



South Saskatchewan Regional Plan Strategies Biodiversity Management Framework



What will the Biodiversity Management Framework (BMF) be?

In Alberta, environmental management frameworks provide the regional context within which decisions about future activities, and management of existing activities, occur in each of the seven Land-use Framework planning regions. One of these frameworks is a regional biodiversity management framework (BMF). Each regional BMF includes biodiversity objectives for the planning region and provides context for managing the cumulative effects of development on the environment. Monitoring and reporting on the performance of indicators in relation to threshold values will inform planning and decision-making, and help determine if biodiversity objectives are being achieved.

Biodiversity and the services it provides are critical to the well-being of current and future generations of Albertans. Benefits from healthy functioning ecosystems and the biodiversity contained within include the following:

- Supporting services such as nutrient cycling and seed dispersal;
- The provision of food, fibre, fresh water and raw materials;
- Cultural benefits, including spiritual, recreational and esthetic values; and
- Regulation of climate, soil formation and carbon sequestration.

The South Saskatchewan region BMF supports the achievement of biodiversity outcomes stated in the South Saskatchewan Regional Plan, that *biodiversity and ecosystem functions are sustained through shared stewardship*. Additional more specific objectives for biodiversity included in the regional plan are:

- Terrestrial and aquatic biodiversity are maintained;
- Long-term ecosystem health and resiliency is maintained;
- Species at risk are recovered and no new species at risk are designated;
- Intact grasslands habitat is sustained; and
- Biodiversity and healthy, functioning ecosystems continue to provide a range of benefits to communities in the region and all Albertans, and there is sustainable use of Alberta's biodiversity resources.

Indicators

Indicator Selection

When selecting proposed biodiversity indicators for the South Saskatchewan region BMF, the following criteria were used:

- Relevant to the South Saskatchewan regional plan objectives;
- Representative of regional scale biodiversity;
- Ecologically relevant;
- Responsive to changes in land use; and
- Feasible to measure and monitor.



Pyramid Structure for indicators

Biodiversity relies on complex interacting systems. Monitoring every component of biodiversity is not possible, but we can begin to understand its health by selecting key elements that have the capacity to represent a broader suite of biodiversity. Each BMF selects species and habitat indicators, from both terrestrial (upland/dry area) and aquatic (lowland/wet area) systems. This approach produces four indicator pyramids (Figure 1); each pyramid is divided into four tiers (Figure 2). The intent is to have one indicator in Tier 1 and two indicators in Tier 2 of each pyramid, for a total of 12 indicators with triggers. Supporting indicators will be listed in Tier 3. They will not have triggers but they will be monitored and reported on with the Tier 1 and 2 indicators. All other monitoring data and supporting information will reside at the pyramid base in Tier 4.

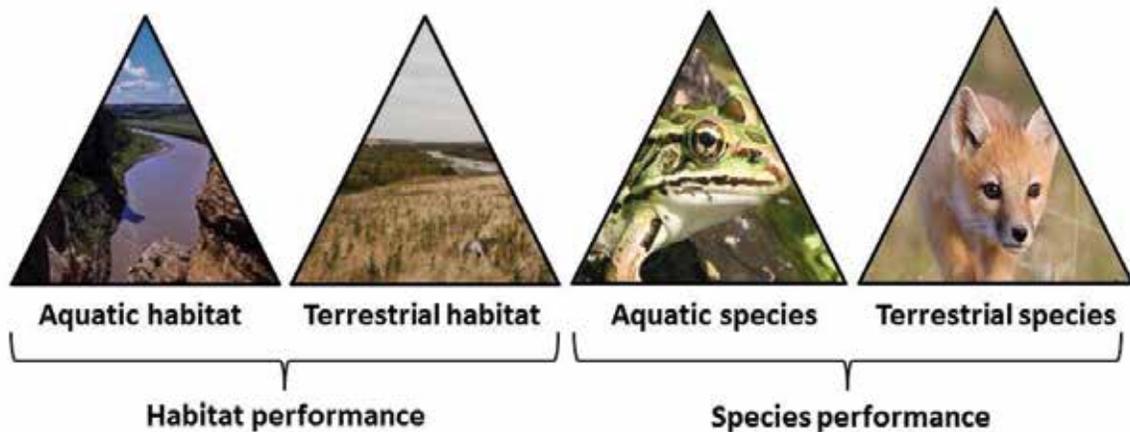


Figure 1. Four categories of indicator pyramids used in the biodiversity management framework

A brief description of each tier, within each pyramid, follows:

- **Tier 1** – One composite indicator that communicates the general state of biodiversity within the region. The Tier 1 indicator is associated with a threshold so that the cumulative effects of various disturbances can be appropriately managed. The intent is to maintain consistency in Tier 1 indicators across all planning regions to provide a provincial perspective.
- **Tier 2** – Two indicators of regional significance that are associated with thresholds. These indicators will directly address the biodiversity issues identified within the South Saskatchewan and reflect species and habitats of special interest within this region.
- **Tier 3** – Several indicators representing the subcomponents of Tier 1 and 2 composite indicators (e.g. total native aquatic cover could be broken down into the total amount of wetland area (e.g. shallow open water, swamps, marshes, riparian area, etc.), in addition to species and habitats of social importance. Tier 3 indicators will be monitored and reported on with the Tier 1 and 2 indicators, and will inform the management actions in response to triggers.
- **Tier 4** – Supporting data provides valuable additional information regarding the status of biodiversity within the region.

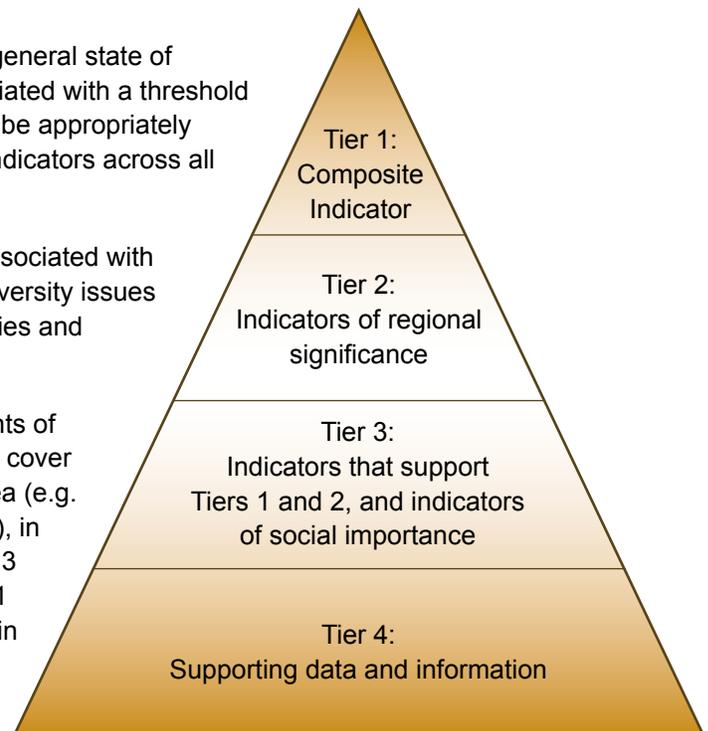


Figure 2. Tiers of the indicator pyramid



Key biodiversity concerns in the South Saskatchewan Region

- **Cumulative effects management** – Understanding and managing the combined effects of past, present and reasonably foreseeable future land-use activities on the environment.
- **Conservation of grasslands** – Conserving a range of landscape types representative of Alberta’s natural diversity provides habitat security that will support and maintain aspects of biodiversity that depend on these landscapes.
- **Connectivity** – Preventing habitat fragmentation and isolation of populations. This allows for the interchange of genetic material between populations, the movement of animals into new ranges, access to seasonal ranges, and can reduce the potential for negative wildlife-human interactions.
- **Invasive species** – Preventing the establishment of invasive species to support maintaining healthy ecosystems and avoiding the economic costs associated with control and habitat loss.

Triggers

What are triggers?

Triggers are the quantitative basis for evaluating biodiversity performance and assessing whether the BMF objectives are being achieved. Triggers are intended to act as “early warning signals” in the BMF system.

- Triggers are intended to drive improved practice (industry and other land users) in a region to minimize the rate, extent and duration of human footprint.
- If an indicator performs poorly and crosses a trigger, this indicates the need for a management response.
- Triggers are indicator specific – they are based on the best available estimates of current abundance and/or condition, historic records and anticipated pressures.

Trigger development for indicators

The BMF will establish triggers for all indicators in Tiers 1 and 2. However, some indicators are new; they do not have existing monitoring programs and data that allow a

trigger to be calculated. The BMF is committed to filling these gaps. Monitoring programs will be designed, and as more data are collected our increasing knowledge of the indicator will support the development of a trigger. This level of in-built flexibility is known as adaptive management.

The development of biodiversity triggers is an emerging practice. Other environmental frameworks have been able to adopt international, national or provincial guidelines and standards. However, similar guidance generally does not exist for regional scale biodiversity. As such, the development of thresholds will rely on the best available science and monitoring, and require input from multiple land users, including local governments, stakeholders, First Nations and Métis organizations. In line with the adaptive management philosophy, the work will need to be adaptable as additional information becomes available.

Explaining the trigger approach

1. A **reference condition** is established for each indicator. A reference condition is the predicted condition of the indicator in the absence of development and disturbance. Reference conditions may be determined using modelling tools, or be based on the condition of an indicator in a reasonably undisturbed area.
2. The established **current condition** is determined for each indicator. The current condition refers to the abundance, health and distribution of the indicator as we see it today. Calculations of current condition rely on existing monitoring or modelling data.
3. The **change** from reference condition to current condition is calculated and a threshold is established.
4. Each indicator will be **monitored** over time and its performance will be compared to the threshold value. The performance of each indicator will be **reported** on every two years.
5. If a trigger is crossed a **management response** will be initiated. Indicators that do not have an established trigger will still be monitored for change until a trigger is set, and it will be possible to initiate a management response for these indicators based on the reported performance.



Each indicator will have three trigger values. These triggers define four management levels, indicating where the reported condition of each indicator sits. The performance of each indicator is regularly assessed and if a trigger is crossed this will prompt a management response. The management intent at each level shows the stringency of management actions needed. The intention of the BMF is to increase the stringency of any management actions required as part of the management response as the level increases. Table 1 summarizes the management intent at each level.

Table 1. Management levels and corresponding management response intent.

Management Level	Management Intent
Level 4	Manage cumulative effects to reduce the extent and duration of land disturbance impacts on biodiversity to stabilize or improve indicator performance. Increase the stringency of regulatory approaches in Level 4.
	Trigger into Level 4
Level 3	Proactively maintain biodiversity by adjusting existing management tools and planning, or initiate new tools as needed. Increase the stringency of regulatory approaches in Level 3.
	Trigger into Level 3
Level 2	Improve knowledge and understanding, adjust existing approaches and planning as needed.
	Trigger into Level 2
Level 1	Maintain biodiversity through standard regulatory and non-regulatory approaches.

Management response

Foundations of biodiversity management in Alberta

The biodiversity management framework will build upon the foundation of policy and management practices that currently support biodiversity in Alberta. For example, species at risk planning, integrated land management, sub-regional planning, hunting and fishing regulations, and rangeland management will all continue to play an important role in the BMF system. New conservation areas established under regional plans will supplement existing conservation areas and contribute to achieving biodiversity objectives. Management of public lands outside of conservation areas, in addition to encouraging the responsible management of private lands, will further assist in achieving BMF objectives.

- **Management response** – a set of steps initiated if monitoring data shows that an indicator trigger has been crossed (refer to Figure 3).
 - Part of the management *response* is determining the need, if any, for management *action*

- **Management action** – includes a range of measures and tools, both regulatory and non-regulatory, with varying degrees of stringency.

The role of proactive management

The BMF will enable proactive management actions to support the achievement of biodiversity objectives now. Research, regional planning, and species at risk recovery planning initiatives have shown that managing the extent, duration and rate of linear footprint disturbance and motorized access are the most significant actions that can be taken to support biodiversity. Other key approaches include:

- Maintaining and enhancing areas of intact native grasslands;
- Ensuring wildlife connectivity in areas of high biodiversity value, including wildlife corridors and stream continuity;
- Managing natural and human disturbance in key habitats and enhancing reclamation; and
- Enhancing management of land disturbance through a Linear Footprint Management Plan.



The Integrated Land Management Program supports the goals of both the Recreation Management Plan/Linear Footprint Management Plan and the BMF.

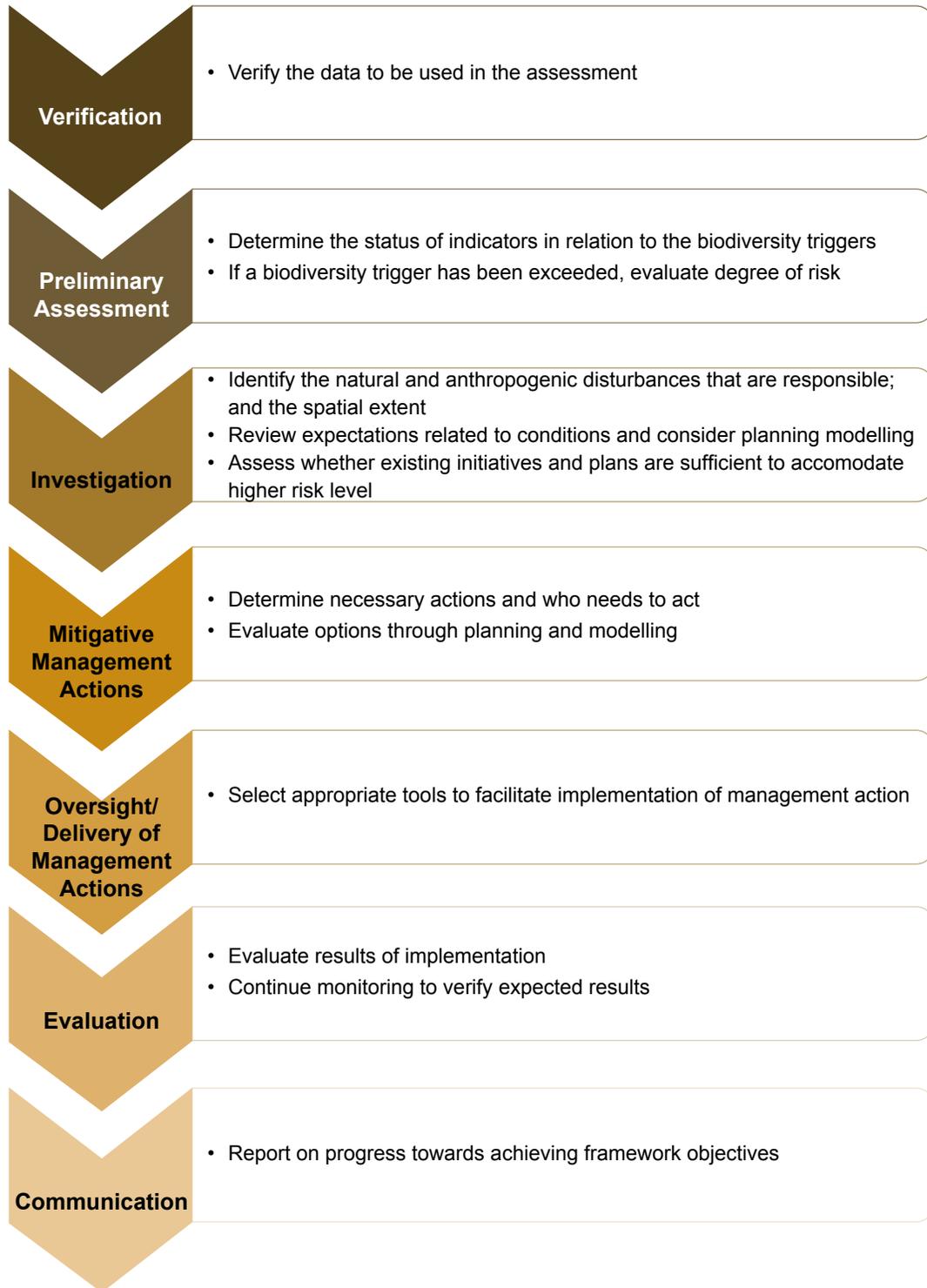


Figure 3. The management response



Examples of management actions

When they are needed, management actions will be identified by ESRD in collaboration with other parties. These parties may include other provincial government departments and agencies, local governments, stakeholders, First Nations and Métis organizations. Management actions can include a range of approaches and tools with varying degrees of rigour. Management actions are designed to be flexible to consider the circumstances when a trigger is crossed. Some of these approaches and tools may include:

- Education and awareness programs;
- Voluntary programs and incentives;
- Additional monitoring;
- New or different regulatory requirements or restrictions in approvals and dispositions;

- Amendments to approvals (in accordance with authority under legislation);
- Changes to fish and wildlife regulations;
- Economic instruments;
- Offset programs;
- Voluntary and mandatory integrated land management practices; and
- Enhanced reclamation requirements.

Supporting rationale for proposed indicators

The following tables provide an overview of the rationale for each of the proposed Tier 1 and 2 indicators for the South Saskatchewan BMF.

Table 2. Terrestrial habitat indicators

Tier 1	Terrestrial native cover
	<p>Rationale – Habitat loss and land conversion are the largest contributors of local biodiversity loss on Earth. By monitoring terrestrial native land cover in the region we get a clear picture of the amount of habitat loss due to cumulative impacts of human disturbance.</p> <p>Definition – The total amount of terrestrial native land cover refers to the proportion of upland/dry area (e.g., not major waterbodies, wetlands, or riparian areas) within the region that are free of human footprint.</p>
Tier 2	Native land cover patch size (upland & lowland)
	<p>Rationale – Increasing fragmentation of native land cover by human activities is a major threat to biodiversity. Reductions in size and connectivity of remaining native cover patches leads to loss of species biodiversity, restrictions in species movement, and greater vulnerability to species extinction. This indicator will track the fragmentation, including size, distribution and connectivity, of the remaining native land cover patches in the region.</p> <p>Definition – For this indicator, a patch is defined as the area of native land cover without obstructive barriers created by large-scale, human-caused disturbance (e.g., cultivation, transmission lines, residential development, paved and gravel roads). The methodology to describe fragmentation is still under development.</p>
Tier 2	Native land cover patch integrity
	<p>Rationale – The integrity of the remaining native land cover patches is threatened by the occurrence of human-caused disturbances that do not necessarily create barriers affecting connectivity, but compromise the integrity of the patch by creating soil and vegetation disturbance. This indicator reflects the quality of the remaining native land cover.</p> <p>Definition – For this indicator, patch integrity is defined as the inverse of the proportion of human-caused disturbance within a native land cover patch. The methodology for this indicator is still under development.</p>



Table 3. Aquatic habitat indicators

Tier 1	Aquatic native cover
	<p>Rationale – Habitat loss is recognized as a major component of biodiversity loss. By monitoring aquatic native cover in the region we get a clear picture of the amount of habitat loss (e.g. major waterbodies, wetlands, or riparian areas) due to cumulative impacts of human disturbance.</p> <p>Definition – Amount of aquatic native land cover refers to the percentage of lowland/wet area within the region that is free of human footprint. It includes major water bodies, wetlands (e.g., shallow open water, swamps, marshes) and riparian habitats.</p>
Tier 2	Temporary/Seasonal wetland cover*
	<p>Rationale – Up to 70 per cent of wetlands in the settled area have already been lost and smaller, less permanent wetlands like temporary and seasonal wetlands are more susceptible to conversion. These wetlands support a wide array of biodiversity by providing critical habitat for breeding and migrating waterfowl, shorebirds, amphibians and invertebrates. They also contribute to drought resiliency, flood attenuation, water purification and groundwater recharge.</p> <p>Definition – Temporary wetlands are periodically flooded every year for a short period of time but otherwise lack surface water (i.e. class 2's) and seasonal wetlands are typically flooded for most of the growing season, but have little to no surface water by the end of summer (i.e. class 3's). They both contain emergent vegetation in the deepest portion of the wetland in the majority of years.</p>
Tier 2	Riparian integrity
	<p>Rationale – Riparian areas refer to the vegetated fringe surrounding lakes, rivers, streams and wetlands; they are the transitional zone between terrestrial and aquatic ecosystems. Native riparian areas are productive ecosystems, and are “hot spots” of biodiversity. A high proportion of species are estimated to use riparian areas during some part of their respective life histories. Effective native riparian areas provide access to water, foraging, corridors between other important habitats, thermal or security cover breeding sites and refugia from disturbance. Factors affecting riparian integrity include hydrology, habitat alteration, non-native plants and loss of adjacent upland habitat.</p> <p>Definition – This indicator will reflect the amount of riparian habitat on the landscape. Riparian integrity is defined as the proportion of human-caused disturbance (cultivation, residential development, paved and gravel roads, etc.) within a native riparian patch.</p>

* Temporary or seasonal wetland cover is tentatively proposed as a Tier 2 indicator. This indicator is currently being investigated further to determine its suitability with respect to the selection criteria, in particular responsiveness and representative of regional scale biodiversity.



Table 4. Terrestrial species indicators

Tier 1	Terrestrial biodiversity intactness
	<p>Rationale – Mitigation of species loss due to human activity is a priority for the region. The intactness index is a broad, species-based, biodiversity indicator, particularly in relation to habitat conversion and degradation, which are recognized as major contributors to biodiversity loss.</p> <p>Definition – A measure of terrestrial biodiversity intactness is currently monitored by the Alberta Biodiversity Monitoring Institute (ABMI). This method assesses the abundance of species within certain taxa (e.g. birds, mites, mammals, plants, lichens and mosses) against the abundance that would be expected in an undisturbed area. This indicator is built on data for identifying relationships between human land use, habitat and species abundance.</p>
Tier 2	Non-native vascular plants
	<p>Rationale – Non-native vascular plant species can respond quickly and aggressively to land disturbance and impair habitat quality. While not all non-native species represent a threat to biodiversity, given the right conditions, non-native species can become a major ecological and economic concern.</p> <p>Definition – The indicator will be based on the proportion of ABMI plot quadrants dominated by one or more non-native vascular plant species. Non-native, or alien, vascular plants are those species that have been accidentally or deliberately introduced into habitats outside their normal range.</p>
Tier 2	Species of potential conservation concern (terrestrial & aquatic)
	<p>Rationale – This indicator will track species that are considered sensitive to human activities and that, if not properly managed, could be potential future candidates for listing as a threatened or endangered in Alberta.</p> <p>Definition – Species of potential conservation concern would be monitored in a composite indicator for a region. The methodologies for this indicator are under development.</p>



Table 5. Aquatic species indicators

Tier 1	Aquatic biodiversity intactness
	<p>Rationale – Mitigation of species loss due to human activity is a priority for the region. By monitoring and reporting on the level of “intactness” of biodiversity groups, a consistent measure of aquatic species performance is provided.</p> <p>Definition – A measure of terrestrial biodiversity intactness is currently monitored by the ABMI as described above. A similar approach needs to be developed for aquatic intactness. Sub-components of this composite metric may include fish, water birds, semi-aquatic mammals, aquatic plants, etc.</p>
Tier 2	Index of native fish integrity
	<p>Rationale – The health of fish communities and the status of fish populations are strongly associated with aquatic ecosystem health. Approximately 40 fish species are considered native to the South Saskatchewan and Milk River basins; any shifts in community composition may reflect influence of land use stressors such as impairments to fish habitat or over-fishing.</p> <p>Definition – The index of native fish integrity (INFI) is one of two method used by Environment and Sustainable Resource Development for assessing the status of fish populations. The INFI is a measure of the structure of the fish community; the indicator provides an overall score of the current health of a fish community to an unaltered state.</p>
Tier 2	Amphibians*
	<p>Rationale – Declines in amphibian populations have been documented worldwide, from many regions and habitat types. No single cause for declines has been demonstrated, but stressors such as habitat loss, contaminants, non-native predators, disease agents, parasites, and the effects of ultraviolet radiation have all been suggested. Because of their susceptibility to these and other stressors, amphibians are important indicators of ecosystem health.</p> <p>Definition – The intent is for an amphibian indicator to track the changes in average abundance of the measureable amphibians over the regional area. The methodology is under development.</p>

* Amphibians are tentatively proposed as a Tier 2 indicator. This indicator is currently being investigated further to determine its suitability with respect to the selection criteria, in particular feasibility.