2018 Annual Knowledge Plan

October 2018

Prepared by Eclipse Geomatics
for the Skeena Knowledge Trust

Skeena Knowledge Trust
2018 Annual Knowledge Plan

1.0 Introduction

The Skeena Knowledge Trust (SKT) was formed in September 2017 following a multi-year collaboration between the Bulkley Valley Centre for Natural Resource Research and Management Society, the Wet'suwet'en Treaty Office Society, SkeenaWild Conservation Trust, and the Pacific Salmon Foundation to address the need for greater knowledge management and more informed decision-making pertaining to salmon and salmon habitat within the Skeena River watershed and estuary. A trust model was adopted as the governing framework, as it provides the necessary structure to ensure high quality, unbiased data is gathered, stored, and disseminated in an objective and impartial manner. This level of data governance was considered to be essential in order for the SKT to become a trusted source of data for local First Nations, community members, and decision makers.

The purpose of the SKT as defined in Section 4.1 of the trust agreement is the advancement of public education and other purposes beneficial to the community by educating the public on the wild salmon populations, their genetic diversity, and their ocean and freshwater habitats in the Skeena Watershed and Ocean Approaches, and the implementation and effectiveness of broadly supported plans and policies by collecting and disseminating information on such populations and habitats, through the decision-making procedures set out in the Annual Knowledge Plan Process (Schedule "C" of the trust agreement).

2.0 Objective

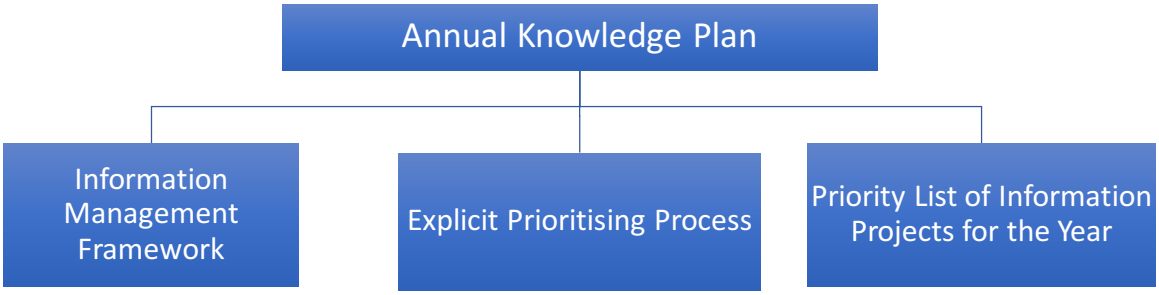
The objective of the Annual Knowledge Plan is to establish an annual data and knowledge acquisition, compilation, and communication plan in order to further public education on wild salmon in the Skeena watershed.

3.0 Accessibility

In order to maximize the accessibility of data relevant to Skeena salmon, the SKT has developed two principal tools to store and deliver information. The Skeena Salmon Data Centre (SSDC, https://data.skeenasalmon.info/) is a publicly-accessible, online data warehouse and library based on open-source CKAN software, and provides users with access to a comprehensive collection of relevant reports, data, and spatial files. The Skeena Maps Portal (SMP, http://maps.skeenasalmon.info/) was developed based on an open-source GeoNode platform, and allows users to search, view, and download spatial files, as well as create maps.

4.0 Annual Knowledge Plan Framework

The Skeena Knowledge Trust Annual Knowledge Plan is outlined by the Skeena Knowledge Trust Agreement Schedule “C” and consists of the following components:



4.1. Information Management Framework

The information management framework consists of the following (summarized from Schedule ‘C’ Part 4 of the Trust Agreement):

1) A list of salmonid policy documents, provincial land-use plans and First Nations land-use plans that apply to the Skeena Watershed and Ocean Approaches and that have demonstrated broad support from the affected public;
2) A compilation of salmon-related objectives from the plans and policies organized into objective classes including: wild salmon populations and genetic diversity, salmon habitat (ocean, estuary, and freshwater), hydroriparian ecosystems, hydrology, water quality, and salmon fisheries management;
3) Relevant pressure indicators of management activities; and
4) Relevant geographic areas (shown in Schedule ‘A’ of the Trust Agreement).

The information management framework is reviewed and maintained on an annual basis.

4.2. Explicit Prioritising Process

Incoming information is prioritized according to the following parameters:

1) Its relevance to Skeena salmon;
2) Its credibility;
3) Its value for assessing risk to an objective;
4) Its accessibility; and
5) Its clarity of presentation.

4.3. Priority List of Information Projects

A priority list of information projects for the year is established using the prioritizing process to:

1) Canvas existing information and select and rank candidate information by its value in assessing risk to an objective;
2) Where information is found not to exist, rank candidate information projects by the value of newly-generated information to assess risk to an objective by a pressure indicator; and
3) Rank previously acquired information projects by the need to improve the accessibility and clarity of existing presentation.

Information projects on the priority list are further ranked by:

4) Relative cost in obtaining the information; and
5) Changes in the relative priorities of each type of project over time.

5.0 Results of the 2018 Annual Knowledge Plan Process

Salmon-related objective classes were assessed and prioritized for 2018 based on current activities within the Skeena watershed, research objectives and findings, and public interest. High-priority objective classes and related threats identified for 2018 include:

- Wild salmon populations
  - Harvesting pressure
  - Climate change
- Wild salmon habitat
  - Development within the Skeena River estuary
  - Climate change
- Hydroriparian ecosystem integrity
  - Land use activities (forestry, agriculture, energy production, mining)
  - Transportation corridors
- Water quality
  - Pollution
  - Climate change (i.e. temperature)
- Salmon fisheries
  - Harvesting pressure

Refer to the appended "Economic Activities and Priority Concerns within the Skeena Watershed and Estuary that Inform the Skeena Knowledge Trust Annual Knowledge Plan: Working Paper" (Eclipse Geomatics, 2018) for additional discussion of priority objective identification.

A priority list of information projects was prepared by ranking existing information sources by objective class, value for assessing risk to an objective, and relative cost (Section 3.3), and is presented in the following table. Individual datasets within the prioritized information projects will be evaluated for relevance to Skeena salmon, credibility, and clarity of presentation (Section 3.2) as they are acquired.

A gap analysis to identify new information required to provide further clarity on specific objectives and pressure indicators was not performed for 2018 as it is the first year of data curation for the SKT and existing high priority information sources have yet to be assembled for inclusion in a gap analysis.

6.0 Skeena Knowledge Trust Proposed Activities for 2018

A budget was established by the trustees for 2018 in support of the following proposed activities.

6.1. Governance

SKT operations for 2018 will continue to be supported by a grant from the Gordon and Betty Moore Foundation administered by the Bulkley Valley Centre for Natural Resource Research and Management Society (BVRC). The SKT will apply for status as a registered charity with the Canadian Revenue Agency. Upon receipt of registration, the SKT will move forward with transitioning towards operational independence. Funding diversification will be an important component of ensuring the continued success of the SKT.

6.2. Communications

New information will be publically-accessible on the SSDC and SMP. Social media platforms and the main SKT website will be used to promote releases. Brochures will be developed to provide information on the SKT for potential users, and a list of potential stakeholders and contact information will be compiled.

6.3. Data Curation

High priority information identified in Section 5.0 will be uploaded into the Skeena Salmon Data Centre (SSDC) and Skeena Maps Portal (SMP) first, followed by medium priority and low priority items as resources allow.

6.4. Technical Development

Major upgrades to the SSDC and SMP platforms are scheduled for 2018 which will include the addition of new features. Ongoing issues and bugs will be addressed as required.

6.5. Educational Activities

Workshops on using the SSDC and SMP to access and search information for user groups and the public will be developed in addition to on-going outreach and engagement with stakeholders.

7.0 Evaluation and Reporting

A summary of data acquisition and curated information will be prepared after the SKT year end of December 31st and presented to the trustees for review.

Economic Activities and Priority Concerns within the Skeena Watershed and Estuary that inform the Skeena Knowledge Trust Annual Knowledge Plan: Working Paper

August 2018, revised October 2018

Prepared by Eclipse Geomatics for the Skeena Knowledge Trust

Introduction

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This document outlines the SKT information project prioritizing process in support of the 2018 SKT Annual Knowledge Plan.

Project Background

In order to provide public access to information on wild salmon in the Skeena, the SKT maintains and populates the Skeena Salmon Data Centre (SSDC, an online data warehouse) and the Skeena Maps Portal (SMP, an interactive mapping tool for sharing and viewing spatial information). The information uploaded to the SSDC and SMP is guided by international, national, and regional conservation policies and guidelines. On the international level, the SKT aims to incorporate the Open Standards for the Practice of Conservation (OSPC) as it applies to the Skeena Watershed. Nationally, the SKT is guided by the Wild Salmon Policy, specifically Strategy 2 - Assessment of Habitat Status and Strategy 3 - Inclusion of Ecosystem Values and Monitoring. On a regional level the SKT's Annual Knowledge Plan reflects the various objectives tied to regional land use plans including First Nations land use plans and salmon recovery plans.

Wild Salmon Policy and Regional Land Use Plans

On a national level the contents of the SSDC are guided by the federal Wild Salmon Policy. Of particular focus is cataloging and warehousing information relevant to Strategy 2 - Assessment of Habitat Status and Strategy 3 - Inclusion of Ecosystem Values and Monitoring.

On a regional and sub-regional level the contents of the SSDC are guided by a wide range of land use plans and salmon recovery plans as outlined in Schedule "C" of the Skeena Knowledge Trust Agreement.

The SKT information priorities are organized below by topic as they relate to the OSPC direct threats classification and further expanded upon based on their relevance to the Wild Salmon Policy as well as regional and sub-regional land use plans.

International Conservation Standards

A joint effort by the International Union for Conservation of Nature (IUCN) and Conservation Measures Partnership (CMP) to create a global standard classification system of direct threats to conservation has led to the creation of the OSPC. The SKT aims to incorporate the OSPC as it applies to the contents of the SSDC and SMP. Our focus is specifically centered on the Direct Threats Classification Version 2.0 created as a key component of the Open Standards[1], included as Appendix A. Of the eleven threats identified through the OSPC, the SKT has identified seven of these threats as relevant to the Skeena watershed and estuary environment for 2018.

The seven threats defined by the CMP and IUCN identified as relevant to the Skeena watershed include:

- Residential and Commercial Development (Threat 1)
- Agriculture and Aquaculture (Threat 2)
- Energy Production and Mining (Threat 3)
- Transportation and Service Corridors (Threat 4)
- Biological Resource Use (Threat 5)
- Pollution (Threat 9)
- Climate Change (Threat 11)

The threats listed above are not ranked by priority as their significance to the Skeena watershed varies by geographical scope and activity. They are all relevant for different reasons outlined below.

Salmon Populations

The highest priorities within the Skeena sub-watersheds and estuary are to understand the status of different salmon populations and the impact of climate change across the watershed and estuary. These two priorities align with the CMP Classification Threat 5: Biological Resource Use and Threat 11: Climate Change and Severe Weather and apply to the entire Skeena watershed and estuary.

The knowledge base relevant to understanding the status of different salmon populations is continually growing and to date includes sockeye, chinook, coho, pink and steelhead summaries provided by Fisheries and Oceans Canada and the Pacific Salmon Foundation. The SKT continually searches for additional up-to-date information on harvesting pressure and population status with respect to Skeena salmon. Any knowledge relevant to the status of salmon populations and salmon harvesting is considered a high priority knowledge item to be included in the SSDC.

Forestry Activities

Knowledge items cataloged under Threat 5: Biological Resource Use also include habitat concerns with respect to resource based activities such as forest harvesting. Information relevant to sedimentation, the status of stream crossings, road density, and expanding harvesting activities into previously unlogged areas are all high priority knowledge to include in the SSDC.

Climate Change

The impacts of Threat 11: Climate Change with respect to salmon fisheries and water quantity are relevant across the entire Skeena watershed and estuary. Specifically, main knowledge concerns are focused on:

- Sea temperature increase resulting in changes to zooplankton communities and negatively impacting salmon survival at sea
- Atmospheric warming resulting in changes in weather patterns, increase of severe weather events including drought (related to low stream flow conditions and reduced access to smaller streams) and extreme rainfall events (resulting in high stream flow and turbidity conditions)
- Stream temperature increase
- Glacial melting

Information added to the SSDC will focus on increasing the current knowledge base with respect to current projected climate impacts at a regional and sub-watershed level scale. Select information items will be also included as they relate to the broader climate change scenario within the Pacific Northwest.

Agriculture and Aquaculture

Concerns with respect to Threat 2: Agriculture and Aquaculture include disease transfer from Atlantic farmed salmon to Pacific wild salmon populations. Sea lice are less of a concern on the northern coast of British Columbia due to the smaller number of aquaculture operations than on the southern coast. Agricultural concerns are mostly focused within the Upper Bulkley River sub-watershed, in particular fish-related impacts related to range lands and maintaining and restoring riparian areas.

Energy Production and Mining

All information relevant to the assessment of Threat 3: Energy Production and Mining including current, proposed and past mining activity within the Skeena watershed and estuary is a priority knowledge item, particularly as it pertains to water quality. Currently, particular projects of interest are the proposed Telkwa coal mine, proposed Morrison mine, several upper Skeena coal proposals, exploration activities at Silver Queen mine, and maintenance at Equity Silver mine.

Residential and Commercial Development

Key Threat 1: Residential and Commercial Development concerns are centered on development within the Skeena River estuary, in particular Lelu Island and Flora Bank. Also of interest as it relates to salmon habitat is the new propane facility development within the Prince Rupert harbor.

Pollution

Current concerns pertaining to Threat 9: Pollution include the application of pesticides along rail lines due to a recent blanket application along the rail line between Terrace and Prince Rupert and the proximity of the rail line to the Skeena River and its tributaries.

Transportation and Service Corridors

Threat 4: Transportation and Service Corridors including resource road development and pipeline development are of interest within the Skeena watershed due to their impact on fish habitat. Of particular relevance are the TransCanada Pacific Trails Pipeline and the Prince Rupert Gas Transmission Line.

Summary

The Skeena watershed and estuary are constantly experiencing pressures and threats to salmon and these pressures will change over time based on a variety of reasons including the unpredictable nature of climate change and new economic activities initiated both locally and from agents outside the watershed. To ensure the information available in the SSDC reflects current pressures on Skeena salmon, the SKT will revisit the high priority concerns within the watershed on an annual basis.

References

1. Conservation Measures Partnership. No date. Conservation Measures Partnership's Conservation Direct Threats Classification Version 2.0. Retrieved from https://docs.google.com/spreadsheets/d/1rJSNz1LG_KOqoudVFglodx47HZ9LR-M6iVlRYMvn9Wk/edit#gid=310830663 on June 14, 2018.

APPENDIX A

Conservation Direct Threats Classification Version 2.0

Conservation Measures Partnership

CMP Direct Threats Classification v 2.0			
Classification Levels			
1 2 3 *(examples, not comprehensive)*	**Definition**	**Exposition**	**Mapping to v 1.1**
1. Residential & Commercial Development	Human settlements or other non-agricultural land uses with a substantial footprint	These are threats tied to a defined and relatively compact area, which distinguishes them from those in *4. Transportation & Service Corridors* which have a long narrow footprint, and *6. Human Intrusions & Disturbance* which do not have an explicit footprint. Note that we can use standard land-cover classifications to assess the stresses delivered by these direct threats.	Added reference to standard land cover classifications to exposition.
1.1 Housing & Urban Areas	Human cities, towns, and settlements including non-housing development typically integrated with housing	This category dovetails somewhat arbitrarily with *1.2 Commercial and Industrial Areas.* As a general rule, however, if people live in the development, it should fall into this category.	
urban areas, suburbs, villages, vacation homes, shopping areas, offices, schools, hospitals			
1.2 Commercial & Industrial Areas	Factories and other commercial centers	Shipyards and airports fall into this category, whereas shipping lanes and flight paths fall under *4. Transportation & Service Corridors.* Dams are NOT included here, rather they are in *7.2 Dams & Water Management / Use.*	
manufacturing plants, shopping centers, office parks, military bases, power plants, train & ship yards, airports			
1.3 Tourism & Recreation Areas	Tourism and recreation sites with a substantial footprint	There is a fine line between housing and vacation housing/resorts. Be careful not to confuse this category, which focuses on the habitat effects of recreation areas, with those in *6.1 Recreational Activities,* which focuses on the disturbance effects posed by recreation.	
ski areas, golf courses, beach resorts, cricket fields, county parks, campgrounds			
2. Agriculture & Aquaculture	Threats from farming and ranching as a result of agricultural expansion, intensification or practices; includes silviculture, mariculture and aquaculture	Threats primarily resulting from the use of agrochemicals, rather than the direct conversion of land to agricultural use, should be included under *9.3 Agricultural & Forestry Effluents* .	
2.1 Annual & Perennial Non-Timber Crops	Crops planted for food, fodder, fiber, fuel, or other uses		
farms, household swidden plots, plantations, orchards, vineyards, mixed agroforestry systems			
2.2 Wood & Pulp Plantations	Stands of trees planted for timber or fiber outside of natural forests, often with non-native species	If it is one or a couple timber species that are planted on a rotation cycle, it belongs here. If it is multiple species or enrichment plantings in a quasi-natural system, it belongs in *5.3 Logging & Wood*	
teak or eucalyptus plantations, silviculture, christmas tree farms			
2.3 Livestock Farming & Ranching	Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semidomesticated animals allowed to roam in the wild and supported by natural habitats (ranching)	In farming, animals are kept in captivity; in ranching they are allowed to roam in wild habitats. If a few animals are mixed in a subsistence cropping system, it belongs in *2.1 Annual & Perennial Non-Timber Crops.* Forage of wild resources for stall-fed animals falls under *5.2 Gathering Terrestrial Plants*	
cattle feed lots, dairy farms, cattle ranching, chicken farms, goat, camel, or yak herding			
2.4 Marine & Freshwater Aquaculture	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild	Farmed animals are kept in captivity; hatchery fish are put into wild habitats and are the aquatic equivalent of terrestrial ranching.	
shrimp or fin fish aquaculture, fish ponds on farms, hatchery salmon, seeded shellfish beds, artificial algal beds			
3. Energy Production & Mining	Threats from production of non-biological resources	Various forms of water use (for example, dams for hydro power) could also be put in this class, but these threats seemed more related to other threats that involve alterations to hydrologic regimes. As a result, they should go in *7.2 Dams & Water Management / Use.*	
3.1 Oil & Gas Drilling	Exploring for, developing and producing petroleum and other liquid hydrocarbons	Oil and gas pipelines go into *4.2 Utility & Service Lines.* Oil spills that occur at the drill site should be placed here; those that come from oil tankers or pipelines should go in *4. Transportation & Service Corridors* or in *9.2 Industrial & Military Effluents,* depending on your	
oil wells, deep sea natural gas drilling			
3.2 Mining & Quarrying	Exploring for, developing and producing minerals and rocks	It is a judgement call whether deforestation caused by strip mining should be in this category or in *5.3 Logging & Wood Harvesting* - it depends on whether the primary motivation for the deforestation is access to the trees or to the minerals. Sediment or toxic chemical runoff from mining should be placed in *9.2 Industrial & Military Effluents* if it is the major threat from a mining operation.	
coal mines, alluvial gold panning, gold mines, rock quarries, coral mining, deep sea nodules, guano harvesting			
3.3 Renewable Energy	Exploring, developing and producing renewable energy	Hydropower should be put in *7.2 Dams & Water Management / Use.*	
geothermal power production, solar farms, wind farms (including birds or bats flying into windmills), tidal farms			
4. Transportation & Service Corridors	Threats from long, narrow transport corridors and the vehicles that use them including associated wildlife mortality	This class includes transportation corridors outside of human settlements and industrial developments. These corridors create specific stresses to biodiversity including especially fragmentation of habitats and lead to other threats including farms, invasive species, and poachers.	
4.1 Roads & Railroads	Surface transport on roadways and dedicated tracks	If the main threat is pollution from roads, this belongs in *9.1 Household Sewage & Urban Waste Water* . Off-road vehicles are treated in the appropriate category in *6. Human Intrusions & Disturbance.* If there are small roads associated with a major utility line, they belong in *4.2. Utility & Service Lines.*	
highways, secondary roads, logging roads, bridges & causeways, road kill, fencing associated with roads, railroads			
4.2 Utility & Service Lines	Transport of energy & resources	Cell phone and other communication towers connected by small access roads belong here. If there are small utility lines using a road right of way, they belong in *4.1 Roads & Railroads.* Oil spills from pipelines should go in *9.2 Industrial & Military Effluents.*	
electrical & phone wires, aqueducts, oil & gas pipelines, electrocution of wildlife			
4.3 Shipping Lanes	Transport on and in freshwater and ocean waterways	This category includes dredging and other activities that maintain shipping lanes. Anchor damage from dive boats belongs in *6.1 Recreational Activities* .	
dredging, canals, shipping lanes, ships running into whales, wakes from cargo ships			
4.4 Flight Paths	Air and space transport	Airports fall into *1.2 Commercial & Industrial Areas.*	
flight paths, jets impacting birds			
5. Biological Resource Use	Threats from consumptive use of "wild" biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific species	Consumptive use means that the resource is removed from the system or destroyed - multiple people cannot use the same resource, as they could fit under *6. Human Intrusions & Disturbance.* Threats in the class can affect both target species (harvest of desired trees or fish species) as well as "collateral damage" to non-target species (trees damaged by felling or fisheries bycatch) and habitats (coral reefs destroyed by trawling). Persecution/control involves harming or killing species because they are considered undesirable.	
5.1 Hunting & Collecting Terrestrial Animals	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch	This category focuses on animals that primarily live in a terrestrial environment. There are obviously some species that live on the terrestrial/aquatic boundary. Hunting otters, beavers, amphibians, polar bears, penguins, waterfowl, and sea birds should (somewhat arbitrarily) go here. Hunting seals, whales and other marine mammals, and freshwater and marine turtles go in *5.4 Fishing & Harvesting Aquatic Resources.* Yes, most people "gather" honey, eggs, insects or other slow moving targets, rather than "hunt" them. But it seems	
bushmeat hunting, trophy hunting, fur trapping, insect collecting, honey or bird nest hunting, predator control, pest control, persecution			
5.2 Gathering Terrestrial Plants	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons	This category focuses on plants, mushrooms, and other non-animal terrestrial species except trees which are treated in *5.3 Logging & Wood Harvesting* .	
wild mushrooms, forage for stall fed animals, orchids, rattan, control of host plants to combat timber diseases			
5.3 Logging & Wood Harvesting	Harvesting trees and other woody vegetation for timber, fiber, or fuel, including site preparation and other forestry management practices	Felling trees to clear agricultural land goes in the appropriate category in *2. Agriculture & Aquaculture.* If it is a few timber species that are planted on a rotation cycle, it belongs in *2.2 Wood & Pulp Plantations.* If it is multiple species or enrichment plantings in a quasi-natural system, it belongs here.	
clear cutting of hardwoods, selective commercial logging of ironwood, pulp operations, fuel wood collection, charcoal production			
5.4 Fishing & Harvesting Aquatic Resources	Harvesting aquatic wild animals or plants for commercial,	This category focuses on all kinds of species that are primarily found in	

CMP Direct Threats Classification v 2.0			
Classification Levels			
1 2 3 *(examples, not comprehensive)*	**Definition**	**Exposition**	**Mapping to v 1.1**
trawling, blast fishing, spear fishing, shellfish harvesting, whaling, seal hunting, turtle egg collection, live coral collection, seaweed collection	recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch	an aquatic environment. There are obviously some species that live on the terrestrial/aquatic boundary. Hunting otters, beavers, amphibians, polar bears, penguins, waterfowl, and sea birds should (somewhat arbitrarily) go in *5.1 Hunting & Collecting Terrestrial Animals.* Hunting seals, whales and other marine mammals, and freshwater and marine turtles go here.	
6. Human Intrusions & Disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources	Non-consumptive use means that the resource is not removed - multiple people can use the same resource (for example, birdwatching). These threats typically do not permanently destroy habitat except perhaps in extremely severe manifestations.	
6.1 Recreational Activities	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons	This category does not include work involving consumptive use of biodiversity - for example disturbance impacts from loggers or hunters would be in the appropriate category in *5. Biological Resource Use.* Vehicles and boats in established transport corridors go in *4. Transportation & Service Corridors.* The development of permanent recreational or tourist facilities (such as hotels and resorts) should be included under *1.3 Tourism & Recreation Areas* rather than here.	
off-road vehicles, motorboats, jet-skis, snowmobiles, ultralight planes, dive boats, whale watching, mountain bikes, hikers, birdwatchers, skiers, pets in recreational areas, temporary campsites, caving, rock-climbing			
6.2 War, Civil Unrest & Military Exercises	Actions by formal or paramilitary forces without a permanent footprint	This category focuses on military activities that have a large impact on natural habitats, but are not permanently restricted to a single area. Permanent military bases should go under *1.2 Commercial & Industrial Areas.* Other military activities might best be assigned to other categories. For example, hunting of specific animals by soldiers living off the land fits under *5.1 Hunting & Collecting Terrestrial Animals.*	
armed conflict, mine fields, tanks & other military vehicles, training exercises & ranges, defoliation, munitions testing			
6.3 Work & Other Activities	People spending time in or traveling in natural environments for reasons other than recreation or military activities	This will probably not be a commonly used category.	
law enforcement, drug smugglers, illegal immigrants, species research, vandalism			
7. Natural System Modifications	Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare	This category deals primarily with changes to natural processes such as fire, hydrology, and sedimentation, rather than land use. Thus it does not include threats relating to agriculture (which should be under *2. Agriculture & Aquaculture*), or infrastructure (*1. Residential & Commercial Development* and *4. Transportation & Service Corridors*).	
7.1 Fire & Fire Suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation	This category focuses on the human activities that lead to either not enough fire or too much fire in the ecosystem in question. If fire escapes from established agricultural lands, it belongs here, if fire is used to clear new agricultural lands, it belongs in the appropriate category in *2. Agriculture & Aquaculture.* It also includes damaging "natural" fires in systems that have lost their natural resilience.	
fire suppression to protect homes, inappropriate fire management, escaped agricultural fires, arson, campfires, fires for hunting			
7.2 Dams & Water Management / Use	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities	This category focuses on the human activities that lead to either not enough water or too much water in the ecosystem in question. Note that homogenizing flows to a constant level may be outside the "natural range of variation." Dredging belongs in *4.3 Shipping Lanes.*	
dam construction, dam operations, sediment control, change in salt regime, wetland filling for mosquito control, levees and dikes, surface water diversion, groundwater pumping, channelization, artificial lakes			
7.3 Other Ecosystem Modifications	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare		
land reclamation projects, rip-rap along shoreline, mowing grass, tree thinning in parks, beach construction, removal of snags from streams			
7.4 Removing / Reducing Human Maintenance	Absence or reduction of current or historical maintenance regimes important for key ecological attributes. Includes regimes historically maintained by protected area staff, farmers and ranchers, indigenous peoples, private landowners, or any other resource manager.	Many ecosystems and species depend on human maintenance to mimic natural conditions and maintain key attributes. This threat captures the loss of these direct maintenance regimes. Caution should be used in applying this category – it is not meant as a catch-all for a lack of conservation action at a site, but rather refers to instances where a historical action is no longer possible due to, for example, funding, institutional constraints, or actors being disempowered. This category does not include less direct maintenance actions, such as lack of outreach or lack of adequate policy.	New Level 2 Category pulling threats that may have been coded under *7.3 Other Ecosystem Modification* for lack of a better place. Click here for a detailed discussion of changes.
lack of mowing of meadows, reduction in controlled burns, lack of indigenous management of key ecosystems, ceasing supplimental feeding of condors			
8. Invasive & Problematic Species, Pathogens & Genes	Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance or virulence	We spent a lot of time talking to experts about the subdivisions and phrasing of this class. They would like to restrict the use of "invasive species" to refer to non-native species to keep things simple for policy makers. They recommended using the term "problematic native species" to refer to native species that have become superabundant or otherwise cause problems. If possible, also record the source of the invasive species and/or conditions that exacerbate their effect.	Click here for detailed discussion of chang
8.1 Invasive Non-Native / Alien Plants & Animals	Harmful plants and animals not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities	We are defining non-native/alien/exotic species as those brought either intentionally or accidentally by humans in the last 10,000 years.	≈ *8.1 Invasive Non-Native / Alien species* but removing pathogens & microbes
feral horses, feral household pets, zebra mussels, Miconia tree, introduction of species for biocontrol			
8.2 Problematic Native Plants & Animals	Harmful plants and animals that are originally found within the ecosystem(s) in question, but have become "out-of-balance" or "released" directly or indirectly due to human activities	It is a bit of a judgement call as to when a species becomes "problematic" (aka outside its natural range of variation). This category could probably be refined over time.	≈ *8.2 Problematic Native Species* but removing pathogens & microbes
overabundant native deer, overabundant algae due to loss of native grazing fish, plague affecting rodents, invasive grasses			
8.3 Introduced Genetic Material	Human altered or transported organisms or genes	Hatchery fish are not necessarily invasive species, but they can upset the gene pool of native fish.	
pesticide resistant crops, hatchery salmon, restoration projects using non-local seed stock, genetically modified insects for biocontrol, genetically modified trees, genetically modified salmon			
8.4 Pathogens & Microbes	Harmful native and non-native agents that cause disease or illness to a host, including bacteria, viruses, prions, fungi, and other microorganisms	Disease that is within the "natural or acceptable range of variation" for a species population or ecosystem is not a threat.	New Level 2 Category pulling pathogens & microbes from 8.1 & 8.2; for IUCN Threats Classification 3.2, new Level 2 Category that includes all of 8.5 and 8.6, and elements from 8.1, 8.2, and 8.4.
plague affecting rodents, Dutch elm disease or chestnut blight, Chytrid fungus affecting amphibians outside of Africa			
9. Pollution	Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources	This class deals with exotic or excess materials introduced to the environment. There is obviously a fine distinction when the pollution comes from another threat - for example, should an oil spill from a pipeline be classified as *4.2 Utility & Service Lines* or *9.2 Industrial & Military Effluents* ? You will have to exercise some judgement here as to which represents the direct threat in your situation. In some cases, the source of the pollution may be either unknown or from a historical source (e.g., heavy metals buried in sediments). In these cases, you may have to make an educated guess as to which category to assign the pollutant.	
9.1 Household Sewage & Urban Waste Water	Water-borne sewage and non-point runoff from housing and	This category does not include major industrial discharge, which falls	

CMP Direct Threats Classification v 2.0			
Classification Levels			
1 2 3 *(examples, not comprehensive)*	**Definition**	**Exposition**	**Mapping to v 1.1**
discharge from municipal waste treatment plants, leaking septic systems, untreated sewage, outhouses, oil or sediment from roads, fertilizers and pesticides from lawns and golf-courses, road salt	urban areas that include nutrients, toxic chemicals and/or sediments	under *9.2 Industrial & Military Effluents.* It does include chemicals and next generation pollutants (caffeine or pharmaceuticals) in household waste streams. Technically, sewage from a pipe is "point-source" whereas a leaking septic system is "nonpoint-source." This category does not include agricultural runoff, which falls under *9.3 Agricultural & Forestry Effluents.*	
9.2 Industrial & Military Effluents	Water-borne pollutants from industrial and military sources including mining, energy production and other resource extraction industries that include nutrients, toxic chemicals and/or sediments	The source of the pollution is often far from the system – an extreme example are the heavy metals that migrating eels bring to the Sargasso Sea. Often, the pollutants only become a problem when they bioconcentrate through the food chain. Oil spills from pipelines should generally go here.	
toxic chemicals from factories, illegal dumping of chemicals, mine tailings, arsenic from gold mining, leakage from fuel tanks, PCBs in river sediments			
9.3 Agricultural & Forestry Effluents	Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied	Wind erosion of agricultural sediments or smoke from forest fires goes in *9.5 Air-Borne Pollutants.*	
nutrient loading from fertilizer run-off, herbicide run-off, manure from feedlots, nutrients from aquaculture, soil erosion			
9.4 Garbage & Solid Waste	Rubbish and other solid materials including those that entangle wildlife	This category generally is for solid waste outside of designated landfills - landfills themselves should go in *1.2 Commercial & Industrial Areas.* Likewise, toxins leaching from solid waste - for example, mercury leaking out of a landfill into groundwater - should go in *9.2 Industrial & Military Effluents.*	
municipal waste, litter from cars, flotsam & jetsam from recreational boats, waste that entangles wildlife, construction debris			
9.5 Air-Borne Pollutants	Atmospheric pollutants from point and nonpoint sources	It may be difficult to determine the sources of many atmospheric pollutants – and thus hard to take action to counter them.	
acid rain, smog from vehicle emissions, excess nitrogen deposition, radioactive fallout, wind dispersion of pollutants or sediments from farm fields, smoke from forest fires or wood stoves			
9.6 Excess Energy	Inputs of heat, sound or light that disturb wildlife or ecosystems	These inputs of energy can have strong effects on some species or ecosystems.	
noise from highways or airplanes, sonar from submarines that disturbs whales, heated water from power plants, lamps attracting insects, beach lights disorienting turtles, atmospheric radiation from ozone holes			
10. Geological Events	Threats from catastrophic geological events	Strictly speaking, geological events may be part of natural disturbance regimes in many ecosystems. But they need to be considered a threat if a species or habitat is damaged from other threats and has lost its resilience and is thus vulnerable to the disturbance.	
10.1 Volcanoes	Volcanic events		
eruptions, emissions of volcanic gasses			
10.2 Earthquakes / Tsunamis	Earthquakes and associated events		
earthquakes, tsunamis			
10.3 Avalanches / Landslides	Avalanches or landslides		
avalanches, landslides, mudslides			
11. Climate Change	Change in climate patterns (eg those resulting from increased atmospheric greenhouse gases like CO_2) and/or events outside the natural range of variation that could wipe out a vulnerable species or ecosystem	Strictly speaking individual climatic events may be part of natural disturbance regimes in many ecosystems and are thus technically "stresses" and not "direct threats." But they act as a threat if a species or ecosystem is damaged from other threats and has lost its resilience and is thus vulnerable to the disturbance. In addition, many climatic events may also be increasing in frequency or intensity outside their natural range of variation due to human influences. Even though most projects may not be able to address the root causes of these climate change threats, they do need to consider taking action to counter the effects of these threats.	Removed "Severe Weather" from Level 1 name and changed definition and exposition
11.1 Ecosystem Encroachment	Large-scale effects of ecosystems shifting and impinging on other species and ecosystems.	Changes in the location of any given ecosystem is technically a "stress" to both that ecosystem and its component species. But as ecosystems "migrate" they put pressure on adjacent ecosystems and species that can be considered a threat to those adjacent systems that needs to be mitigated.	≈ *11.1 Habitat Shifting & Alteration*
sea level rise (inundation of shoreline ecosystems, drowning of coral reefs), desertification (sand dune encroachment)			
11.2 Changes in Geochemical Regimes	Broad-scale changes in the geochemical conditions of ecosystems including ocean acidification		New category; droughts moves to *11.4 Changes in Precipitation & Hydrological Regimes*
ocean acidification, changes in atmospheric CO_2 affecting plant growth, loss of sediment leading to broad-scale subsidence			
11.3 Changes in Temperature Regimes	Broad-scale changes in temperature mean, variability, seasonality and extremes, including changes in temperature extremes, increased average summer temperature, and decreased minimum winter/spring temperature	Loss of snowpack is often a combination of change in temperature and precipitation regimes, but is for now assigned to *11.4 Changes in Precipitation & Hydrological Regimes.*	≈ *11.3 Temperature Extremes* with change in name and definition to reflect the concept of regime
heat waves, cold spells, oceanic temperature changes, melting of glaciers/sea ice			
11.4 Changes in Precipitation & Hydrological Regimes	Broad-scale changes in precipitation mean, variability, seasonality, and extremes, including decreased or increased precipitation, changes in timing of precipitation, changes in form of precipitation (eg snow vs rain; snowcover and snowpack where applicable), changes in evapotranspiration rates and hydrological cycles, and droughts and floods	Flood impacts of specific storm events belong in *11.5 Severe / Extreme Weather Events.*	Substantial expansion of *11.2 Droughts*
droughts, changes in timing of rains, loss of snowcover, increased severity of floods			
11.5 Severe / Extreme Weather Events	Changes in frequency, timing and/or intensity of storms as well as severe weather events that threaten targets that have lost resilience		≈ *11.4 Storms & Flooding* with a focus on specific storm events
thunderstorms, tropical storms, hurricanes, cyclones, tornadoes, hailstorms, ice storms or blizzards, dust storms, erosion of beaches during storms			