Practitioners' Working Group
White Paper 2

This paper has been organized as follows. First it addresses structuring incentives into an ecosystem market to enhance restoration and conservation outcomes. In this segment, it introduces a quality rating system as a potential incentive mechanism for increasing the generation of quality credits in an ecosystem market. The second part of the paper is broken into two sections. In Section 1, the paper addresses sources of market uncertainty and risk, and how responsibilities for risk are distributed depending on regulatory drivers of different ecosystem markets (specifically wetland mitigation banking and water quality trading programs). Section 2 considers tools for managing these risks. This paper includes references to sources for additional information.

Part I: Incentives to Protect Ecosystems through Ecosystem Markets

An incentive is any factor that motivates a specific course of action. Incentives for ecosystem protection motivate actions that increase the quality of restoration and condition of ecosystem functions, with long term protection. These incentives can be provided through the policies and regulations developed by public agencies or they can be incorporated through building incentives into the structure of an ecosystem market.

Incentives for protecting ecosystems are relatively new; there is no standard for providing incentives in the regulatory framework or in the market structure. An illustration of potential incentives provided through the rules and regulations of an ecosystem market, as well as incentives incorporated through the structure of an ecosystem market are provided in Table 1.

Table 1: Incentives in Ecosystem Markets

Type of Incentive	Method of Implementation
Regulatory Incentives These measures provide participants in ecosystem markets with legal, financial, or conditional privileges for taking actions to protect ecosystems that are preferred by public agencies to comply with laws, policies, and regulations	**Trading Ratios** Trading Ratios can be adjusted to encourage restoration projects occur in a specific location or habitat type. **Trading Areas** Trading areas can be increased or restricted for credits depending on their features. For example, if a credit is verified at a higher quality, it may be eligible to trade in a larger trading area, whereas a credit of lower quality is restricted to a smaller trading area.
Incentives through Market Structure These measures provide incentives to participate in an ecosystem market by reducing liability, risk, and uncertainty in an ecosystem market, and through the provision of	**Quality Rating System** A rating system can attach product information to a credit that informs the buyer as to additional ecosystem values provided by the credit. Buyers could use that information to set an offer price for the credit, communicate the additional benefits of their credits to others, or manage the risk of their credit portfolio. This is described in detail below, with an example of a potential quality rating system for a shade credit in a water quality trading market.

additional quality information in credit transactions.	**Risk Incentives** Risk incentives reduce risk and uncertainty through sound science and sufficient data, transparency and disclosure in credit accounting and market rules, avoidance of perverse incentives, appropriate protection measures for investments. This is a broad classification of risk incentives and includes risk management tools that reduce uncertainty and risk in marketplaces. Examples of these are in the risk management tools section at the end of this paper.

To incorporate incentives that improve the quality of credits and investments in an ecosystem market, the practitioners' working group developed a quality rating system for credit based on five quality metrics:

1. **Location** of the credit relative to a priority conservation area. Credit quality could vary depending on their location to a priority area. If credits are within a priority area, for example, they could be of higher quality than a credit adjacent to a priority area. Location could also take into consideration connectivity, such that if a credit location enhances connectivity of existing conservation projects, it could be rated higher.

2. **Scale** of the restoration project. Credit quality could be rated higher for larger 'scale' projects, where "scale" may be defined as a spatial and temporal measurement for habitat composition, species diversity, and/or ecological functionality. Scale should be defined to provide incentives for high quality, large "scale" projects, without creating disincentives for projects at a smaller "scale." Incentives for high quality restoration at large "scales" may need to be balanced with adequate participation (credit buyers and sellers) in the marketplace.

3. **Ecological Efficiency**. Projects where goals for restoration and/or management of the site best match the natural ecological potential of a site. The natural ecological potential of the site would be determined by:
    a. The habitat(s) that existed on the site at the time of settlement;
    b. Current conditions resulting from change that has occurred at the site since the time of settlement due to agriculture, forestry, fire suppression, and other similar land use issues;
    c. Trajectory of change over recent decades (i.e. the past 30 to 60 years) since more recent changes to habitat structure are more easily reversed than longer term changes;
    d. Conditions at reference sites (native-dominated habitats typical of historic conditions in the Willamette Valley assuming intact fire regimes and hydrologic conditions);
    e. The absence of constraints for the range of restoration options due to relatively permanent alterations of natural processes such as flooding or water table patterns.

4. **Stewardship**, where the credit is tied to a mechanism that ensures long-term stewardship of the site to maintain its natural ecological potential. The mechanism would be determined by the needs of the site. As such, the mechanisms may not need to be legally binding (e.g. formal contracts) or permanent (e.g. in-perpetuity conservation easements) at all sites.

The practitioners' working group recommended that a legal stewardship protection plan should be, at a minimum, equal to length of the credit life. For example, the water temperature trading program in the Tualatin Basin developed by Clean Water Services has a 5-year permit cycle, meaning that CWS renews its contract to provide riparian shade credits with credit generators (agricultural landowners) every 5 years. Shade trees and shrubs planted at the restoration sites are not expected to provide adequate shade for cooling the river's water for 10 to 20 years. The disparity in time horizon between CWS's permit cycle and the time horizon for restoration efforts to meet permit requirements (life of the credit) creates a greater risk in the market. If a landowner terminates restoration and maintenance of their site after the first permit cycle (5 years), thereby reneging from the permit, the first 5 years of riparian shade restoration completed by CWS will not reduce water temperature as anticipated by the permit. One way to hedge against this risk is to increase the trading ratio. Another method is to require that permit cycles are equal to the time period required for restoration actions to adequately benefit the targeted ecosystem service(s) (or the life of the credit). The practitioners' working group felt that the second method should be required for credits generated in the Willamette Ecosystem Marketplace.

5. **Multiple Ecological Benefits**. An ecological ecosystem is a multi-functioning unit, where living organisms (plants, animal, and microorganisms) interact and function together with nonliving factors (air, water, rocks, and energy) of the environment, and produce fundamental life-supporting services for humans. A credit that considers multiple ecosystem benefits, such as conservation of endangered species, increase in water quality, and contribution to carbon sequestration could be of higher quality than a credit that benefits one ecosystem service.

These quality metrics could be incorporated into a rating system that exceeds the "Quality" credit baseline (or a Tier 1 credit on the rating system) as is defined by regulatory agencies. Ratings exceeding the "Quality" credit would inform the buyer as to the additional ecosystem value provided by the credit. Buyers could use that information to set an offer price for the credit, communicate the additional benefits of their credits to others, or manage the risk of their credit portfolio. These quality ratings are a way to keep credit definition for the basic "Quality" credit as simple as possible, and move the demand for additional information into the market area where they can be more flexible. A four tiered rating system may be designed as follows:

<table>
<tr><td>"Quality" Credit Tier 1</td><td>Credits defined within the trading rules approved by the regulators</td></tr>
<tr><td>"Silver" Credit Tier 2</td><td rowspan="3">Credits provide additional ecosystem benefits beyond trading rule requirements</td></tr>
<tr><td>"Gold" Credit Tier 3</td></tr>
<tr><td>"Platinum" Credit Tier 4</td></tr>
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The "Quality" credit definition would be specific to ecosystem markets and the process that defines the credit within that ecosystem market. For example, what constitutes a "Quality" credit in wetland

mitigation banking would be different from a "Quality" credit in water trading programs or conservation banking. Furthermore, different activities that produce the ecosystem benefits for a credit in an ecosystem market will change the definition of a "Quality" credit. For example, in water quality trading markets a temperature credit is calculated in terms of kilocalories per unit of time; however, it varies according to activity reducing water temperature (riparian shade restoration; flow augmentation; wetland restoration; and eventually floodplain/hyporheic restoration). "Quality" temperature credits for riparian shade restoration, for instance, equal the thermal load deflected by plantings from streams[1]. The definition of each credit tier, would progress from the "Quality" credit definition to build a rating system that informs the buyer of additional ecosystem benefits provided by higher quality credits. A temperature credit for shade restoration in the Willamette Basin could have a quality rating system that gradually increases the five quality metrics to a higher quality level, similar to table 2.

Table 2: Proposed Quality Rating System for Temperature Credits

Quality Metrics	Quality Credit (Tier 1)	Silver Credit (Tier 2)	Gold Credit (Tier 3)	Platinum Credit (Tier 4)
Location	N/A	Adjacent to a priority area, thus increasing conservation area	In a priority area	In a priority area, increasing connectivity
Scale	150 ft. stream buffer restored	150 ft. stream buffer restored on both sides of stream	200 ft. stream buffer restored on both sides of stream	300 ft. stream buffer restored on both sides of stream
Ecological Efficiency	Diversity of site-appropriate natives and management to control invasive plants to less than 5%	Plantings beyond the tree layer into the shrub and herbaceous layer	Silver plus in-stream benefits to fish habitat	Gold plus restoration of upland and wetland supporting functions
Stewardship	Contract to preserve temperature benefits	Credit tied to 20-year contract	Credit tied to 50-year contract	Credit tied to permanent, recorded conservation easement
Multiple Ecosystem Benefits	Reduces water temperature *x* kilocalories	Credit improved beneficial uses (fish habitats)	Silver plus increases other riparian functions (fish habitats, flood storage, wetland, carbon)	Gold plus increases upland habitat functions (sediment filtration, carbon, wildlife corridors, etc)

[1] For definitions of the other four activities that generate quality credit, see "Methods for Defining Temperature Off-Set Credits in the Willamette River Basin" on Partnership's webpage: http://www.mwvcog.org/WillamettePartnership/WillamEcoMarket.asp.

A quality credit rating system can incentivize improved restoration quality that also reduces the risk of ecosystem failure and enhances conservation outcomes in an ecosystem market and/or the Willamette Ecosystem Marketplace. There are a number of other incentives that can be incorporated into a market to reduce risk, such as taxes and subsidies incentives, clear liability rules, and protection measures for credits and investments.

Part II. Liability, Uncertainty, & Risk in Ecosystem Markets

Section 1: Sources of uncertainty, risk, and how liability is addressed in ecosystem markets

Uncertainty arises from inadequate or absence of knowledge or the meaning of that knowledge. The sources of uncertainty in an ecosystem market can be categorized as substantive uncertainty; strategic uncertainty; and institutional uncertainty (outlined below). Risk in an ecosystem market is derived from these sources of uncertainty. Essentially risk is quantified uncertainty. Risk occurs once potential and undesirable outcomes have been identified. It is the chance of something going wrong; of being the responsible party to a transaction, contract, or monitoring, maintenance, and enforcement protocols; and/or of losing capital in an investment. Risks can be partially controlled though the design and management of the ecosystem market structure, including incentives for high quality restoration and conservation outcomes, and legal and financial tools to reduce uncertainty and risk.

Ecosystem markets are risky business and the entity that is impacted by uncertainty and the way risk is manifested will vary in different markets depending on how liability for credit performance is assigned in specific markets. This paper specifically addresses the differences in legal and financial liability for wetland mitigation banking and water quality trading programs based on the differences of their regulatory drivers[2]. Although both of these programs is rooted in the Clean Water Act (CWA or the Act), they are in different sections of the Act, which changes how they address legal and financial liability for different entities in the market.

Wetland mitigation banking is driven by §404 of the Act[3], which transfers liability from the permit holder to the bank sponsor. Water quality trading programs are driven by §402 of the CWA[4]. This creates a favorable situation for the credit provider since they have no CWA liability and compliance requirements; however, it diminishes the permit holder's motivation to make transactions. Under this section, liability remains with the permit holder. The roles and their responsibilities of the key actor's in a wetland mitigation bank are explained in Table 3.

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[2] An overview of water quality trading and wetland mitigation banking can be found in Section 1.1 and 1.2, respectfully, of "Applying Lessons Learned from Wetland Mitigation Banking to Water Quality Trading". February 2005.

[3] Section 404 of the CWA requires a permit from the US Army Corps of Engineers to discharge dredged material or fill material into navigable waters of the US (including wetlands). Impacts must be avoided and minimized when possible. For unavoidable impacts, compensatory mitigation, or action that is taken to replace aquatic resources lost, is required through compensatory action at the project site (i.e. restoration, creation or establishment, enhancement, or preservation) and at a functional replacement of at least 1 to 1 (i.e. "no net loss" is permitted).

[4] Section 402 of the CWA requires a National Pollutant Discharge Elimination System (NPDES) permit for discharges into the nation's waters. NPDES permits require the discharger to attain technology-based effluent limitations. The permits are issued for 5-year periods and must be renewed after each permit-cycle.

Table 3: Key Players & Responsibility for Wetland Mitigation Banking versus Water Quality Trading

Role in Market	Wetland Mitigation Banking	Water Quality Trading
Permitte *Entity who will require a permit for impacting a site under Federal law, and unavoidable impacts will require mitigation actions*	Typically a developer or agency, such as the Department of Transportation, whose actions result in impacts for which a permit is required and mitigation is sought. Once this entity purchases approved mitigation credits, they are relieved of financial and legal responsibilities associated with the mitigation project.	Typically an industry or municipality whose pollution emissions into a U.S. water body requires a permit. This entity is responsible for meeting permitted regulations (through a NPDES permit, TMDL levels, etc.) and is not relieved of financial or legal responsibilities when mitigation credits are purchased to offset their pollution emissions.
Producer or Credit Generator *Entity generating mitigation credits for the permittee or the ecosystem market's aggregator or central exchange*	Referred to as the "bank sponsor"[5]. This entity assumes financial and legal responsibilities for successful construction, development, performance, maintenance, and monitoring of a mitigation site. They are also responsible for securing appropriate financial assurances for the long-term maintenance of the bank.	This can be referred to as a "restoration sponsor." Financial and legal liabilities of the credit-generating site are not transferred to this entity; however, a trade agreement may be used to establish joint liability or liability sharing.[6]
Permitting Agency *Federal or State agency that issues permit and determines the level of mitigation required*	U.S. Army Corps of Engineers (Corps), a state agency, or another regulatory agency with jurisdiction over wetland impacts. In Oregon, the Division of State Lands works with the Corps to provide permits. They determine whether a permit will be issued to a proposed project with wetland impacts, they decide the appropriate level of mitigation required, and how mitigation obligations should be met by the permittee.][7]	The Environmental Protection Agency (EPA) establishes the broad guidance for water trading; however, states are required to develop the specific permit rules and regulations that meet state water quality standards. In Oregon, the Department of Environmental Quality (DEQ) develops the permits.

[5] A bank sponsor can be any public or private person or organization. A bank can also be sponsored by a partnership between a private and public entity. For example, a bank can be constructed by a private individual or company, and turned over to a public agency or non-profit conservation organization for long-term management purposes.

[6] Typically, this is a member of the agricultural community.

[7] U.S. Army Corps of Engineers (Corps), a state agency, or another regulatory agency with jurisdiction over wetland impacts. In Oregon, the Division of State Lands works with the Corps to provide permits. They determine whether a permit will be issued to a proposed project with wetland impacts, they decide the appropriate level of mitigation required, and how mitigation obligations should be met by the permittee.

Long-term Maintenance Provider *Entity that holds fee title to the mitigation site*	The fee title to a wetland bank is often transferred from the bank sponsor to a long-term owner after credits have been produced and sold. When credits are sold, they are retired and the site is required to be protected and maintained in perpetuity. Generally a public agency or non-profit organization (such as a land trust) becomes the long-term owner, transferring all future monitoring and maintenance of the bank to this provider.	In water quality trading programs, the long-term maintenance provider is typically the producer of water quality credits. These credits do expire so a credit producer may anticipate an ongoing stream of income from the credit-generating site. There are no requirements or recommendations for long-term protection of the site.

The key difference between wetland mitigation banking and water quality trading is in how liability is transferred under the regulatory driver. These differences can impact how the sources of uncertainty generate risk in an ecosystem market. Below is an outline of the three sources of uncertainty (substantive uncertainty, strategic uncertainty, and institutional uncertainty) with an analysis of uncertainty and risk may vary under the liability provisions of different ecosystem markets.

i. Substantive Uncertainty: Risk is generated from the various unknowns in ecosystem functionality and processes and how to restore and maintain them due to a lack of information or insufficient understanding of new and emerging information. Scientific breakthroughs and innovations are continuously emerging in ecology and restoration science. When this emerging science is combined with new and escalating fluxes in ecosystems, driven by global warming, urbanization, and invasive species, substantive uncertainty is magnified.

Substantive uncertainty raises questions such as:

- *Will planting vegetation or building hyporheic zones along a stream's riparian buffer cool water to the same degree as a cooling system at the end of a pipe?*
- *How should we manage an area that may be adversely impacted by climate change? Or inundated with invasive species?*
- *How long does a project need to be monitored and maintained before it is sustainable?*
- *Will a restoration project improve the ecosystem holistically or will its effect be fragmented, only improving the ecosystem function required by the market?*

Risks from Substantive Uncertainty:

- Lack of Scientific Data or Scientific Understanding
- Restoration Project Location: Regions topography, geography, hydrology
- Habitat and Species Mix, Age, and Historic Character
- Weather: Rain & Snowfall, Wind, Temperature, etc.
- Future of Site: Climate Change, Scientific & Technological Innovations, etc.

The last question raises the issue of how ecosystem functionality is incorporated into an ecosystem market. For different markets, this may vary. For example, water quality credits use selected ecosystem functions (such as water temperature) to stand as a proxy for the health of the site's entire ecosystem, whereas wetland mitigation bank credits represent the overall condition of a site. These are often referred to as bundled versus unbundled credits. Whether risk increases when the ecosystem is not treated as a whole, bundled system, has not been determined. Different ecosystem markets have tackled this differently. Renewable Energy Credits have bundled credits and there is an on-going discussion about which is preferred in an ecosystem market.

Typically, substantive uncertainty is managed by information gathering and use of expert knowledge. Application of adaptive management and/or the precautionary principle can also assist in reducing substantive uncertainty. Substantive uncertainty is managed differently in wetland mitigation banking and water quality trading.

In wetland mitigation programs, the bank sponsor is responsible to ensure restoration is carried out and that there are adequate funds for monitoring and maintenance of the wetland that is in perpetuity. Since any private, public or non-profit entity with sufficient capital to purchase and generate wetland credits can be a bank sponsor, the generation of high quality credits backed by sound ecological and restoration science is inherently uncertain. To discourage prospective bankers who may generate low quality credits, with poor science, the EPA and Corps has developed high performance standards required for operating a wetland mitigation bank[8]. There is no consensus if high performance standards have resulted in higher restoration quality and ecosystem functionality in wetland mitigation banking.

Regulatory agencies have not placed stringent "quality" or performance standards on water quality trading programs, nor are the responsibilities for restoration, monitoring, and maintenance clearly articulated in the guidance documents. In part, this is because water quality programs are newer than wetland mitigation banking, with protocols that have not been developed into regulatory standards. In addition, the program is inherently different in its provision of credits. The restoration sponsor, typically an agricultural landowner, is adverse to any regulatory controls, which impedes regulatory requirements for high quality restoration for credit generation. Agricultural landowners have always been persuaded into conservation programs through financial incentives, such as distributing green payments or conservation grants. Water quality trading programs are therefore viewed as one economic mechanism, as opposed to a policy tool, to increase restoration and conservation quality on agricultural land.

ii. Strategic Uncertainty: Risks also stem from uncertainty in managing relationships between the parties involved in ecosystem markets. When more people are involved, behavior becomes harder to predict. When there is insecurity in a marketplace, especially when expressed by the actors engaged in the market, participation in the market is likely to decrease, leading to a risk for market failure. This occurs when strategic moves by actors depend upon the actions of other actors, as well as the anticipation of other actor's moves.

Risks from Strategic Uncertainty:

- Low Perception of Investment Potential & Restoration Quality
- Revealing presence of protected area on land will decrease land value or access to agricultural subsides
- Ecosystem market will increase the value of land making land acquisition costly

Questions that emerge from strategic uncertainty include:

- *Will agricultural landowners be willing to participate in an ecosystem market? Will their contribution be individually or as a group?*
- *What role will businesses play in ecosystem markets? Will they be able to expand in the face of an ecosystem market? Will they invest in*

[8] Mitigation performance standards are site specific. As such, there is no Federal standard. They are developed to ensure ecological functionality and may include specific hydrologic, soil, and vegetation conditions, such as the permitted percent of invasive species allowed on the site.

the ecosystem markets that they impact? And what are the projected returns over the life of the credit for investors?

- *What impact will neighboring programs, such as CREP, have on participation in the ecosystem market?*
- *What are the projected returns over the life of the credit for investors?*

Liability in an ecosystem market will affect who participates in an ecosystem market and which role they take on in the market. As depicted in Table 3, liability is transferred in wetland mitigation banking, creating a favorable situation for permit holders to purchase credits. This liability transfer, however, creates adversity for third-parties to become long-term holders of a retired wetland bank. In water quality trading, liability is non-transferable and held by the permit holder. This is an unfavorable position for permit holders and to increase their involvement in water quality trading. For both of these ecosystem markets, a system of joint or shared liability may be more secure way to ensure participation in the marketplace and long-term protection of credits and investments. Shared liability may have some drawbacks. In water quality trading, for instance, the restoration sponsor (typically an agricultural landowner) is adverse to regulatory control under the CWA. Under joint or shared liability, these entities would be partially responsible for ensuring regulations under the CWA are met.

Stability for strategic uncertainty is provided by rules, norms, trust, and perceptions in the market. Certainty can be attained through trusted project approval processes, sound science and reputable biologists overseeing restoration projects, clear liability laws, and appropriate contractual arrangements.

iii. Institutional Uncertainty: Risk is also generated from uncertainties in regulatory approval procedures surrounding ecosystem markets. This includes uncertainty in the intent of regulatory policy and regulations, changes in federal and state policies that may change the nature of demand for credits in a market, and the new policies on financial assurances that may change the ability of markets to generate revenue. As markets become more complex, the unknowns surrounding how market institutions are structured and the implications of that structure on various actors increase institutional uncertainty.

Questions that arise from institutional uncertainty include:

- *What current and future federal programs will conflict with an ecosystem market? And how will this impact supply and demand of credits?*
- *How will future environmental laws and legislation impact ecosystem markets?*
- *How will actor's roles and responsibilities shift under new liability laws?*

The rules of ecosystem markets and the responsibility roles for each step of the market process can become complicated for different ecosystem markets depending on their regulatory

Risks from Institutional Uncertainty:

- Shifting Policies & Program Guidelines
- High Transaction Costs
- Lack of Guarantee
- Other Programs Limiting Funding or Changing Ecosystem Market Policy
- Shifts in Electoral Positions and Party Policy
- Disparity in different ecosystem market programs: Roles & Responsibilities for Actors, Verification Processes, Procedure for Monitoring & Maintenance of nonpoint vs. point sources, Long-term Management Requirements

drivers and liability provisions, as is depicted in Table 3. Enforcement, monitoring and maintenance, and verification roles become complicated and mucky in different ecosystem markets. For instance, enforcement of water quality permit stipulations is typically straight forward in water quality programs since NPDES permits under the CWA require the permit holder to clearly document monthly discharge reports. However, when an NPDES permit holder enters into a water quality trading program to purchase water abatement, monitoring continues at the point source, but benefits are provided by another site. Without a transfer of NPDES liability, the responsible party for noncompliance of the NPDES permit becomes murky, which could make enforcement obsolete. This is augmented when the NPDES uses a third party credit broker to perform the abatement transaction. Since liability is transferred in wetland mitigation, noncompliance is easier to identify and enforce. Determine the liable party is not a problem in wetland mitigation banking since liability is transferred; however, enforcement is not always carried out due to inadequate monitoring with insufficient agency staffing, etc.

Risk of shifting policies and program guidelines, complex rules, and unclear roles and responsibilities for actors, participation in the ecosystem market is delayed (at best) or impeded. These risks generated from institutional uncertainty can be minimized through clearly defined rules that remain stable over a predictable time period, including a robust and simple credit accounting system; removal of complex administrative obstacles, such as streamlined permitting and reporting requirements; and transparency in the market.

Section 2: Reducing Uncertainty and Managing Risk through Market Tools

Legal and financial tools can reduce uncertainty and manage risk in ecosystem markets. The tools utilized to manage risk may vary with specific situations; however, there are some general guidelines that can be used to determine which tools should be considered in certain situations. Here are four general guidelines to consider the appropriate risk management tools for a specific site:

1. Credit producers (landowners or conservation groups) that restore a site of high ecological functionality with scientifically certain restoration practices should consider placing a conservation easement on the land in order to maintain the site's quality over a long time horizon. On the contrary, sites that are of low ecological functionality and/or restoration practices are uncertain (such as the creation of hyporheic zones for water temperature credits) may not need a permanent protection mechanism. These sites are risky; however, and a financial mechanism needs to be in place to ensure restoration is adequately carried out, such as a performance bond.

2. A more robust risk management portfolio may be necessary for credits generated by private landowners with no restoration experience, than landowners with expansive restoration experience (enrolled in CREP), Federal or State agencies or conservation organizations that regularly carry out restoration work. (For example, a larger trading ratio may be recommended for less experienced credit generators).

3. The credit generating action should partially determine the level of risk. If credits are generated prior to impact, there are fewer substantive uncertainties with credit sales, and these credits are less risky. The appropriate risk management tools should be determined accordingly. Restoration and preservation projects also have less risk than the enhancement or creation of credit sites. As such, the later projects should consider robust risk

management tools; specifically strong short-term financial tools should be encouraged. Furthermore, the creation of credit sites should not be encouraged since these practices do not increase the net impact of ecosystem functionality.

4. Methods to pool risk should always be considered. If bankers have to fund 100% of the risk associated with their individual banks, then there is likely to be less money left over for additional investment in restoration or managing the site to the optimum quality. Endowment funds could be collectively managed. Another goal for the endowment might be to invest in projects that put capital into the ground (through assurance pools) rather than Wall Street. For example, maybe endowment funds are invested in additional wetland restoration, carbon offsets, or other green market sector. Ensure that the partners involved in a pooled risk venture are secure (i.e. they use sound restoration science for projects; they use an appropriate approval process: and develop unassailable management plans). Avoid partners who do not follow sound practices, as this may increase risk of project failure instead of decreasing risks.

Below are ___ situations that have been developed by practitioners to understand how uncertainty and risk are generated in an ecosystem market within the Willamette Basin and which tools should be considered for each specific situation. The risk management menu that follows provides definitions for some of the potential risk management tools that can be used in these situations. It is not an exclusive list.

Scenario 1:

Recommended Risk Management Tools:

Scenario 2:

Recommended Risk Management Tools:

Scenario 3:

Recommended Risk Management Tools:

Risk Management Menu

Below are several tools that have been used in ecosystem markets, stock markets, and/or real estate markets. These various tools can be adapted to manage long-term versus short-term risks associated with ecosystem restoration and can be adjusted for specific sites or program objectives.

A. On-site, long-term risk management tools

Long-term risk management tools include legal and financial instruments. The legal tool establishes the rights to the land, its natural resources, and the activities performed on the land. Financial tools provide the monetary support to perform the legal protection measures, including the monitoring and maintenance, and enforcement measures.

i. Legal on-site, long-term risk management tools

The legal tools are derived from the real estate market. These tools are tied to the land, meaning that when ownership changes hands, future owners are bound to the said requirements as established by the legal tool. To encourage participation in an ecosystem market and promote high quality credit generation, legal tools may include tax exemptions, deductions, and incentives. Legal tools can also be incorporate flexibility provisions, such as escapement clauses, that may increase landowner participation in an ecosystem market.

Conservation Easement: A legally binding agreement between a landowner and a third party that limits uses of the land in order to protect its conservation values. The landowner voluntarily renounces certain rights associated with the land, such as intense development, while retaining title to the property, other property rights, and the right to sell it or pass it on to heirs. The agreement is typically permanent, although in some federal government programs, conservation easements are 10-, 15-, 30-year or permanent agreements.

Deed Restrictions and Covenants are the opposite of conservation easements. Deeds are legal instruments that grant a right. Commonly, deeds are used to transfer the title of land or property from one person to another. A deed restriction, places a restriction on the property or land, which travel with the deed and cannot be removed by new owners. Restrictive covenants are deed restrictions that apply to a group of properties, land, or homes in a community.

Leases: Property rights and privileges are retained by the owner; however, a property owner can sell, contract, or grant specific property rights and privileges to another individual, an organization, or a governmental entity. A transfer of rights and privileges to property is stipulated in the lease agreement. Typically, the contractual terms and conditions of the lease agreement are enforced by the owner or lessor, since they retain ownership of the property and liability.

ii. Financial on-site, long-term risk management tools

The financial tools provide a large funding pool to protect long-term investments and credits and may be supplied through a portion of credit sales, a tax on the credit or credit fee, investment dividends, or through pooling funds.

Enforcement fund: A fund generated from credit sales to ensure enforcement options are available. Enforcement options can include support for the steps in the project approval process, verification, certification, and monitoring and maintenance procedures, as well as the legal proceedings for breaking contractual agreements as established by the long-term legal tool. To date, enforcement funds have not been utilized by ecosystem markets.

Trust fund or Endowment funds: The establishment of a pool of money that is typically invested in the stock market or an outside market. The principal remains intact and the interest is applied to the long-term maintenance and monitoring of a site.

Revolving fund: A revolving fund can be employed to protect or restore a piece of property, with permanent financing for operations to remain available through credit sales.

Irrevocable trust: A trust which may not be revoked after its creation, as in the case of a deposit for money by one entity or organization (surety) in the name of another (credit provider) as trustee for the benefit of a third person (i.e., the beneficiary or permittee in this instance). The irrevocable trust is one of five types of financial assurance mechanisms recommended for wetland mitigation banks in the 1995 *Federal Guidance*. Landry *et al.* defined this term.

B. On-site, short-term risk management tools

On-site, short-term risk management tools provide assurances that activities are performed to meet the performance standards and high conservation outcomes. These tools can be financial assurances or adequate processes of approving credit generation that minimizes future risk.

i. Financial on-site, short-term risk management tools

There are a number of financial assurances to manage risks in an ecosystem market. The most common is the performance bond. The following three short term, financial management tools are recommended for wetland mitigation banks in the 1995 *Federal Guidance* and defined in "Applying Lessons Learned from Wetland Mitigation Banking to Water Quality Trading" by Landry *et al.*

Environmental performance bonds: A deposit of money for actions — typically construction or development — with uncertain environmental consequences (such as fire, invasive species, inadequate restoration work, or insolvency). The monetary deposit reflects the best estimate for the largest potential environmental damages. If actions damage the environment, the bond is used to restore the site and the remaining balance is returned to the procurer of the bond. If no damages occur, and the bond procurer can demonstrate that future damages will not occur, the bond is returned in its entirety. An environmental performance bond has limitations. For it to be effective, the bondholder must monitor and enforce compliance effectively, and the bond must be held for a period of time that ensure compliance with environmental performance standards, quality criteria, or permit requirements. Environmental performance bonds are common for wetland mitigation banks.

Escrow accounts: The responsible party (the bank sponsor in wetland mitigation banking) places a predetermined amount of money into a bank account to be held until performance standards or other milestones are met. Often, a set amount of money (for example, $5,000 per wetland credit) is deposited into the account as each credit is sold. The amount of money per credit deposited into the account can be diminished as specified milestones ore performance standards are met. If the bank becomes insolvent, the escrow account becomes the property of the regulatory agency, which can use the funds to ensure that the promised mitigation does in fact occur. The funds are released to the bank sponsor once the monitoring period is over.

Letters of credit: An assumption of payment responsibility by a bank or other person made at the request of the bank sponsor that the issuer will honor drafts or other demands for payment upon compliance with the conditions specified in the credit. A credit may be either revocable or irrevocable. The assumption of payment responsibility may be either an agreement to honor or a statement that the bank or other person is authorized to honor. Letters of credit are intended generally to facilitate purchase and sale of goods by providing assurance to the seller of prompt payment upon compliance with specified conditions or presentation of stipulated documents without the sellers having to rely upon the solvency and good faith of the buyer.

ii. Process for project approval

The approval process of a credit can reduce uncertainty and future risks. A multi-step process that including verification and certification measures, and the establishment of a management plan or performance standards that protect the long-term viability of that credit can greatly reduce risks in the ecosystem market and produce a high quality credit. If a credit generating project is low risk, it would likely go through the project approval process quickly, whereas a high risk project is likely to take a longer period of time. The time for project approval would reduce the uncertainty of picking a poor site, cement contractual relationships, and establish appropriate goals and contingencies.

Verification: Confirmation that conservation and restoration actions are producing the ecological benefits necessary for the generation and sale of credits in an ecosystem market. Verifiers must be able to rapidly assign credit qualities and quality rating to conservation actions in the Marketplace. Verification can be completed through self-verification or a third-party.

Self-verification places responsibility and liability for inspecting, monitoring, and reporting the ecological benefits produced by restoration actions on the private landowners or credit generator, with reduced oversight from the regulating or verification body. Self-regulation would shift verification costs to the landowner, but it would limit access to landowner's property. Self-verification has been common in wetland mitigation banking, where the credit generator verifies that they have meet the standard credit requirements as outlined by their memorandum of agreement and a report is submitted to the appropriate agency. The agency reviews the report and visits the site at an annual or regular basis to ensure the bank is complying with the permit.

A third-party verifier is an independent certified person or organization, with no financial interest in the sale of credits. Watershed councils, soil and water conservation districts and other trusted third parties could fulfill this role. Water quality trading and carbon trading programs commonly used third party verifiers.

Certification: Confirmation that verification reports are consistent with market rules and standards. Certifiers make sure the processes used by the verifiers are valid. Certification and verification roles can be combined.

Certification can take on a second role, where silver, gold, and platinum credits can be quality certified, similar to organic food. This can incorporate an eco-labeling approach that informs credit purchasers about the high conservation quality for silver, gold, and platinum credits, allowing purchasers to act on their preferences for high quality restoration and conservation products.

Monitoring and Maintenance: Inspection and monitoring of generation of credits and ecosystem outputs to ensure high quality is produced and maintained. This can be performed by the credit generator, a third party, or regulating agency. The length of time a monitoring and maintenance project is carried out may depend upon the state of site, the long-term objectives for the site, and the funding or protection instrument used on the site.

C. Landscape (or Market-wide) risk management tools

Landscape risk management tools can be implemented to reduce risk over the entire landscape or provide incentives for actions that are risk adverse or secure ecological functionality. The two landscape tools discussed in the July 30th meeting were trading ratios and assurance/insurance pools.

Trading Ratio: Trading ratios are the conventional tool for risk management in ecosystem markets. Typically trading ratios hedge uncertainty by requiring larger credit units for the creation, restoration, protection, or enhancement of an ecosystem service than the units of the ecosystem service destroyed by development. Trading ratios can also provide incentives for actions that will meet the ecological goals of the landscape than other actions that may be more economical. Adjusting trading ratios can improve ecological quality (placing value on silver versus platinum quality credits in a quality credit rating system); temporal lags in project impacts and maturity of offset restoration; location (in or outside of a watershed or ecoregion, on-site or off-site mitigation); compensation mechanism (preservation, enhancement, restoration, or creation).

Assurance & Insurance Pools: These are two risk management tools that are not conventional to ecosystem markets. The concept between these tools is similar; however, they diverge in how their premiums are invested and the currency disbursed for risk impacts. Insurance pools are monetary premiums invested by each party to a trade in a large market, such as the stock market, in order to cover risks of trade or address non-compliance issues (e.g. a flood through riparian planting, a broken contract, or rule changes). Assurance pools differ in that assurance premiums invested are extra credits that are generated in the ecosystem market or marketplace and maintained by the marketplace's clearinghouse to cover inherent risks. The premiums paid out in an insurance market are in the form of money, where as the premiums paid out in assurance markets are credits.

Trading ratios and assurance/insurance pools are inversely related. As credits maintained in an assurance/insurance pool increases, the need for high trading ratios decreases, and vice versa. Assurances can be used in lieu of trading ratios or other risk tools, so long as assurances more accurately price and cover the risks of trading activity.

References and Guidance Documents

These documents and tools provided background information for this paper. They may offer additional information on risk management, and water quality and wetland mitigation banking for practitioners.

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United States Environmental Protection Agency, Office of Water, "Water Quality Trading Assessment Handbook: Can Water Quality Trading Advance Your Watershed's Goals?" November 2004. www.epa.gov/ncepihom

United States Environmental Protection Agency, Office of Water, "Water Quality Trading Policy." January 2003. www.epa.gov/owow/watershed/trading/finalpolicy2003.pdf

Websites with additional information:

The U.S. EPA website on Water Quality Trading: www.epa.gov/owow/watershed/trading.htm

The Environmental Law Institutes website: www2.eli.org/research/wqt_bibl.htm

National Wetland Mitigation Action Plan website: www.mitigationactionplan.gov/