are not always consistent to a degree that data can be compared and citywide trends can be evaluated. Strategic improvements in the placement of sampling stations, indicators measured, and consistency in measurement methods will greatly improve citywide data comparability.

What does the new monitoring approach entail?

The new monitoring approach is a direct application of *Watershed Measures*. Watershed measures translate the city's watershed objectives for hydrology, habitat, water quality and biological communities into specific and measurable indicators that can be tracked to assess progress in meeting watershed objectives. The watershed measures informed the design of the new monitoring approach, and all the watershed measures are included within it. The list of watershed measures and their locations and frequency of sampling are included in Table 1.

The new approach is built around the approach used in the Environmental Monitoring and Assessment Program (EMAP). EMAP is a research program that develops tools necessary to monitor and assess the status and trends of national ecological resources[5]. The city stream monitoring component is designed directly from the EMAP National Rivers and Stream Assessment protocols, with some minor additions and subtractions to better address Portland watershed measures. To the core EMAP protocol are added Bird Index of Biotic Integrity monitoring in riparian and upland habitats, USGS flow gage monitoring, and developing amphibian and turtle monitoring efforts.

The geographic focus of sampling varies by measure to reflect the nature of the measure and match the city's objectives. For example, fish sampling is measure quarterly at all streams – perennial and intermittent – but birds will be evaluated across the city's terrestrial and riparian habitats.

What components are outside the new monitoring approach?

It is also important to specify what components of watershed monitoring are *not* addressed in the new monitoring approach. Project-specific monitoring and site-specific pollutant source identification are not addressed by the proposed program revisions. Project-specific monitoring is at too fine a spatial scale to be included in these efforts. Project-specific monitoring should be designed to integrate well within the overall watershed monitoring design, and will be coordinated with, benefit from and provide benefit to the revised monitoring. However, it will continue to be paid for by projects and designed to address site-specific project objectives.

[5] http://www.epa.gov/emap/

Restoration project and stormwater facility monitoring are examples of project-specific monitoring that are not directly addressed by these monitoring changes.

Site-specific pollutant source investigation is also at a finer spatial scale than addressed by these efforts. While watershed monitoring will help to identify areas and contaminants of concern, priority outfalls, and subwatersheds where focused source control or management actions are required, once source investigation transitions from the subwatershed to the reach or site-specific scale it will not be addressed by the currently proposed set of monitoring changes. The new approach is focused on a watershed-subwatershed ambient scale. Outfall- or facility-specific stormwater monitoring, UIC monitoring, wastewater effluent monitoring, and site assessments are beyond the current scope of the new monitoring efforts.

Finally, while some monitoring may be at a watershed to subwatershed scale, the intensity or specificity of information required by its specific objectives may exceed that provided by this program. Portland Harbor Superfund and Columbia Slough Sediment Program monitoring are compliance-driven efforts that require much more intensive monitoring than the ambient network of citywide stations provided by this monitoring. Watershed monitoring will benefit from and support these efforts, but the intensity of sampling needed for these programs is beyond the resources of the citywide watershed monitoring efforts. In addition, experiments or research that is highly focused on specific program objectives – such as tagging fish to track survival and habitat use along the lower Willamette – would also be outside the scope of this effort.

What are the benefits of the new monitoring approach?

The Portland Watershed Management Plan Monitoring Strategy[6] outlines a set of principles that should guide watershed monitoring. These principles are that monitoring should be targeted, effective and efficient, systematically and deliberately managed, coordinated, accessible, and responsive. The new monitoring approach will adhere to these principles in the following way:

> *Targeted:* The approach is designed in direct response to the watershed objectives and measures for the Portland Watershed Management Plan.
>
> *Effective and efficient:* The survey is designed to collect numerous indicators at the same sites using a statistically efficient sample design. This will result in operational efficiency by reducing the cost of field work and increase the information content of data through the use of sample designs that are meant to reduce the redundancy of sample points. The use of EMAP protocols ensures that the monitoring approach is based on the best available science.
>
> *Systematically and deliberately managed::* The survey is designed to be managed by a core group of technical personnel from Watershed Services and Pollution Prevention Services. All survey details will be documented in a quality assurance monitoring plan. Data management will be centralized, based on tested EPA procedures, and supported by BES IT staff. The consolidated management of monitoring programs will result in clear responsibilities for meeting the city's goals outlined in the Watershed Management Plan.

[6] D. Kliewer. Portland watershed management plan monitoring strategy. Technical report, City of Portland, June 2008. Draft

Coordinated: The revised approach uses consistent sampling approaches across watersheds to improve the ability to compare conditions amongst the city's watersheds. The survey is also designed to coordinate watershed and compliance monitoring for all stream resources and to provide a single source of information for watershed health data in the city. The use of a national monitoring protocol means that coordination and sharing of monitoring with other agencies is possible in a much more extensive way than has ever been done in the past.

Accessible: Centralized data management will ensure that all watershed data are available at a single location. Coordinated, consistent and well-designed data collection will facilitate data analysis and reporting, and support an annual report on citywide watershed monitoring. Centralized data and consistent design will simplify automatic data reporting through web portals and other data sharing.

Responsive: The flexible nature of the sampling design means that the survey can adapt to changing needs through time. Sample intensity can easily be varied through time and space while indicators can be added and dropped from the survey with little structural change to the survey. A consolidated program with good documentation and a clear sample design will allow for much simpler peer review than a group of watersheds with dissimilar sampling designs. The use of EMAP protocols ensures that the design will evolve as technologies and approaches advance.

In summary, the proposed monitoring changes will increase the power and utility of the data collected by coordinating monitoring across all city watersheds, refocusing monitoring so that it more evenly addresses the four watershed goals, expanding efforts to include systematic monitoring of terrestrial habitats and populations, and increasing the rigor, accuracy and efficiency of the monitoring design. The use of EMAP's well-designed, extensively reviewed and nationally consistent protocol means that Portland data are collected according to the best available science, and our results can be compared and combined with regional and national assessments of watershed health.

Table 1: Location and frequency of monitoring for each watershed measure.

Hydrology Measures

Indicator	Metrics	Geography	Frequency
Hydrologic Alteration	▪ Stream discharge ($T_{Qmean)}$) or Richards-Baker Flashiness Index ▪ Water level ▪ Water velocity	All streams and rivers within the city	Continuously
Total and Effective Impervious Area	▪ Total Impervious Area (derived through GIS) ▪ Effective Impervious Area	All lands within the city, and the lands outside the city that contribute drainage to city watersheds	Dependent on the frequency of multi-spectral data collection

Hydrology Measures

Indicator	Metrics	Geography	Frequency
Stream connectivity	▪ Length of stream that is piped ▪ Barriers (culverts, dams, weirs) / km	All streams within the city	Irregularly, as GIS data on piped infrastructure are updated

Habitat Measures

Indicator	Metrics	Geography	Frequency
Large wood*	▪ Pieces / 100 m ▪ Volume / 100 m	All streams and rivers within the city	Annually
Depth refugia*	▪ Pool area (% total stream area as pools) ▪ Pool frequency (# channel widths between pools) ▪ Residual pool depth ▪ # complex pools (pools w/ >=3 pcs. large wood)		
Substrate composition*	▪ Relative bed stability ▪ Grain size distribution ▪ Substrate depth		
Amount of off-channel habitat	▪ Area of off-channel habitat (field survey and GIS analysis)		
Bank condition*	▪ Bank angle / bank undercut distance ▪ Bank Composition ▪ Width : depth ratio of channel ▪ Percentage hardened bank		
Stream connectivity	▪ Length of stream that is piped ▪ Barriers (culverts, dams, weirs) / 1 km ▪ Amount of habitat blocked to anadromous species by barriers	All streams and rivers within the city	Annually
Width and composition of vegetated riparian zone*	▪ Percentage vegetated cover in the riparian zone (canopy, shrub, or – where native – grassland) ▪ Vegetative composition, where available.		
Breaks and barriers	▪ Number of breaks / km (GIS analysis, field survey)	All streams within the city	Irregularly, as GIS data on piped infrastructure are updated
Plant community composition	▪ Vegetation survey at avian monitoring sites	All lands and streams within the city	Annually

Habitat Measures

Indicator	Metrics	Geography	Frequency
Floodplain condition	▪ Percentage of vegetated floodplain ▪ Percentage of floodplain with human structures (roads, parking lots, buildings and other infrastructure) ▪ Percentage of native/invasive plants in floodplain	All floodplains within the city	Dependent on the frequency of multi-spectral data collection (for vegetation) and building and infrastructure GIS updates
Canopy cover	▪ Percentage canopy cover	All lands within the city	Dependent on the frequency of multi-spectral data collection

Water Quality Measures

Indicator	Metric(s)	Geography	Frequency
Temperature*	▪ 7-day average daily maximum	All streams and rivers within the city	Quarterly
Dissolved oxygen*	▪ Continuous dissolved oxygen ▪ Daily minimum ▪ 7-day daily minimum mean ▪ 30-day daily minimum mean		
Nutrients*	▪ Ammonia/pH ▪ Total and Ortho-Phosphorus		
Pathogens*	▪ E-coli		
Solids*	▪ Total Suspended Solids (TSS)		
Toxic contamination of water, sediments, and biota	▪ Heavy metals: Cu, Pb, Zn, Hg (water column) ▪ Heavy metals: Zn, Hg (fish tissue); Cu, Pb (sediment) ▪ PCBs (fish tissue) ▪ PAHs (sediment) ▪ DDT, chlordane, dieldrin (fish tissue and sediment)		Water column samples collected quarterly. Tissue and sediment sampling frequency TBD.

Biological Communities Measures

Indicator	Metric(s)	Geography	Frequency
Aquatic communities-fish*	▪ Fish IBI ▪ Salmonid genetic diversity	All streams and rivers within the city	Quarterly
Aquatic communities-benthics*	▪ Benthic IBIs ▪ EPT richness ▪ DEQ PREDATOR Expected/Observed ratio	All streams and rivers within the city	Annually
Aquatic Vertebrate Community Composition	▪ Species richness ▪ Percentage of non-natives ▪ Presence of listed, candidate, or state sensitive species	In progress. Amphibians are currently being sampled in ponds; terrestrial sites may be added.	TBD
Terrestrial communities-avian	▪ Avian IBI ▪ Abundance ▪ Richness ▪ Diversity ▪ Native:exotic ratio	All lands within the city	Annually