

Appendix M

Directions for Identifying and Ranking Risks Using Forms 1 & 2

PURPOSE OF IDENTIFYING AND RANKING RISKS

1. Describe risks in a consistent, standardized format to facilitate planning decisions.
2. Provide a tool that will allow NHFG to objectively prioritize actions within and among levels of the ecological hierarchy (e.g., within species, within habitat, and among species and habitats).
3. Provide a source of data that can be queried to obtain a comprehensive overview of risks.

FORM 1: RISK EXPOSURE

Complete Form 1 or provide comments on a completed draft of Form 1 using the following guidelines, and return it to NHFG:

- a. **SPATIAL SCALE:** Identify all possible risks, regardless of spatial scale, for each conservation target (i.e., species or habitat). The scale of the risk should be commensurate with the scale of the target. Broad scale, pervasive risks like global climate change, acid rain, and heavy metal contamination should be assessed if exposure can be linked to a stress in the conservation target, even though it may be difficult to identify specific points on the exposure pathway for a given target. It is recognized that ultimately it will be impractical to plan for such large-scale issues within the context of a particular species or habitat; therefore major statewide risks will be compiled and explicitly addressed in a section of the Comprehensive Wildlife Strategy (CWS) specifically dedicated to statewide risks. As such, no conservation actions should be provided for statewide risks within a species or habitat profile.
- b. **TEMPORAL SCALE:** Identify all possible risks that wildlife are currently or potentially exposed to. Limit potential risks to those with underlying causes that currently exist and are likely to increase with current human population patterns. The ‘timing’ field could also be interpreted as a rough indicator of the CWS planning horizon. The upper bar for strategy development is 15 years. Some broad scale, long-range issues (e.g., climate change, acid deposition) will receive attention elsewhere in the plan.
- c. **ECOLOGICAL SCALE:** Risks that cause stress to individual species should be evaluated at the species level. For habitats, address risks that stress entire groups of species, such as small mammals, large mammals, birds, reptiles, amphibians, invertebrates, natural communities, or habitat structure/composition.
- d. **RISK CATEGORIES:** Consider all categories of risk identified in **TABLE 2 “Generic Threats in Different Biome Types”**, but only list risks that actually or potentially cause stress to the target.
- e. **CAUSALITY:** Definitions of the terms used to describe exposure pathways are given in **TABLE 1**. The pathways of risk exposure are continuous chains of causality

that lead from human action (usually) to impacts on a conservation target. There are an infinite number of discrete points along the exposure pathway, so it is expected that there will be variation in the underlying causes, direct risks, stresses, and targets that individuals identify for any given pathway. The ability to plan conservation actions effectively is limited by knowledge of the causes of ecological stress and effects on targets. It will be most useful to identify the underlying causes and direct risks for which it is most practical to develop and implement actions to abate the risk. Likewise, it will be most useful to identify stresses or aspects of the conservation target that can be easily monitored to observe a response to changes in the risk.

f. EVIDENCE: As much as possible, cite evidence in support of your assessment of each risk that has been identified.

1. Completed forms and comments will be compiled and condensed by NHFG or the profile writer to screen for redundancy and collate underlying causes, direct risks, and stresses under the most appropriate categories.

FORM 2: RISK FACTOR RANKING FORM

1. Transfer the list of direct risks from the final FORM 1 to FORM 2 (this may have been done already by NHFG or the profile writer).
2. Fill in scores for the factors described below. The factors are rarely constant over time. Onset of loss of function in the target will be used as an ecological constant across all assessments of risks for all species and habitats. Loss of function may be defined as an adverse change (stress) in the trend of a critical process in the life history of an organism (e.g., reduced survival, reproduction, or foraging, etc.) or ecology of a habitat (e.g., shifting composition, structure, or productivity, etc.). Onset occurs at the inflection point for the changing trend. To truly signify onset, such a change would have to be sustained and exceed the normal range of variation. If onset has already occurred, TIMING should receive the score for 'current' (4), and scores for all other factors should be based on their current values. Otherwise, TIMING should be scored based on the projected time of onset, and all other factor scores based on their projected values at the timing of onset.

In some instances quantitative statewide risk data are available to assist with scoring the factors. Currently, for example, quantitative data are available to assess risks caused by air and water pollution, road impacts, wind energy, climate change, development, and population growth. However, little reliable quantitative data exists beyond these issues. As such, expert opinion will be used to augment quantitative data to assist with making conservation planning decisions.

3. MAGNITUDE FACTORS

- a. SCOPE: A measure of the percent (%) of the statewide distribution of the target that may be exposed to the risk or number affected relative to the total

area or number). A risk that is very localized, therefore not impacting a large percentage of the affected target, should score lowest, whereas a pervasive broad scale risk should score high. Consider whether outside factors like land protection influences the potential scope of the risk.

- b. **SEVERITY:** A measure of the intensity of the stress impacting the proportion of the target exposed (as defined by SCOPE) to the risk. Severity is expressed as the percent (%) of the exposed population/habitat that will realize loss of function as defined above (e.g., mortality, loss of viability, failed dispersal, starvation, competitive exclusion, community succession, etc.). A stress inducing a very low rate of lost function in the exposed population should be assigned a low score while a stress inducing a high loss of function should be assigned a high score.
4. **URGENCY FACTORS**
- a. **TIMING:** Time until the target begins to lose function (loss of function is defined above). If a risk already has caused a loss of function in the target, it should be considered current, and score highest. If a risk is expected to cause a loss of function more than 15 years from now, it should score lowest.
 - b. **LIKELIHOOD:** The probability that the risk will actually be manifested as defined above (e.g., at the levels projected for scope, severity, and timing). The likelihood score increases as probability increases.
 - c. **INFORMATION:** A measure of the quality and reliability of evidence that the risk will be manifested as defined above (e.g., at the levels projected for scope, severity, and timing). The information score increases as the quality and reliability of evidence increases.
5. **OVERALL RISK RANK:** Ranked factors will be applied to a formula that calculates the overall RISK RANK (this will be done automatically if using the available Excel spreadsheets). The factors used to measure risks are reduced to magnitude (scope, severity) and urgency (timing, likelihood, information), by taking their means, and are then given a multiplicative relationship and scaled to 4 to retain the original scoring scale:

$$\text{RISK RANK} = (((a+b)/2)/4)((c+d+e)/3)$$

where a=SCOPE score, b=SEVERITY score, c=TIMING score, d=LIKELIHOOD score, and e=INFORMATION score.

6. **INTERPRETING RISK RANK:** In the published literature, there are many examples of arithmetic and rule-based approaches that summarize the factors influencing risks. Most of these conservation-planning tools use a combination of weights, means, and additive or multiplicative interaction of factors. The resultant ordering varies according to how the summary algorithm or formula is defined. It is acknowledged that the summary rank is a planning and decision-making tool, not a true quantitative measure. Therefore, precise ordering is not the intended outcome. The purpose of the ranking process is to provide a consistent basis for comparing risks across all species and habitats, and for placing those risks into categories of appropriate conservation action.

7. CATEGORICAL CLASSES: For this planning effort, the RISK RANK score will be used to assign the risk to a categorical class and decide which risks to plan to address in the current planning period with focused conservation strategies. When a score for a given risk falls near the threshold for two classes, careful scrutiny of the ranks given for each factor is warranted to ensure that the potency of the risk is being ranked appropriately relative to the other risks being ranked. When evaluating your scores, consider risks in the following context:

- a. Without action, CATASTROPHIC risks (3.25-4.00) will in the near future almost certainly result in the widespread complete loss of populations/habitat patches, with statewide extirpation already looming on the horizon. Immediate action is necessary to secure the conservation target, and there is not enough time to wait for better information.
- b. Without action, CRITICAL risks (2.50-3.24) will in the near future almost certainly result in widespread degradation of populations/habitats, resulting in an increasing risk of statewide extirpation. Action is necessary to control the risk, but initiating research to improve the efficacy of actions is, in some cases, justifiable over immediately initiating abatement.
- c. Without action, SERIOUS risks (1.75-2.49) may in the near future degrade some populations/habitats, with a very low risk of statewide extirpation. The risk may need to be controlled at the local level in the short term, but it is advisable to first conduct research to obtain more accurate information about the risk or wait until changes in the level of the risk can be measured statewide.
- d. Without action, CHRONIC risks (0-1.74) may degrade some populations/habitats at a level that is currently sustainable. The risk may need to be controlled in the long term, but currently it is reasonable to plan to re-evaluate the risk later.

Conservation actions should only be generated for risks ranked as “CATASTROPHIC” or “CRITICAL.” However, if you find that you have no serious or critical risks, then address those higher ranked “moderate” ones.

8. Where data are available, quantitative analyses will be conducted to check results. As an additional check, risks assessments are nested within all species, habitats, and landscapes. It would be very difficult for a significant risk to a conservation target to be missed at each of these hierarchical filters. For example, on a hypothetical landscape scale, lack of concrete information limits our ability to develop a strategy to address climate change or even project the magnitude of stress induced by it, which may result in climate change receiving a “serious” rather than a “critical” overall rank. Effort to address such a landscape risk would be allocated to informing regional, national, and global planners of our findings and by supporting regional monitoring and planning efforts. However, in some instances, climate change may be well documented in a specific location, with a fairly predictable pattern of high magnitude

stress for a well-known species. In such cases a resulting risk rank of “critical” would be justified. In these cases, effort may be allocated to the critical species risk by immediately initiating research on rates of habitat change and evaluating preservation of the species in zoos before it becomes extinct.

Completed risk ranking forms will be compiled and condensed by NHFG or the profile writer. Scores from individuals will be averaged....

Thank you for taking the time to contribute to NH’s Comprehensive Wildlife Conservation Strategy!

Table 1. Definitions (from Salefsky et al, 2003).

- **Threats** – Any human activity or process that has caused, is causing or may cause the destruction, degradation and/or impairment of biodiversity and natural processes. There is often a fine line between a naturally occurring event such as a fire set by lightning and a human-caused threat such as a fire set by a match or even increased intensity of fires due to forest management practices. In general, we would regard the latter two as threats whereas the former is not. In systems that depend on human actions to maintain biodiversity such as the use of prescribed burns, the removal or alteration of these management activities may also constitute a threat. Includes both *direct threats* and *underlying causes*. Synonymous with *pressures*.
- **Direct Threats** – Factors that immediately cause stress to conservation targets by physically causing their destruction or degrading their integrity.
- **Underlying Causes** – A condition or environment, usually social, economic, political, institutional, or cultural in nature, that enables or otherwise contributes to the occurrence and/or persistence of a direct threat. There is typically a chain of underlying causes behind any given direct threat. In a situation analysis, underlying causes can be subdivided into *indirect threats* (factors with a negative effect) and *opportunities* (factors with a positive effect). Synonymous with *drivers*.
- **Targets** – The biological entities (species, communities, or ecosystems) that the project is trying to conserve. Synonymous with *conservation targets*, *biodiversity targets*, and *focal targets*.
- **Stress** – The impairment or degradation to a key ecological attribute of a conservation target that results in reduced integrity of the target. As shown in the diagram, a stress is not a threat in and of itself, but rather a condition of the target. In many situations, defining specific stresses leads to an unnecessary level of detail, especially when the project is operating at a coarse scale. In these cases, it is better to just have the stress be implicit in the arrow leading from the threat to the target. For example, if a threat to a forest in a National Park is illegal clearcut logging, then the project team members will want to act to keep the loggers out of the forest. They don't need to worry about stresses. In some situations, however, it is important to detail the specific mechanisms by which a threat affects a target. For example, the threat to a forest in a managed timber area is legal selective logging, then the team may not be able to completely eliminate the loggers. Instead, the project may wish to ameliorate specific problems caused by the logging such as soil erosion into streams and secondary damage to trees caused by felling practices. In this case, the team members may wish to expand the arrow linking the logging threat to the forest target to show specific mechanisms or stresses.

Table 2. Threat Categories (from Salefsky et al, 2003).

	GENERIC THREATS IN DIFFERENT BIOME TYPES				
THREAT CATEGORY	Forests	Grasslands / Savannah	Desert	Freshwater	Marine
Habitat conversion	Housing Industrial development Farms Plantations Ski areas	Housing Industrial development Farms Dam construction Golf courses	Housing Industrial development Farms Golf courses	Docks Farms (e.g., rice) Channelization Dam construction Ship yards	Aquaculture Destructive fishing
Transportation infrastructure	Utility lines Roads Railroads	Utility lines Roads Railroads	Utility lines Roads Railroads	Levees & dikes Dredging	Dredging Shipping lanes
Abiotic resource use	Mining Oil & gas drilling Geothermal energy Water withdrawal	Mining Oil & gas drilling Geothermal energy Water withdrawal Wind farms	Mining Oil & gas drilling Geothermal energy Water withdrawal Wind farms	Mining Oil & gas drilling Water withdrawal	Mining Oil & gas drilling Coral mining Desalination plants Wind farms
Consumptive biological resource use	Hunting / NTFP collect Grazing Logging	Grazing Hunting / gathering	Grazing	Fishing	Fishing Trawling
Non-consumptive biological resource use	ATVs / snowmobiles Hiking / biking Scientific research Military maneuvers	ATVs Hiking / biking Scientific research Military maneuvers	ATVs Hiking / biking Scientific research Military maneuvers	Jet skis Boating Scientific research Military maneuvers	Jet skis Boating Scuba / snorkeling Scientific research
Pollution	Acid rain Solid waste Toxins Radio active fallout	Solid waste Toxins Radio active fallout Agricultural runoff	Salization Toxins Solid waste	Municipal waste Solid Waste Toxins Agricultural runoff Thermal pollution	Solid Waste Toxins Agricultural Runoff Municipal waste Sonic pollution
Invasive species (alien and native)	Plants Animals Disease & pathogens	Plants Animals Disease & pathogens	Plants Animals Disease & pathogens	Plants Animals Disease & pathogens	Plants Animals Disease & pathogens
Modification of natural processes / ecological drivers / disturbance regimes *	Climate change Loss of key predators Grazing patterns Fire regime	Climate change Desertification Grazing patterns Fire regime	Climate change Grazing patterns	Climate change Sea-level rise Sedimentation Salinity Loss of key predators Flow regimes (dams) Shoreline stabilization	Climate change Sea-level rise Coral bleaching Loss of key predators

* Items in this row could be categorized as "stresses" rather than as "threats" but are important for practitioners to consider.