Chapter 10

Prescribing Solutions: Characterization of Risks

10.1 Introduction

This chapter builds on previous chapters by discussing the importance of characterizing the risks that are inherent in the solutions developed in Step 2 of the framework of a wetland protection program (Figure 10-1). The scientific information available indicates that as human populations grow, we increasingly impact the environmental processes that maintain the functions of our natural resources (Dale et al. 2000). We have not yet found the ways by which we can completely eliminate impacts in the face of our growing population. Therefore, the goal for protecting and managing our natural resources, including wetlands, should be to minimize the risk to resources from our activities, thereby, also reducing cumulative impacts (Cairns 1997).

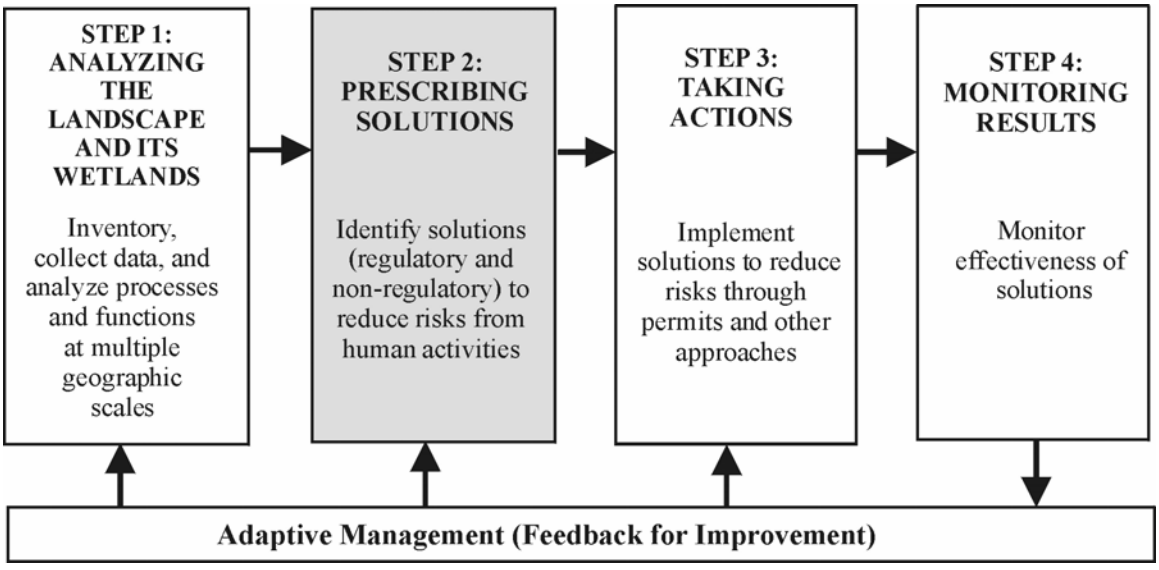

Figure 10-1. Characterizing risks is part of Step 2, Prescribing Solutions, within the four-step framework recommended for protecting and managing wetlands (shaded box).

Risks are minimized by first understanding the risks inherent in actions taken and then developing a program that minimizes those risks. The first step, developing an understanding of risks, is called a *characterization of risks* or *risk assessment.* A characterization of risks considers the impacts and benefits that result from actions that are proposed to be taken. A characterization provides a way to develop, organize, and present scientific information so that it is useful in making decisions about future land

uses. The characterization can provide a basis for comparing different options for protecting and managing wetlands, and it should enable decision-makers and the public to make more informed decisions about wetland resources.

In a characterization of risks, local jurisdictions should consider whether the plans, policies, and regulations they are developing will minimize the risk of cumulative impacts to the functions and values of natural resources including wetlands. If the risk to the wetland resource is still high with the proposed actions in place, the jurisdiction should identify additional measures that can be taken to reduce the risk.

The descriptions of impacts and benefits used for a characterization of risks may range from qualitative judgments to numeric estimates of probability. The guidance for characterizing risks described in this chapter can be applied to both qualitative and quantitative approaches. Local governments are encouraged to characterize the risks of each policy, zoning plan, regulation, exemption, incentive, restoration program, etc. based on the impacts or benefits it poses to landscape processes and the wetland resource.

For example, a regulation that represents a relatively low risk to wetlands is to set a standard 300-foot buffer around every wetland. This is not necessarily recommended because it does not take into account differences among wetlands, but it would significantly reduce the risk to wetlands from human activities in the immediate vicinity. Such a standard could be characterized as having "low risk." On another extreme, a local government may apply a 30-foot buffer around all their wetlands, which could be characterized as "high risk." The review of the literature indicates that a 30-foot buffer alone is not large enough to protect most functions of a wetland. By consistently applying a 30-foot buffer around all wetlands, the functions of wetlands in the jurisdiction will be degraded and result in cumulative impacts such as "space crowding" and "fragmentation" (see Chapter 7 in Volume 1).

There are no simple, unambiguous methods to characterize the risks of different actions that can be taken by local jurisdictions to protect wetlands. The methods are being developed and are still quite subjective. The departments of Ecology and Fish and Wildlife recommend, however, that local jurisdictions try to characterize the risks of their actions. A subjective characterization is better than none at all if the choices and decisions made are documented. The following section outlines one type of process by which the risks can be characterized and documented.

10.2 Risk and the Growth Management Act

A characterization of risks of proposed solutions for protecting and managing wetlands is not a statutory requirement of the Growth Management Act. However, the procedural guidelines (WAC 365-195) adopted by the department of Community, Trade, and Economic Development (CTED) in 2001 recommend that risks to critical areas resulting from the adoption of policies and development regulations be identified. The risks should be identified if the policies and regulations depart from the best available science

established in the record or where adequate scientific information is lacking. Following are relevant excerpts from WAC 365-195.

The following section describes the process that should be used when a local jurisdiction determines that it cannot, for some reason, include the best available science in its development policies and regulations. In these cases, the clear identification of risks to the functions and values of critical areas is essential (see bolded language below).

WAC 365-195-915 Criteria for including the best available science in developing policies and development regulations.

(1) To demonstrate that the best available science has been included in the development of critical areas policies and regulations, counties and cities should address each of the following on the record:

(a) The specific policies and development regulations adopted to protect the functions and values of the critical areas at issue.

(b) The relevant sources of best available scientific information included in the decision-making.

(c) Any nonscientific information -- including legal, social, cultural, economic, and political information -- used as a basis for critical area policies and regulations that depart from recommendations derived from the best available science. A county or city departing from science-based recommendations should:

(i) Identify the information in the record that supports its decision to depart from science-based recommendations;

(ii) Explain its rationale for departing from science-based recommendations; and

(iii) Identify potential risks to the functions and values of the critical area or areas at issue and any additional measures chosen to limit such risks. State Environmental Policy Act (SEPA) review often provides an opportunity to establish and publish the record of this assessment.

(2) Counties and cities should include the best available science in determining whether to grant applications for administrative variances and exemptions from generally applicable provisions in policies and development regulations adopted to protect the functions and values of critical areas. Counties and cities should adopt procedures and criteria to ensure that the best available science is included in every review of an application for an administrative variance or exemption.

In addition, the WAC addresses situations where there is a lack of adequate scientific information upon which to base development policies and regulations.

WAC 365-195-920 Criteria for addressing inadequate scientific information.

Where there is an absence of valid scientific information or incomplete scientific information relating to a county's or city's critical areas, leading to uncertainty about which development and land uses could lead to harm of critical areas or uncertainty about the risk to critical area function of permitting development, counties and cities should use the following approach:

(1) A "precautionary or a no-risk approach," in which development and land use activities are strictly limited until the uncertainty is sufficiently resolved; and

(2) As an interim approach, an effective adaptive management program that relies on scientific methods to evaluate how well regulatory and non-regulatory actions achieve their objectives. Management, policy, and regulatory actions are treated as experiments that are purposefully monitored and evaluated to determine whether they are effective and, if not, how they should be improved to increase their effectiveness. An adaptive management program is a formal and deliberate scientific approach to taking action and obtaining information in the face of uncertainty. To effectively implement an adaptive management program, counties and cities should be willing to:

(a) Address funding for the research component of the adaptive management program;

(b) Change course based on the results and interpretation of new information that resolves uncertainties; and

(c) Commit to the appropriate timeframe and scale necessary to reliably evaluate regulatory and non-regulatory actions affecting critical areas protection and anadromous fisheries.

10.3 A Process for Characterizing Risks

Ideally, local jurisdictions will be taking steps to protect and manage wetlands at the different geographic scales discussed in previous chapters. The goal is to reduce risks to natural resources to levels that can be considered acceptable. Please note however, that this document does not try to establish what might be considered an “acceptable risk” to the wetland resources. This has to be determined by each jurisdiction based on the laws and policies they are trying to implement and the functions and values of the resources they are trying to protect.

Whether planning is done at the scale of the management area or the site itself, the risks can be characterized by answering a series of questions about the actions being proposed:

- What disturbances or benefits will result from a proposed action (e.g., change in land use through zoning, regulations that affect how land is used, restoration plan, etc.)?
- What risks do these disturbances pose to the functions and values of wetlands?
- What measures are proposed to minimize the risks or replace the resource at risk?

10.3.1 Identifying the Environmental Disturbances or Benefits that Result from Proposed Actions

Chapter 3 in Volume 1 summarized the different types of environmental disturbances that can occur as humans modify ecosystems to meet their needs. The plans, regulations, restoration actions, etc. taken by local jurisdictions to direct and control the use of land can also be characterized in terms of the disturbances they may allow or rectify. The first step in characterizing the risk, therefore, is to identify how a specific type of land-use activity may cause an environmental disturbance or benefit.

The characterization of risks should start with a thorough list of the different actions being proposed to protect and manage wetlands (e.g., zoning categories, regulations, exemptions, ordinances, etc.). Each of these has the potential to cause an environmental disturbance by allowing certain land uses to occur or by changing the current land use to some other one.

The types of environmental disturbances identified in Volume 1 include:

- Changing the physical structure within a wetland (e.g., filling, removing vegetation, tilling soils, compacting soils)
- Changing the amount of water (increasing or decreasing the amount)
- Changing the fluctuation of water levels (frequency, amplitude, direction of flow)
- Changing the amount of sediment (increasing or decreasing the amount)
- Increasing the amount of nutrients
- Increasing the amount of toxic contaminants
- Changing the acidity (acidification)
- Increasing the concentration of salt (salinization)
- Fragmentation of habitats
- Other disturbances (noise, etc.)

For example, a jurisdiction may be revising their zoning ordinance and zone an area that was previously rural as urban to accommodate growth. The potential disturbances that may result from this action include changing the patterns of water flow, increasing the input of nutrients and toxic compounds, and causing fragmentation of habitat on the landscape. Another area may be re-zoned from low- to high-density residential. This would result in changes in the patterns of water flow, introduction of toxics from lawn care, and increase the disturbance to wildlife by introducing more predation by pets.

An example of disturbances caused by management actions at the site scale is allowing single-family residences, as an exemption, in the buffers of wetlands. Such an action

would allow disturbances such as the introduction of nutrients and toxics from lawn care and pets, and possibly a change in water regime to occur.

Table 10-1 provides an example of how the environmental disturbances and risks associated with various management actions could be summarized.

Table 10-1. An example of a table summarizing risks associated with common land-use actions.

Action	Disturbance Caused by Allowing Action	Risk of Disturbance to Wetland Functions and Values
Urban zoning in a recharge area	Change in water regime, increased surface runoff, and less infiltration	High for wetlands fed by groundwater and for those that will receive the direct runoff from paved surfaces
Permit fill of wetlands	Change in structure of wetland and loss of wetland area	High for functions within wetland
300-ft buffers for wetlands with a high habitat score	Minimal	Low
200- to 300-ft buffers for high habitat score	Will allow some disturbance of wildlife and limit upland zones suitable for amphibians	Moderate
< 200-ft buffers for high habitat score	Significant disturbance of wildlife	High

10.3.2 Identifying the Risks of Disturbances to the Functions and Values of Wetlands

Not all human-caused disturbances will result in significant impacts to the functions and values of wetlands in a jurisdiction. Once all the possible disturbances have been identified (as discussed in the previous section), the next step in the characterization of risks is to identify which of the proposed land-use actions have the greatest risk of impacting wetlands (see third column in Table 10-1). This task is best done using maps, especially at the scale of the management area. The process described in Chapter 5 for performing a landscape analysis can be used to identify what parts of the landscape within the management area are sensitive to the different types of disturbance and risks that may be generated by proposed land use actions.

For example, if wetlands are located in an area zoned as urban or residential and the area serves to recharge an aquifer, then the risk to these wetlands is high as a result of the impervious surfaces created. Creating impervious surface in areas where water infiltrates rapidly into groundwater creates a risk to wetlands that rely on that groundwater.

Regulations that focus on the wetland sites themselves (site scale) can also be analyzed in terms of the risks they pose to wetlands. Using the example used previously, the exemption of single-family residences in the buffer of a wetland would pose a much

higher risk to wetlands that have a high habitat value than those that function poorly as habitat.

Corrective actions (regulatory and non-regulatory) should also be considered when assessing risks. Areas that are proposed for restoration or preservation, for example, should be considered in terms of how these actions might reduce the risks to wetlands. For example, the restoration (by non-regulatory means) of a diked field to a floodplain wetland identified in the landscape analysis as important for restoring hydrologic processes, reduce the overall risk to the jurisdiction from losses of hydrologic functions in other locations targeted for development.

10.3.3 Proposing Measures to Minimize the Risk or Replace the Resource at Risk

If the characterization of risks indicates that some of the policies, regulations, or plans pose a risk to the functions and values of wetlands in a jurisdiction, it is important to identify what actions can be taken to minimize this risk. Using a previous example, if a comprehensive plan calls for urban development in an area where groundwater is recharged, the risk to the aquatic resources can be reduced by requiring that all runoff be infiltrated on site or that paved areas use some of the more innovative approaches such as permeable surfaces.

A summary table such as that shown in Table 10-2 can be used to document the risks identified and the actions taken to minimize risks.

Table 10-2. An example of a table summarizing the risks of land-use actions and measures to minimize the risks.

Action	Disturbance Caused by Action	Risk of Disturbance to Wetland Functions and Values	Measures to Minimize Risk	Does This Reduce Risk to an Acceptable Level?
Urban zoning in a recharge area outside of wetland	Change in water regime, increased surface runoff, and less infiltration	High for wetlands fed by groundwater and for those that will receive the direct runoff from paved surfaces	Change development standards in recharge area to require all surface water to be infiltrated	Yes
Permit fill of wetlands	Change in structure of wetland and loss of wetland area	High for functions within wetland	1. Require compensation at ratios that will ensure no net loss 2. Ensure compliance 3. Do not permit fill in wetlands that cannot be replaced (e.g., bogs)	Maybe

The King County example of a characterization of risk

As part of revisions to its critical areas ordinance, King County has prepared an *Assessment of Proposed Ordinances* that describes the risks to resources from the county's proposed regulatory and non-regulatory actions. Section 2.9 from Chapter 2 of the King County report describes the risks to the wetland resource from actions such as specified buffers, allowed alterations, classification (rating), and mitigation requirements. This section of the King County report is reproduced in Appendix 10-A of this volume. The full report is available on the web at http://www.metrokc.gov/ddes/cao/.

By first identifying and categorizing the risks to wetland resources and then identifying the actions necessary to minimize those risks a local jurisdiction will be in a better position to make decisions that incorporate existing scientific information. The characterization of risk can also be used as the first step in a program of adaptive management (see Chapter 12). Actions deemed to be of different levels of risk can be monitored to determine if the initial conclusions were valid.