

## Master List of Threats for Utah WAP/WRI

**Levels 1 and 2 from:** Salafsky, N., D. Salzer, A.J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S.H.M. Butchart, B. Collen, N. Cox, L.L. Master, S. O'Connor, and D. Wilkie. 2008. A standard lexicon for biodiversity conservation: Unified classifications of threats and actions. *Conservation Biology* 22:897-911.

**Level 3 threats** - with a few exceptions - were generated by Utah subject matter experts in 2014-15, who were conducting species and habitat threat assessments during production of the 2015-2025 WAP. Threat list was reconciled and standardized by the Threats Committee of the WAP Joint Team, and approved by the Joint Team. Threat definitions were generated in 2 ways: priority threats in the 2015-2025 WAP were defined during production of the document in 2014-2015. Non-priority threats were defined in 2016, using the comments field of the existing threat assessments. A few new Level 3 threats were also generated and defined in 2016, during game and sportfish threat assessments.

**Highlighted threats** are those that rank as "WAP Priority Threats", due to the larger number of species and habitats they impact. These priority threats all have a write-up in the WAP, with a description, case study, list of species and habitats affected, etc. Most are defined at Level 3, but a few are defined at Level 2.

IUCN-CMP L1 Code	IUCN-CMP L2 Code	UTAH L3 Code	Level 1 IUCN-CMP Threat Level 2 IUCN-CMP Threat Level 3 Utah-Specific Threat
1			<b>Residential and Commercial Development</b> Threats from human settlements or other non-agricultural land uses with a substantial footprint.
	1.1		<b>Housing and Urban Areas:</b> human cities, towns and settlements including non-housing development typically integrated with housing (e.g., <i>urban areas, suburbs, villages, vacation homes, shopping areas, offices, schools, hospitals</i> ).
		1.1.1	Cabin Communities / Development: rural development sprawl driven by demand for vacation properties, not principal residences. Occurs mainly when private, formerly working, lands are subdivided into smaller (5-20 acre) "ranchettes". Sometimes occurs on leased public land. Some habitat is directly and immediately lost due to development footprint and associated infrastructure, but much more habitat is impacted over time due to 1) the exclusion of fire, timber harvest, and ungulate hunting, 2) the introduction and/or enhancement of problematic species (mainly subsidized native and domestic predators and invasive plants), and 3) the increased presence of people, their vehicles, and their waste streams.
		1.1.2	Expansion of Urban Footprint: urban development sprawl driven by population and economic growth, and subsequent requirements for residential, commercial, industrial, recreational etc land uses. Occurs mainly when private agricultural lands are annexed, rezoned, and subdivided. Habitat is directly and immediately lost due to development footprint and associated infrastructure. More habitat is impacted over time due to 1) the increased presence of people, their vehicles, their pets, and their waste streams, and 2) increased requirements for water, fuel, electricity, etc.
	1.2		<b>Commercial and Industrial Areas:</b> factories and other commercial centers (e.g., <i>manufacturing plants, shopping centers, office parks, military bases, power plants, train and ship yards, airports</i> ).
		1.2.1	Expansion of Military Installations: change in land or airspace use driven by demand for military testing and training ranges. Occurs mainly when federal public lands or airspace are withdrawn from multiple-use designation, and reassigned to the military for their sole use. Impacts can be on the ground from equipment testing, training maneuvers, or ordinance impact, or from aerial noise or visual disturbance. Chemical and/or heavy metal contamination is a distinct possibility, but a different set of threats.
		1.2.2	Landfill Operation: refers specifically to routine operation, or new development, or expansion - and not the ongoing existence of or pollution from - landfills. New development or expansion can be sited more appropriately, or mitigated. Routine operation can generate dust, noise, attractive nuisance, subsidized predator populations, etc.
		1.2.3	Power Generation: refers specifically to both the existing footprint, plus any new development or expansion, of traditional fossil-fuel-powered electrical generation facilities and substations. Does not include the pollution from their operation -that is a different set of threats.
	1.3		<b>Tourism and Recreation Areas:</b> tourism and recreation sites with a substantial footprint (e.g., <i>ski areas, golf courses, beach resorts, cricket fields, county parks, campgrounds</i> ).
		1.3.1	Riparian Campground Development: Refers specifically to developed, dedicated campgrounds, not dispersed informal camping (a different threat). Some habitat is directly and immediately lost due to development footprint, but much more habitat is impacted over time due to 1) the diffusion of impacts to vegetation, soil, and water, 2) the introduction and/or enhancement of problematic species (mainly subsidized native predators and invasive plants), and 3) the increased presence of people, their vehicles, their dogs, and their waste streams.
		1.3.2	Trailhead and Staging Area Development - refers to parking lots, pit toilets, garbage cans, trailer loading & unloading areas. Some habitat is directly and immediately lost due to development footprint, but much more habitat is impacted over time due to 1) the diffusion of impacts to vegetation, soil, and water, 2) the introduction and/or enhancement of problematic species (mainly invasive plants), and 3) the increased presence of people, their vehicles, their dogs and pack stock, and their waste streams.

		1.3.3	Ski Area Development - refers to ski runs, ski lifts, parking lots, restaurants, lodges, etc.. Some habitat is directly and immediately lost due to development footprint, but much more habitat is impacted over time due to 1) the diffusion of impacts to vegetation, soil, and water, 2) the introduction and/or enhancement of problematic species (mainly subsidized native and domestic predators and invasive plants), and 3) the increased presence of people, their vehicles, their dogs, and their waste streams.
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2			<b>Improper Agriculture and Aquaculture</b> Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture.
	2.1		<b>Annual and Perennial Non-timber Crops:</b> crops planted for food, fodder, fiber, fuel, or other uses (e.g., farms, household swidden plots, plantations, orchards, vineyards, mixed agroforestry systems).
		2.1.1	Conversion from Flood to Sprinkler Irrigation - two distinct forms of impact are noted here, one more terrestrial, one more aquatic. On the terrestrial side, removing anthropogenic surface waters (irrigation ditches and ponds, usually unlined) and the resulting vegetation and wetlands reduces breeding and foraging habitat for many species of amphibians, reptiles, birds, and mammals. On the aquatic side, more efficient use - i.e., a higher consumption ratio - of the water means that more water is transpired and evaporated to the atmosphere, and less water returns to the stream through percolation or overland flow. This results in less irrigation water being required per acre, which usually equates to more acres irrigated in order to use an equal amount (the irrigator's full share) of water. Conversion from flood to sprinkler irrigation could be beneficial for stream life if a portion of the water savings were legally converted to instream flow.
		2.1.2	Conversion to Cropland or Pasture: native, natural land cover (forest, woodlands, wetlands, grasslands, etc) are cleared, drained, leveled, and/or otherwise thoroughly domesticated for agricultural use. Does not include relatively low-intensity vegetation management, e.g. fuels management activities, post-fire rehabilitation, aspen regeneration, etc. where the objective is to retain native landforms, species composition, and seral dynamics.
		2.1.3	Grain and Hay Harvest: cutting of grass crops for human and livestock consumption. Main impacts due to coincident timing of crop ripening with ground-nesting bird use of the fields. Otherwise a fairly compatible land use for many species, and crucial habitat for some.
	2.2		<b>Wood and Pulp Plantations:</b> stands of trees planted for timber or fiber outside of natural forests, often with non-native species (e.g., teak or eucalyptus plantations, silviculture, christmas tree farms).
	2.3		<b>Improper Livestock Farming and Ranching:</b> domestic terrestrial animals raised in one location on farmed or nonlocal resources (farming); also domestic or semidomesticated animals allowed to roam in the wild and supported by natural habitats (ranching) (e.g., cattle feed lots, dairy farms, cattle ranching, chicken farms, goat, camel, or yak herding).
		2.3.1	Improper Grazing (current): refers to grazing systems currently in practice and subject to improvement. The timing, duration and intensity of livestock grazing are able to alter plant structure and composition, water quantity and quality, and soil structure and stability. Improper grazing may thereby reduce habitat suitability in numerous and diverse ways. Over the longer term, improper grazing accelerates desertification by reducing litter, increasing soil bulk density and bare ground, reducing water infiltration, and increasing water runoff and soil erosion.
		2.3.2	Livestock Feedlot: refers to confined animal feeding operations. In Utah, mostly local impacts but can be serious. Main impacts are to water quality due to excessive nutrient loading.
		2.3.3	Water Developments for Livestock: refers to diverting landscape water from springs and streams into pipes, tanks, and troughs to provide drinking water to domestic livestock. Can lead to dewatering of streams and springs and subsequent loss of aquatic and riparian habitat, movement of diseases such as chytrid and whirling disease, and drowning of bats and small mammals.
	2.3.4	Improper Grazing (historic): refers to previous grazing systems, no longer in practice or subject to alteration, but which have lingering deleterious site-level or landscape-level effects. These effects mainly amount to 1) elimination of native forbs and grasses, subsequent invasion by exotic forbs and grasses, and an accelerated fire cycle, 2) erosive loss and/or compaction of upper soil horizons and subsequent loss of soil fertility and water-holding capacity, and/or 3) gullying and channel incision with subsequent lowering of water tables and loss of wet meadows, springs, and base stream flows. These direct and indirect habitat impacts are believed to have led to profound and diverse wildlife and habitat impacts including loss of water, forage, cover, and prey.	
	2.4		<b>Marine and Freshwater Aquaculture:</b> aquatic animals raised in one location on farmed or nonlocal resources; also hatchery fish allowed to roam in the wild (e.g., shrimp or fin fish aquaculture, fish ponds on farms, hatchery salmon, seeded shellfish beds, artificial algal beds).
		2.4.1	Unintentional Spread of Non-native Species: refers to escape, survival, and establishment of the farmed animals. Presently thought to be restricted to tilapia in the Virgin River basin, and leopard frogs at UDWR's Wahweap Fish Hatchery. Can provide a source of animals for intentional illegal spread (a different threat - Unauthorized Species Introductions), and a vector for diseases such as chytrid (also a different threat).

3			<b>Energy Production and Mining</b> Threats from production of non-biological resources.
	3.1		<b>Oil and Gas Drilling:</b> exploring for, developing, and producing petroleum and other liquid hydrocarbons (e.g., oil wells, deep sea natural gas drilling).

	3.1.1	Well Pad Development: refers to the cleared, developed footprint for a production well or well cluster, plus their required separation distances, truck turnarounds, etc. Impacts are mostly already taken into consideration during impact analysis - e.g., well pads should avoid riparian areas. Proactive planning, and bonds high enough to motivate restoration, are needed to mitigate.
	3.1.2	Spills and Production Water: refers to contamination by target minerals (e.g. crude oil) and their derivatives (e.g., gasoline conveyed in pipelines and trucks), as well as incidental products or supplies (e.g., brine, fracking chemicals). Spills are rare but fairly regular occurrences. Impacts depend on size and location. Many pipelines cross streams and rivers, many railroads and highways follow them. Spills into waterways have higher impacts and are harder to clean up.
3.2		<b>Mining and quarrying:</b> exploring for, developing, and producing minerals and rocks (e.g., <i>coal mines, alluvial gold panning, gold mines, rock quarries, coral mining, deep sea nodules, guano harvesting</i> ).
	3.2.1	Hardrock Minerals: refers to diverse activities and impacts. Underground mining can capture ground and surface waters, and often acidifies and pollutes them. Strip and open-pit mining obliterate existing land cover, topography, etc. with subsequent impacts to all aspects of habitat: food, cover, water, etc.
	3.2.2	Sand and Gravel: refers to two distinct forms of mining. One is from terrestrial sources, and has highly localized effects (though they can be extreme). The other is from fluvial or riparian sources; mining sediment from lotic systems can impact numerous chemical and physical properties of riverine and riparian habitats for some distance downstream.
	3.2.3	Oil Shale: mainly an anticipated threat. Impacts would be from excavation and processing of kerogen-bearing rock: construction of an industrial facility, and creation of an open pit that obliterates existing land cover, topography, etc. with subsequent impacts to all aspects of habitat. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.
	3.2.4	Tar Sands: mainly an anticipated threat. Impacts would be from excavation and processing of bitumen-bearing sand. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.
3.3		<b>Renewable Energy:</b> exploring, developing, and producing renewable energy (e.g., <i>geothermal power production, solar farms, wind farms (including birds flying into windmills), tidal farms</i> ).
	3.3.1	Geothermal Power Facilities: mainly an anticipated threat. Impacts would be from development footprint of geothermal field, pads, internal roads, etc. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.
	3.3.2	Solar Power Facilities: refers to both the loss and fragmentation of habitat that occurs when a utility-scale photovoltaic or thermal-solar facility is sited, as well as ongoing direct mortality during routine operation of the facility. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.
	3.3.3	Wind Power Facilities: refers to both the permanent loss and fragmentation of habitat that occurs when a utility-scale wind power facility is sited, as well as ongoing direct mortality to birds and bats during routine operation of the facility. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.
	3.3.4	Hydro Power Facilities: refers to the loss of habitat that occurs when a dam is built and filled, as well as direct mortality from entrainment during routine operation of the facility. Other, perpetual up- and downstream physical habitat impacts (interruption of water and sediment transport, changes in temperature profiles, fragmentation of formerly continuous habitats, etc), are encompassed by another threat - <b>Presence of Dams</b> . Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are also other threats.
	3.3.5	Nuclear Power Facilities: an anticipated threat. Impacts would be from development footprint of nuclear generating plant. Associated impacts - from water consumption, provision of electricity, road development and use, potential for air, soil and water contamination, etc. - are other threats.

4		<b>Transportation and Service Corridors</b> Threats from long narrow transport corridors and the vehicles that use them, including associated wildlife mortality.
	4.1	<b>Roads and Railroads:</b> surface transport on roadways and dedicated tracks (e.g., <i>highways, secondary roads, logging roads, bridges and causeways, road kill, fencing associated with roads, railroads</i> ).
	4.1.1	Roads – Transportation Network: refers to public and toll roads and highways built to accommodate diverse commerce and transit. Impacts include both the permanent loss and fragmentation of terrestrial and aquatic habitats that occurs when a new road is sited, as well as ongoing direct mortality to wildlife as long as the road exists and wildlife persist near it. Roads often facilitate several other threats - fires, contamination, recreation, etc.

	4.1.2	Roads – Energy Development: refers only to those roads built and used to access and extract traditional or renewable energy sources. Impacts include both the permanent loss and fragmentation of terrestrial and aquatic habitats that occurs when a new road is sited, as well as ongoing direct mortality to wildlife as long as the road exists and wildlife persist near it. Roads often facilitate several other threats - fires, contamination, recreation, etc.
	4.1.3	Railroads: refers to both the permanent loss and fragmentation of habitat that occurs when a railroad is sited, as well as ongoing direct mortality to wildlife during routine operations. Largest impact is due to loss and fragmentation, particularly of aquatic and riparian habitats.
4.2		<b>Utility and Service Lines:</b> transport of energy and resources (e.g., <i>electrical and phone wires, aqueducts, oil and gas pipelines, electrocution of wildlife</i> ).
	4.2.1	Utility Lines / Towers - Power and Communication: refers to power & communications infrastructure built to accommodate diverse commerce and transit. Impacts include both the permanent loss and fragmentation of habitat that occurs when a line or tower is sited, as well as ongoing direct mortality to wildlife (e.g., bird strikes) during routine operations and maintenance.
	4.2.2	Pipelines / Powerlines - Energy Development: refers only to linear infrastructure built and used to access and move traditional or renewable energy sources. Impacts include both the temporary disturbance and any permanent loss and fragmentation of habitat that occurs when a line is sited, as well as direct mortality during construction, operations, and maintenance. Related risks are covered by other threats, e.g. <b>Spills and Production Water</b>
4.3		<b>Shipping Lanes:</b> transport on and in freshwater and ocean waterways (e.g., <i>dredging, canals, shipping lanes, ships running into whales, wakes from cargo ships</i> ).
4.4		<b>Flight Paths:</b> air and space transport (e.g., <i>flight paths, jets impacting birds</i> ).

5		<b>Biological Resource Use</b> Threats from consumptive use of "wild" biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific species.
	5.1	<b>Hunting and Collecting Terrestrial Animals:</b> 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 (e.g., <i>bushmeat hunting, trophy hunting, fur trapping, insect collecting, honey or bird nest hunting, predator control, pest control, persecution</i> ).
	5.1.1	Excessive Harvest – Unregulated / Illegal: refers strictly to illicit harvest, or "poaching", the implication being current law is poorly communicated, too restrictive, and/or under-enforced. Reasons cited include intentional killing as "varmints", intentional killing due to misidentification, intentional live collection as personal pets, and intentional live or dead harvest for commerce.
	5.1.2	Excessive Harvest – Regulated / Legal: refers strictly to harvest conducted within confines of the law, the implication being current law is too permissive. Impacts cited are mainly indirect, e.g. reduced prey base for predators, reduced habitat for burrow commensals. Other impacts are direct, e.g. scientific collection of rare animals, intentional trapping for fur trade, etc.
	5.1.3	Incidental Poisoning: refers to intentional and unintentional distribution of toxicants via hunting or trapping, with resulting non-target poisoning. Main impacts cited are unintentional lead poisoning of obligate and facultative scavengers from spent lead shot and lead bullets.
	5.2	<b>Gathering Terrestrial Plants:</b> harvesting plants, fungi, and other nontimber/nonanimal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons (e.g., <i>wild mushrooms, forage for stall fed animals, orchids, rattan, control of host plants to combat timber diseases</i> ).
	5.2.1	Excessive Harvest – Unregulated / Illegal: refers strictly to illicit harvest, or "poaching", the implication being current law is poorly communicated, too restrictive, and/or under-enforced.
	5.2.2	Excessive Harvest – Regulated / Legal: refers strictly to harvest conducted within confines of the law, the implication being current law is too permissive.
	5.3	<b>Logging and Wood Harvesting:</b> harvesting trees and other woody vegetation for timber, fiber, or fuel (e.g., <i>clear cutting of hardwoods, selective commercial logging of ironwood, pulp operations, fuel wood collection, charcoal production</i> ).
	5.3.1	Improper Forest Management: concerns range from "lack of timber harvest" at one extreme, to "existence of timber harvest" at the other. Concerns about lack of timber harvest note that closing of forest canopies and high tree density are impacting composition and structure of understory at site scale, and skewing age-class distribution at landscape scale. Concerns about timber harvest note the removal of large trees reduces roost- and nest-tree availability for certain taxa, as well as recruitment of terrestrial and riparian coarse woody debris.
	5.3.2	Woodcutting for Fuel / Posts: main concern is firewood harvest specifically targeting standing snags, causing removal of hunting perches, prey habitat, roost and nest sites for birds and bats.
	5.4	<b>Fishing and Harvesting Aquatic Resources:</b> harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch (e.g., <i>trawling, blast fishing, spear fishing, shellfish harvesting, whaling, seal hunting, turtle egg collection, live coral collection, seaweed collection</i> ).
	5.4.1	Excessive Harvest – Unregulated / Illegal: refers strictly to illicit harvest, or "poaching", the implication being current law is poorly communicated, too restrictive, and/or under-enforced. Reasons cited include intentional killing for consumption, intentional killing as "trash fish", intentional killing due to misidentification, and intentional live or dead harvest for commerce.

	5.4.2	Excessive Harvest – Regulated / Legal: refers strictly to harvest conducted within confines of the law, the implication being current law is too permissive. Principal concern lies with sterile sportfish taxa being vulnerable to depletion due to lack of natural reproduction and reliance on hatcheries.
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6		<b>Human Intrusions and Disturbance</b> Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources.	
	6.1	<b>Recreational Activities:</b> people spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons (e.g., <i>off-road vehicles, motorboats, jet-skis, snowmobiles, ultralight planes, dive boats, whale watching, mountain bikes, hikers, birdwatchers, skiers, pets in rec areas, temporary campsites, caving, rock-climbing</i> ).	
	6.1.1	OHV Motorized Recreation: concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, litter, removal of vegetation, destruction of soil crusts, etc) and facilitate other threats (fire ignitions, spread of weeds, disease/pathogens, etc). Other impacts are more direct - disturbance of nesting raptors, mortality of fish, amphibians, reptiles, etc.	
	6.1.2	Camping (Dispersed): concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, litter, removal of vegetation, etc) and facilitate other threats (fire ignitions, spread of weeds, etc). Other impacts are more direct - disturbance of wildlife access to water sources or shade, disturbance of nests, dens, etc.	
	6.1.3	Cave / Mine Exploration: concerns center on increasing human presence in bat roosts, maternity colonies, and hibernacula. Some concern also about a few aquatic species. No cumulative impact concerns noted.	
	6.1.4	Hiking / Foot travel: concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, etc) and facilitate other threats (spread of invasives, disease/pathogens, etc). Other impacts are more direct - persecution of snakes for example, or paving of trails and removal of vegetation to improve visibility and human safety.	
	6.1.5	Low-level Aircraft Flights (tourism and recreation) :concerns center on increasing human presence in backcountry, and resulting disturbance particularly during nesting season.	
	6.1.6	Mountain Biking: concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, etc) and facilitate other threats (spread of invasives, disease/pathogens, etc). Other impacts are more direct - disturbance of nesting raptors, mortality of snakes and other reptiles, etc.	
	6.1.7	Pack / Saddle Stock: concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, etc) and facilitate other threats (spread of weeds, etc). No direct impacts noted.	
	6.1.8	River Rafting: concerns center on cumulative impacts of recreational activities which can contribute to habitat degradation (erosion, water quality, etc) and facilitate other threats (spread of invasives, disease/pathogens, etc). Other impacts are more direct - disturbance of nesting raptors, disturbance of fish resting in thermal refugia in summer, etc.	
	6.1.9	Rock Climbing: concerns center on increasing human presence in backcountry, and the resulting direct disturbance particularly during nesting season. No cumulative or indirect impact concerns noted.	
	6.1.10	Skiing: concerns center on increasing human presence in winter backcountry, and the resulting direct disturbance during a challenging time of year. No cumulative or indirect impact concerns noted. Not to be confused with <u>Ski Area Development</u> , a different threat.	
	6.1.11	Snowmobiling: concerns center on increasing human presence in winter backcountry, and resulting disturbance during a challenging time of year. No cumulative impact concerns noted.	
	6.1.12	Unauthorized Species Introductions: refers mainly to illegal stocking of sport and bait fish and invertebrates. Concerns center on establishment of new populations of nonnative fishes and crayfishes that compete with or predate on native fishes, amphibians, mollusks, crustaceans etc, as well as all the diseases, parasites etc. those nonnative fishes may harbor.	
	6.1.13	Skimboarding: concerns center on season of use (summer - low flows) and physical alteration of habitat to create boarding courses. Often associated with in-stream use of OHVs.	
	6.1.14	Swimming / Bathing: concerns center on physical alteration of habitat to create swimming holes, and also contamination from soaps, oils, lotions etc.	
	6.2	<b>War, Civil Unrest and Military Exercises:</b> actions by formal or paramilitary forces without a permanent footprint (e.g., <i>armed conflict, mine fields, tanks and other military vehicles, training exercises and ranges, defoliation, munitions testing</i> ).	
		6.2.1	Military Testing and Training Activities
		6.3	<b>Work and Other Activities:</b> people spending time in or traveling in natural environments for reasons other than recreation or military activities (e.g., <i>law enforcement, drug smugglers, illegal immigrants, species research, vandalism</i> ).
		6.3.1	Low-level aircraft flights (Law Enforcement, Medical, Etc): an anticipated threat. Concerns would be similar to recreational activities. Impacts would be from unintentional disturbance.
	6.3.2	Motorized Travel: largely an anticipated threat. Concerns would be similar to recreational activities. Impacts would be from unintentional disturbance and some direct mortality.	
	6.3.3	Research and Monitoring: an anticipated threat. Concerns would be similar to recreational activities. Impacts would be from e.g., capture and handling, with some direct mortality.	

7		<b>Natural System Modifications</b> Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare.
	7.1	<b>Fire and Fire Suppression:</b> suppression or increase in fire frequency and/or intensity outside of its natural range of variation (e.g., <i>fire suppression to protect homes, inappropriate fire management, escaped agricultural fires, arson, campfires, fires for hunting</i> ).
	7.1.1	Inappropriate Fire Frequency and Intensity: concerns range from "lack of fire" at one extreme, to "too much fire" at the other. Concerns about lack of fire note the closing of forest, woodland, and certain shrubland canopies is impacting composition and structure of understory and early-seral vegetation, mainly through degradation and loss of herbaceous stratum and deciduous trees. Another concern is extreme fire intensity due to fuel loading. At the other extreme, concerns about excessive fire also note impacts to vegetation composition and structure, mainly to deserts and shrublands. A driver and outcome of excessive fire is type conversion to exotic grassland, with loss of woody and succulent components of the plant community with associated effects to wildlife (loss of cover, food, etc). Direct impacts to wildlife mainly concern fish kills due to post-fire alkaline runoff. Indirect impacts include soil erosion, debris flows, water quality degradation, etc.
	7.1.2	Fire Suppression Tactics: refers only to direct and indirect impacts of tactical fire suppression activities. These activities include building fireline, dropping retardant, driving offroad, dipping and scooping water, burning fuels out of indirect firelines, etc. Concerns include soil erosion, water quality degradation, weed spread, direct mortality, etc.
	7.1.3	Canal Burning: refers to annual springtime burning of ditch and canal banks. Concerns are direct mortality of terrestrial wildlife, and short-term water quality degradation from ash leading to fish and amphibian mortality.
	7.1.4	Prescribed Fire: refers to direct and indirect impacts of human and natural ignitions managed for resource benefit. Concerns include soil erosion, water quality degradation, weed spread, direct mortality of fish and other wildlife, etc.
	7.2	<b>Dams and Water Management / Use:</b> changing sediment and water flow patterns from their natural range of variation, either deliberately or as a result of other activities (e.g., <i>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</i> ).
	7.2.1	Presence of Dams: refers only to impacts from the presence of a dam, not those related to its operation. Concerns include the barrier to sediment flow (causing accretion above and erosion below the dam), the barrier to organism passage (causing demographic and genetic impacts to populations), habitat alteration from flowing to still water above a dam, habitat alteration from warmer turbid water to colder clear water below a dam, and loss of riparian forest and shrubland due to elimination of spring floods essential to seedling establishment.
	7.2.2	Presence of Diversions: refers to impacts from the presence of a diversion and associated infrastructure, plus those related to its operation. Impacts are similar to dams, but diversions are vastly more ubiquitous and impacts are often more extreme due to less regulation and mitigation. Impacts include complete dewatering of downstream reaches, habitat and population degradation, fragmentation, and loss, and direct fish mortality due to entrainment into irrigation systems. Reduced instream water volume leads to increased water temperatures, concentration of pollutants, lowered water tables in surrounding uplands, etc.
	7.2.3	Dam / Reservoir Operation: refers only to impacts from the operation of a dam, not those related to its physical presence. Concerns largely center on impacts from fluctuating water levels and flows, impacting survival and recruitment of fish, amphibians, etc. Occasionally can dewater downstream reaches completely, but not usually to the degree of diversions. Dam releases occasionally flush large quantities of hypoxic sediments downstream, causing fish kills. Also, seasonal reservoir management practices drastically lower water levels and minimize desirable or necessary inundation of fish spawning and rearing habitats.
	7.2.4	Dam Safety: largely an anticipated threat. Concerns center on maintenance and improvement activities required to ensure dam safety, plus any contamination or disturbance resulting from such activities, as well as the consequences of a catastrophic dam failure.
	7.2.5	Channelization / Bank Alteration (direct, intentional): refers to intentional diking, rip-rapping, dredging, etc operations. Impacts include accelerated loss of: sediment; stream connection to floodplain; backwater, wetland and riparian habitats; and elimination of riffle-pool-run sequences.
	7.2.6	Groundwater Pumping: Impacts include lowering of aquifers, reduction or loss of rivers, streams, springs, riparian habitat, and wetlands.
	7.2.7	Spring Development / Capping: possibly redundant with <i>Water Developments for Livestock and/or Water Developments for Wildlife and/or Agricultural / Municipal / Industrial Water Usage</i> . Differences may lie in who would address - or create - which threat. Refers to capture & relocation of water from springs (not wells, lakes, rivers or streams), to any human uses. Impacts include lowering of aquifers, reduction or loss of rivers, streams, springs, riparian habitat, and wetlands.
7.2.8	Agricultural / Municipal / Industrial Water Usage: Impacts include in-stream and riparian habitat fragmentation and loss, lowering of aquifers, etc. Reduced instream water volume leads to increased water temperatures, concentration of pollutants, lowered water tables in surrounding uplands, etc.	

	7.2.9	Water Allocation Policies: A driver of most water threats. Current western water law allows for dewatering and over-allocation, and doesn't promote or permit beneficial use for wildlife, with a few exceptions. Acquiring in-stream flows is very difficult to achieve.
	7.2.10	Salinity Alteration (of water): refers almost entirely to increased salinity content of water due to human practices. Salinity loading is a large problem in Colorado Basin, but changes in irrigation practices have reduced loading somewhat.
	7.2.11	Sediment Transport Imbalance: refers to a range of alterations ranging from sediment starvation to sediment overabundance within a stream channel or impoundment. Results in channel aggradation or degradation. Can result from the presence of a dam or diversion, or from poor grazing, soil erosion, loss of riparian vegetation. Aging reservoirs in Utah have lost storage capacity and a reduction in fish habitat since filling, due to sediment accretion. Stream reaches below dams have lost sand and gravel bars, spawning and backwater habitats, etc.
	7.2.12	Diking / Pumping (specific to Great Salt Lake): concerns center on lowering water levels to the point islands become reconnected to mainland, exposing island nesting colonies to exploitation by mainland predators.
7.3		<b>Other Ecosystem Modifications:</b> other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare (e.g., <i>land reclamation projects, abandonment of managed lands, rip-rap along shoreline, mowing grass, tree thinning in parks, beach construction, removal of snags from streams</i> ).
	7.3.1	Brush Eradication / Vegetation Treatments: refers to impacts caused by removal of non-native woody vegetation (tamarisk, Russian olive, etc.) for any purpose, and also to temporary cover or density reduction of native woody vegetation (pinyon, juniper, sagebrush, etc.) for wildlife, fuels, or range purposes. Not to be confused with the threat <u>Conversion to Cropland or Pasture</u> which refers to permanent type conversion of native vegetation to a domesticated state.
	7.3.2	Seeding Non-native Plants: refers to intentional use of aggressive or persistent non-native plant species (Russian olive, forage kochia, crested wheatgrass, etc.) for wildlife, range, or fire rehabilitation purposes.
	7.3.3	Channel Downtcutting (indirect, unintentional): refers to the outcome of natural processes in mostly unnatural situations, e.g., severe erosion enabled by (singly or in combination) removal of beavers, inappropriate grazing, loss of woody riparian vegetation, post-fire debris torrents, etc. Impacts include accelerated sediment loss, elimination of riffle-pool-run sequences, loss of stream connection to floodplain, loss of backwater, wetland and riparian habitats, etc.
	7.3.4	Water Developments for Wildlife: refers to diverting water from springs and streams into pipes, tanks, and troughs to provide drinking water to wildlife. As with <u>Water Developments for Livestock</u> , can lead to dewatering of streams and springs and subsequent loss of aquatic and riparian habitat, movement of diseases such as chytrid and whirling disease, and drowning of bats and small mammals.
	7.3.5	Mine Shaft / Adit Closures: human safety concerns necessitated a state remediation program to close old mine workings. Concern centers on loss of bat habitat in the form of hibernacula and maternity roosts, and some bird habitat as well (winter roosting habitat). Wildlife access can be maintained, with coordination and technology.
	7.3.6	Rotenone Treatments for Fish Control: concerns center on nontarget impacts to imperiled mussels, which are vulnerable to long-duration rodenticide poisoning in lentic settings.
	7.3.7	Stocking Non-native Wildlife: refers to legal introductions of non-native species. Current concerns center on fertile sportfish, main impacts of which are predation on or competition with native wildlife. Also some risk from associated pathogens. Little to no concern for sterile sportfish. No mention of non-native upland or big game introductions. In the future, assisted migration of nongame species could be encompassed by this threat.

8		<b>Invasive and Other Problematic Species and Genes</b> 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.
	8.1	<b>Invasive Non-native / Alien Species:</b> harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities (e.g., <i>feral cattle, household pets, zebra mussels, Dutch elm disease or chestnut blight, Miconia tree, introduction of species for biocontrol, Chytrid fungus affecting amphibians outside of Africa</i> ).
	8.1.1	<b>Invasive Wildlife Species – Non-native:</b> most concerns center on aquatic vertebrates and invertebrates, and their effects on native species and habitats. Direct species effects include hybridization, disease transmission, competition and predation. Indirect habitat effects include altering turbidity and fertility of waters.
	8.1.2	<b>Invasive Plant Species – Non-native:</b> includes both upland and wetland/riparian species ranging from grasses and forbs, to shrubs, to trees. Main effects are on habitats, with indirect effects on species, and include alteration of stream channel morphology, alteration of fire cycles, reduction of prey base, reduction of cover, elimination of open water habitat, and excessive consumption of water.
	8.1.3	<b>Feral Domesticated Animals:</b> main concerns are cats and horses. Impacts include direct predation by cats, and habitat damage by horses, particularly around water sources. Some concern over competition for forage by horses.

	8.1.4	Insects – Alien Organisms: main concern is tamarisk beetle defoliating endangered bird nesting habitat, and inadequate restoration planting follow-up with native woody riparian species.
	8.1.5	Disease – Alien Organisms: concerns include direct mortality and morbidity, and also indirect effects such as trophic cascades.
8.2		<b>Problematic Native Species:</b> harmful plants, animals, or pathogens and other microbes 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 (e.g., <i>overabundant native deer</i> , <i>overabundant algae due to loss of native grazing fish</i> , <i>native plants that hybridize with other plants</i> , <i>plague affecting rodents</i> ).
	8.2.1	<b>Problematic Wildlife Species – Native:</b> most concerns regard hybridization between native species when natural mechanisms of separation are removed or modified. Some significant concerns over predation, particularly when the predator is subsidized or sheltered by human agency.
	8.2.2	Problematic Insects – Native: concerns restricted to bark beetles and their effects on forest composition and structure, with resulting impacts to species and habitats.
	8.2.3	Problematic Plant Species – Native Upland: concerns are presently restricted to conifers within various forest and shrubland habitats. Mainly junipers at middle elevations, but also spruces, pines and firs at higher elevations.
	8.2.4	Problematic Plant Species – Native Wetland: concerns are presently restricted to algae within warmer stream habitats.
	8.2.5	Disease – Endemic Organisms: concerns are presently restricted to native diseases of grouse.
	8.2.6	Loss of Genetic Exchange / Inbreeding: sometimes due to a drastic population reduction and genetic bottleneck, sometimes due to fragmentation of distribution and isolation into multiple small populations that can be reconnected.
	8.2.7	<b>Natural Rarity:</b> refers to larger or higher-trophic or solitary wide-ranging species that are naturally thinly distributed on a landscape or waterscape (e.g., wolverine, condor). Not to be confused with species with a small number of occurrences or a small natural distribution ( <b>Small Isolated Populations</b> ).
	8.2.8	<b>Small Isolated Populations:</b> refers to relictual species with naturally limited distributions, or species whose distributions have been severely truncated by human agency. Not to be confused with widely-distributed species, or species with widely-ranging individuals ( <b>Natural Rarity</b> ).
8.3		<b>Introduced Genetic Material:</b> human-altered or transported organisms or genes (e.g., <i>pesticide resistant crops</i> , <i>hatchery salmon</i> , <i>restoration projects using nonlocal seed stock</i> , <i>genetically modified insects for biocontrol</i> , <i>genetically modified trees</i> , <i>genetically modified salmon</i> ).

9		<b>Pollution</b> Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources.
	9.1	<b>Household Sewage and Urban Waste Water:</b> water-borne sewage and nonpoint runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments (e.g., <i>discharge from municipal waste treatment plants</i> , <i>leaking septic systems</i> , <i>untreated sewage</i> , <i>outhouses</i> , <i>oil or sediment from roads</i> , <i>fertilizers and pesticides from lawns and golf-courses</i> , <i>road salt</i> ).
	9.1.1	Stormwater Runoff: concerns include chemical contamination, thermal alteration, extreme variability in flows. Mainly an urban issue, in particular the Virgin River basin.
	9.1.2	Lack of Comprehensive Watershed Planning to Improve Water Quality (TMDL): concern is presently limited to Utah Lake basin.
	9.1.3	Wastewater Treatment Plant Effluent: concern is presently limited to urban areas. Principal concern is nutrient enrichment. Another concern is presence of pharmaceutical compounds with endocrine-disrupting and other effects. Also includes effects of elevated baseflows during natural low-flow periods.
	9.2	<b>Industrial and Military Effluents:</b> 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 (e.g., <i>toxic chemicals from factories</i> , <i>illegal dumping of chemicals</i> , <i>mine tailings</i> , <i>arsenic from gold mining</i> , <i>leakage from fuel tanks</i> , <i>PCBs in river sediments</i> ).
	9.2.1	Heavy Metal Deposition: from various sources. Main concern is for aquatic habitats and species.
	9.2.2	Acid Mine Drainage: a legacy of hard rock mining. Main concern is for aquatic habitats and species, but can also impact birds and mammals.
	9.3	<b>Agricultural and Forestry Effluents:</b> water-borne pollutants from agricultural, silvicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied (e.g., <i>nutrient loading from fertilizer runoff</i> , <i>herbicide runoff</i> , <i>manure from feedlots</i> , <i>nutrients from aquaculture</i> , <i>soil erosion</i> ).
	9.3.1	Agricultural Pollution: concerns range from nutrients to pesticides. May be decreasing due to reduced agricultural return flows, which result from conversion from flood to sprinkler irrigation. May spike during snowmelt over frozen ground, particularly in feedlot and winter pasture situations. Some concerns over prey base reductions due to insecticides.
	9.3.2	Soil Erosion / Loss: sources include sheet erosion, gullying, and mass wasting. Many concerns stem from post-fire impacts. Another major source is loss of herbaceous ground cover to woody vegetation and bare ground (various causes for this, all falling within "poor land management").
	9.4	<b>Garbage and Solid Waste:</b> rubbish and other solid materials including those that entangle wildlife (e.g., <i>municipal waste</i> , <i>litter from cars</i> , <i>flotsam and jetsam from recreational boats</i> , <i>waste that entangles wildlife</i> , <i>construction debris</i> ).

9.5		<b>Air-borne Pollutants:</b> atmospheric pollutants from point and nonpoint sources (e.g., <i>acid rain, smog from vehicle emissions, excess nitrogen deposition, radioactive fallout, wind dispersion of pollutants or sediments, smoke from forest fires or wood stoves</i> ).
	9.5.1	Atmospheric Deposition: main concern is mercury and its bioaccumulation in fishes and fish predators. Sources include coal-fired power plants, gold mines, and dry lakebeds.
	9.5.2	Soil Movement/Deposition: purely an anticipated or unused threat. Potential overlap with <u>Sediment Transport Imbalance</u> and especially <u>Soil Erosion / Loss</u> .
9.6		<b>Excess Energy:</b> inputs of heat, sound, or light that disturb wildlife or ecosystems (e.g., <i>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</i> ).
	9.6.1	Noise Pollution: sources include urban areas, oil and gas production fields, and OHV recreation. Concern is about elevating stress hormones, impacting wildlife health and survival, and forcing changes in behavior.
	9.6.2	Thermal Alteration of Water (e.g., by power plant): concerns center on but are not limited to thermal electric generating sources. Most return flows or inflows, whether from power plants, urban stormwater, agricultural irrigation water, or wildland overland runoff, are warmer than receiving waters. Lowered base flows of receiving waters make them more susceptible to thermal alteration by warmer inflows.
	9.6.3	Light Pollution: concern is about elevating stress hormones, impacting wildlife health and survival, and forcing changes in behavior due to widespread light pollution from cities and towns, and also from isolated industrial/commercial sources.

10		<b>Geological Events</b> Threats from catastrophic geological events.
	10.1	<b>Volcanoes:</b> volcanic events (e.g., <i>eruptions, emissions of volcanic gasses</i> ).
	10.2	<b>Earthquakes / Tsunamis:</b> earthquakes and associated events (e.g., <i>earthquakes, tsunamis</i> ).
	10.3	<b>Avalanches / Landslides:</b> avalanches or landslides (e.g., <i>avalanches, landslides, mudslides</i> ).

11		<b>Climate Change and Severe Weather</b> Threats from long-term climatic changes that may be linked to global warming and other severe climatic or weather events outside the natural range of variation that could wipe out a vulnerable species or habitat.
	11.1	<b>Habitat Shifting and Alteration:</b> major changes in habitat composition and location (e.g., <i>sea-level rise, desertification, tundra thawing, coral bleaching</i> ).
	11.1.1	<b>Increasing Stream Temperatures:</b> concerns center on water temperatures exceeding tolerances of aquatic wildlife, but also include indirect effects such as reduced oxygen content, increased solute loading, increased algae growth, etc. Anticipating direct loss of habitat, and also increased habitat fragmentation and subsequent isolation of smaller wildlife populations with cascading loss of populations and reduction of range.
	11.2	<b>Droughts:</b> periods in which rainfall falls below the normal range of variation (e.g., <i>severe lack of rain, loss of surface water sources</i> ).
	11.3	<b>Temperature Extremes:</b> periods in which temperatures exceed or go below the normal range of variation (e.g., <i>heat waves, cold spells, oceanic temperature changes, disappearance of glaciers/sea ice</i> ).
	11.4	<b>Storms and Flooding:</b> extreme precipitation and/or wind events or major shifts in seasonality of storms (e.g., <i>cyclones, tornados, hailstorms, ice storms or blizzards, dust storms, erosion of beaches during storms</i> ).

		<b>Crucial Data Gaps</b> Gaps in our knowledge or understanding that severely impede our ability to detect, diagnose, and abate threats to species and habitats.
	12.1	<b>Inadequate Understanding of Ecology and Life History:</b> poor knowledge of the target and its relationship to its environment complicates or retards effective conservation
	12.1.1	Cheatgrass Impacts
	12.1.2	Importance and Contribution of Fluvial Populations
	12.1.3	Interaction with Non-native Species Unknown
	12.1.4	Vulnerability to Chytrid
	12.1.5	Relative Impacts of Fragmentation
	12.1.6	Persistent Declines in Prey Species
	12.1.7	Impacts on Migrating Birds
	12.1.8	Unknown Population Status
	12.1.9	Wind Power Impacts
	12.2	<b>Imperfect Understanding of Distribution or Range:</b> poor knowledge of location, extent, timing, and/or seasonal variation of occurrence complicates or retards effective conservation

12.3		<b><u>Inadequate Inventory and Assessment Methods:</u></b> inability to sample or characterize condition of individuals or population complicates or retards effective conservation
	12.3.1	No Morphological Key or Other Means to Identify
	12.3.2	Inventory Techniques Poorly Developed
	12.3.3	No Standardized Condition Assessment Method
12.4		<b><u>Taxonomic Debate:</u></b> uncertain identity complicates or retards effective conservation
	12.4.1	Uncertain Management / Conservation Unit
12.5		<b><u>Abiotic Conditions and Processes:</u></b> uncertainty concerning specific physical or chemical processes complicates or retards effective conservation
	12.5.1	Atmospheric Deposition / Snowmelt Chemistry
	12.5.2	Relationship Between Groundwater and Surface Water
	12.5.3	Scope and Severity of Mercury Deposition
12.6		<b><u>Climate Change:</u></b> uncertain climatic parameters and/or target tolerance and needs complicates or retards effective conservation
	12.6.1	Future Effects of Greater Temperature Variability under Climate Change
	12.6.2	Future Effects of Greater Precipitation Variability under Climate Change
12.7		<b><u>Inadequate Restoration Tools:</u></b> lack of adequate restoration materials or methods complicates or retards effective conservation
	12.7.1	Plant Material Development