



Table 004-2 Environmental Aspect Risk Assessment Procedure

Procedure

What is a Risk Assessment?

A risk assessment involves a thorough look at the way a workplace operates, and considers situations, processes and operational guidance to determine the hazards associated with day to day operations. The objective of risk assessment is to identify the causes and conditions that result in hazards, and identify those activities that are most likely to result in hazards. That information is then used to implement operational controls to minimize or eliminate hazards from the workplace.

Before beginning, it is also important to define the scope of the assessment: For the purposes of this risk assessment, we will be examining potential adverse impacts to natural resources and the environment as a result of forest activities within BCTS Business Areas.

What is Risk?

For the purposes of this risk assessment, risk is determined by examining two components: Consequence (Magnitude) and Probability (Likelihood of an incident). Simply put, risk can be calculated in the following way: **Consequence X Probability = Risk**

The Components of Risk

A. Consequence:

*Consequence is the qualitative measure of the **scale, severity and duration** of impact that an event would have if it were to occur. For example, a small fuel spill at a fuelling station in a dryland sort may have a negligible or unobservable impact to the environment, while a moderate size (>100 litre) spill in a community watershed, sensitive ecosystem or critical habitat will have severe or catastrophic consequences.*

How do we determine consequence?

In order to understand the consequences associated with an unfavourable event occurring we examine three aspects of the event (Scale, Severity and Duration) by asking some diagnostic questions:

1. Scale (How big will it be?)

- ▶ Will there be an impact to a large area?
- ▶ Will multiple organisms / ecosystems be affected?

2. Severity (How bad will it be?)

- ▶ Will there be an impact to human health and safety?
- ▶ Are there legal implications?
- ▶ Has there been a material adverse effect on the environment, or has a habitat feature been rendered ineffective?
- ▶ Will there be a loss of process or product affecting overall profitability of the operation?
- ▶ What is the cost of remediation?

3. Duration (How long will it last)

- ▶ If there is an observable impact, how long will it persist?
- ▶ Do events that occur routinely or continuously have a significant impact over the long term?

Consequence Matrix

Consequence	Magnitude of impact	Description (Scale, severity and/or duration of impact)	Example	Criteria to proceed to next magnitude level
Very Low	Negligible	Not noticeable on a daily basis. Brief or no disruption to environmental processes. No toxic effect on biota or ecosystems	In many cases there are negligible impacts to the environment from active forest operations. However, cumulative effects should be taken into consideration. For example: Soil loss adjacent to a mainline may not be observable on a daily basis, giving the indication that impacts are negligible, but may be contributing to drainage issues along a section of road resulting in a culvert failure into fish habitat.	Noticeable disruption to environmental processes Toxic effects Some duration of impact
Low	Observable	Noticeable after a single event. May cause short term disruptions of environmental processes. Easily remedied. No long term impact to organisms. No impact to human health and safety. No legal implications	Observable impacts may include events such as windthrow. A windthrow event along the windward edge of a recently harvested cutblock may be readily apparent, but may not yield a significant impact to environmental processes. However, the circumstances could be exacerbated if the windthrow generally occurs in sensitive soils, on steep grades or adjacent to riparian areas or wildlife habitat areas etc.	Material adverse effect on ecosystem or biota Human health and safety issues Legal benchmarks exceeded

Moderate	Serious	Reportable events. Potential legal implications. Material adverse effects to resources or biota. Localized human health and safety risks	Serious events have some measurable adverse effect on an ecosystem. For example, an improperly installed culvert on a fish stream can detrimentally affect fish passage and habitat. Although impacts are confined to a single biological unit, the consequences on that ecosystem can be profound if the situation is not remedied. Legal implications may be a factor.	Long term impacts Likely or certain administrative penalties Impacts to SAR, critical habitat etc Ongoing or mobile human health and safety risks
High	Severe	Long term impacts to ecosystems or biota. Legal implications. Loss of environmental process and remediation costs. Impacts to Species at Risk (SAR). Ongoing human health and safety risks.	Severe consequences generally involve a substantial or long term alteration to an ecosystem. For example: Failure to adequately clean debris from an S6 stream post harvest may result in a slope failure into a larger fish bearing water body downslope. Although sedimentation downstream may be limited by low gradient flows within the fish bearing water body, the nature of the habitat may be altered over the long term or even permanently as a result of the event.	Irreversible impacts Impacts not limited in scale, severity or duration by external factors Material adverse effects on SAR, critical habitat Remediation extensive, insufficient or impossible Mobile, injurious or large scale human health and safety risks
Very High	Catastrophic	Large scale impact to ecosystems. Large areas, multiple ecosystems or large numbers of organisms affected. Long term and/or irreversible adverse effects to ecosystems, SAR, protected areas etc. Remediation required or not possible. Uncontrolled or large scale human health and safety issues	Catastrophic events typically occur on a large scale (multi hectare or multi ecosystem) but may also include small scale events that profoundly impact human health and safety, sensitive ecosystems or species at risk. For example: A barge containing waste oil and fuel overturning adjacent to a nesting and rearing area for red listed seabirds.	

B. Probability:

For the purposes of this risk matrix, probability refers to a subjective estimate of the **frequency with which an event with some level of consequence will occur**. Probability in this case is not a measure of how often an activity is being undertaken, but rather consideration of how often an event of some consequence is occurring while undertaking that activity. For example: We drive our car everyday, but we may have only had one car accident in the last ten years. In this case the probability of us driving our car today is high, **but** the probability of being in an accident, based on our past performance, is very low. Or, more technically speaking: Our exposure hours are high, but our incident occurrence probability is very low. **For the purposes of this risk assessment, it is the incident occurrence probability that we are measuring, not the exposure.**

How do we Determine Probability?

Ordinarily, probability would be determined by performance statistics. For instance, for our area, we may know that we have had 1 reportable size spill each year for the past 3 years, giving us a frequency of approximately 1 reportable spill per year. That can be compared with the values in the table to determine a probability rating. Where we are unsure of the frequency of an event, we can estimate probability by asking some diagnostic questions:

- ▶ How often is the activity undertaken (what is our exposure)?
- ▶ How often do events of consequence occur while undertaking the activity (What is the frequency of incident)?
- ▶ Does lack of experience play a role in the probability of incidents occurring for tasks that outside of normal daily operations (Low exposure, but high probability of incident)?
- ▶ Is the probability of an event occurring influenced by other external factors (weather, timber type, slope percentage etc)? For example: If we know that the majority of our development over the next two years will be on slopes greater than 60%, then we can reasonably assume that our risk of slope failures related to harvesting will increase, as opposed to if we are currently harvesting low elevation second growth in relatively flat areas.
- ▶ Is it possible that an event is occurring in the licence area without being observed or reported? (i.e. Landslides occurring on a tenure may not be identified immediately following the event when they are occurring where there are no active operations)

For the purposes of the matrix below, probability refers to a subjective estimate of the likelihood that an event with some level of consequence will occur. **It is important to note that just because an activity occurs on a daily basis, that does not mean that the frequency of occurrence is continuous.** For example, an operation may have logging trucks operating continuously, but have only had one reportable spill of fuel from a logging truck in the past year. In this case the likelihood of occurrence (of reportable spills from logging trucks) would rate in the infrequent or rare categories, even though trucks operate continuously.

Probability Matrix

Probability	Likelihood of occurrence	Description	Example
Very Low	Very Rare	>5 years between events	Spill directly into fish habitat
Low	Rare	1-5 years between events	Spill in riparian area
Moderate	Infrequent	Several times a year	Reportable size spills from equipment or fuel storage areas
High	Routine	Every few months or monthly	Minor hydraulic fluid leaks from heavy equipment
Very High	Continuous	Every few weeks or weekly	Fuel spills adjacent to service vehicles (not reportable size)

How do we determine risk from probability and consequence?

In order to easily calculate risk objectively for each activity, we plot the Probability and Consequence values that we have determined on the vertical and horizontal axes of the risk matrix table. These values then correspond to an **Inherent Risk** value for that environmental aspect.

Risk Assessment Matrix						
		Consequence				
		Very Low	Low	Moderate	High	Very High
Probability	Very Low	VL	VL	L	M	H
	Low	VL	L	M	H	H
	Moderate	L	L	M	H	H
	High	L	L	H	H	VH
	Very High	L	M	H	VH	VH

What do we perform our risk assessment on?

For ISO certification we are required to assess risk for a variety of aspects of our work that have potential to impact the environment. Using the list of Environmental Aspects, we divide everyday operations into categories and identify all the potential impacts to resource features. Of the impacts listed for a particular aspect, we select a potential event that appears to have the greatest impact (typically in consequence) and perform a risk analysis on that event (probability of it occurring and it's potential consequence). This information is used to determine whether or not an aspect of our work has potential to significantly impact the environment.

Definitions

Environmental Aspect:

Element of the organization's activities that interacts with the environment

Event:

For the purposes of this risk assessment, an 'event' refers to an occurrence that happens as a result of normal activities that yields a result that is outside of standard or expected conditions. Where this result causes harm to resources or environmental processes, an event is considered to have an adverse impact on the environment.

Generally Applicable Example:

In the Risk Assessment Matrix, the column 'Generally Applicable Example' refers to a example of a key significant impact that could arise as a result of a particular aspect. The examples provided may not be relevant to all business areas and can be adjusted to reflect local conditions. They are provided to offer direction to the types of severe impacts one may expect related to a particular aspect when determining probability and consequence.

What is a "Significant Environmental Aspect"?

After performing the risk analysis, any aspect with an inherent risk rating of moderate or higher is considered to be significant. This means that this activity occurs frequently enough, with sufficient consequences to warrant operational controls. These controls include EFPs and other operational documentation geared towards mitigating potential impacts. In other words: We need to identify and manage those activities that we undertake, which have significant potential to adversely impact the environment.

When should human health and safety be considered when conducting risk assessments on environmental impacts?

Typically human health and safety is managed as part of a company's *Occupational Health and Safety Program*, and is not directly related to environmental risk assessment. However, where resources or environmental processes have been impacted severely enough, or in such a way that they jeopardize human health and safety, these circumstances can be a good indication of the scale and severity of an **environmental** impact. In other words: In order for Impacts to human health and safety impacts to be considered as part of an environmental risk assessment, they must be the direct result of an impact to the environment (i.e. a spill in a community watershed).