Appendix 66
Mountain Columbia Province KEC Analysis

Key Ecological Correlates (KECs)[1] are specific habitat features within biomes—those habitat features include, for example, specific substrates, KECs, and attributes of species' environments. They are called "KECs" within the tables of the Canada IBIS Access database, which is the database we used in this analysis[2]. However, in this appendix we use the term KEC because that is the term most commonly used in subbasin planning.

IBIS treats KECs in a hierarchical fashion as seen in Table 1. Species can be represented more than once in the database. For example , item 1) contains Forest, Shrubland, & Grassland KECs. Item 1.1.1 down wood is a subset of item 1. All species with a relationship to Item 1.1.1 should also be listed as having a relationship with Item 1. The converse is not the case. Because the categories are nested, all KECs are not created equal and **cannot** be directly compared without first assessing whether the KECs are categorizing at the same level of detail.

Table 2 presents the total number of species associated with each of the main categories of KEC for each IBIS biome. Table 3 gives the number of distressed species in the main categories of KECs for each of the biomes. An advantage of examining the main categories of KECs is that there are sufficient data within these broad categories to illustrate frequency without fear of under representing the data. The disadvantage of an analysis that uses these broader categories is that it lacks specificity.

Table 4 shows the distressed species count divided by the total species for the main categories of KECs in each IBIS biome. Tables 5 through 10 list the more specific KECs. We have filtered the fairly large selection of KECs by eliminating all KECs that have no distressed species associated with them. For each major category of KEC we listed the subcategories and provided the species counts for distressed, total species and distressed divided by total species. We did this only in biomes specific to that KEC category. In other words, forest-related habitat-element species counts are included only for forest biomes. For the KEC categories that transcend all biomes, such as anthropogenic KECs we have listed all the biomes in IBIS Canada. The biome types are color coded to emphasize the biomes pertinent to our sub basin planning process.

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[1] *Key environmental correlates (KECs) are specific substrates, KECs, and attributes of species' environments that are not represented by overall (macro)habitats and vegetation structural conditions. Specific examples of KECs include snags, down wood, type of stream substrate, and many others. KECs are denoted for each species using a standard classification system, which include the KECs for vegetation KECs, non-vegetation terrestrial elements, aquatic bodies and substrates, anthropogenic structures, and other categories.*

[2] *As we explained in a footnote at the beginning of the Fish and Wildlife Communities chapter, we made a careful examination of the differences between US and Canada IBIS lists and consulted with IBIS staff to determine which IBIS database—U.S. or Canada—we should use, given our specific needs. We decided that the differences between the databases were not significant for the kinds of analyses we were conducting. Further, IBIS personnel in the U.S. and Canada felt that the Canada database was probably the best list of species to use of those available at the time for any detail work beyond what was already provided using the IBIS-USA website. Hence we have chosen to use the Canada database.*

Some Notes And Cautions About Our Analysis
KEC analyses is most useful at a project-specific planning level, once priority HUC areas are identified. For example, based on IBIS data, 3 out of 21 or 14% of species associated with downed wood are considered to be decreasing or in decline in the herbaceous wetland biome category.   Water depth is an important consideration for 50 species and 17 out of 50 or 34% of the species are in decline. Both water depth and downed wood are specific and local in scale and could conceivably be informally compared to formulate hypotheses regarding what sort of restorations are needed and where might the restoration be located.

There are caveats to the use of these data, however, as well as potential problems with the data base. These include:

1. There is very little quantification of the amount of KEC and the relative contribution of a given species to the proper functioning of that element as a habitat is not evident. It would not be appropriate to draw conclusions about the priority needs of a HUC without further examination of the habitat in field work. IBIS might be used to generate a list of likely candidates for field assessment however. In addition there appears to be much error within the KEC table in the database. Redundant categories are present and some categories appear to be missing.

2. It is possible to identify differences in the number of distressed species based on KECs for each biome. But it is not as easy to glean real differences in importance based on the data in the system. The KECs are short phrases which depict a condition. As such they are very abstract. It is not possible to discern exactly how the individuals perceived these items as they identified relationships. We also do not know how many people actually had input on a single given decision. Expert-based information systems rely on the credentials as well as the number of people that had input as some measure of efficacy. Even accepting that as a basis of proof, we know many authors provided input into IBIS. We do not know if many authors had input on water ph and tiger salamanders however.

3. In our analysis of which KECs had the most species in decline or decreasing (distressed species), we discovered that both "habitat-structure change" and "predation" had no record of a species in distress associated with them. Yet we know that habitat-structure change is at least implicated in the problems associated with many endangered species and predation is a factor for many species as well. If we ask the question, "Why is predation not listed?" there is nothing in the database that affords a satisfactory explanation. We consider this to be a problem.

4. Table 2 is the total number of species associated with each of the main categories of KEC for each IBIS biome. The main categories of KECs are very broad and one would assume there would be a correlation between the biome type and the KEC. For example, the number of species in 1) Forest, Shrubland & Grassland KECs should to be most strongly correlated to forest and grassland biomes. The highest values for this KEC, however, occurs in the riparian biome types.

5. One should look at the total species count when considering the percentage of distressed species divided by the total species. A distressed/total value of 0.5 means two different things if the total number of species in one example is 100 while in another it is two.

Table 1. The Habitat Elements listed in IBIS Canada. (The list has been edited to remove redundancies and errors.)

Key Ecological Correlates or Habitat Elements
1) Forest, Shrubland, & Grassland Habitat Elements
1.1) forest/woodland vegetative elements or substrates
1.1.1) down wood (includes downed logs, branches, and rootwads, in any context)
1.1.1.1) decay class
1.1.1.1.1) hard
1.1.1.1.1) hard [class 1, 2]
1.1.1.1.2) moderate
1.1.1.1.2) moderate [class 3]
1.1.1.1.3) soft
1.1.1.2) down wood in riparian areas
1.1.1.3) down wood in upland areas
1.1.10) fungi
1.1.11) roots, tubers, underground plant parts
1.1.12) ferns
1.1.13) herbaceous layer
1.1.14) trees
1.1.14) trees (located in a shrubland/grassland context)
1.1.14.1) snags
1.1.14.1.1) decay class
1.1.14.1.1.1) hard
1.1.14.1.1.1) hard [class 1, 2]
1.1.14.1.1.2) moderate
1.1.14.1.1.2) moderate [class 3]
1.1.14.1.1.3) soft
1.1.14.1.1.3) soft [class 4, 5]
1.1.14.1.2) tree size (dbh)
1.1.14.1.2.5) large tree 20-29" dbh
1.1.14.1.2.6) giant tree >= 30" dbh
1.1.14.10) large live tree branches
1.1.14.11) tree canopy layer
1.1.14.11.1) sub canopy
1.1.14.11.1) sub-canopy
1.1.14.11.2) above canopy
1.1.14.11.3) tree bole
1.1.14.11.4) canopy
1.1.14.2) snag size (dbh)
1.1.14.2.3) small tree 10-14" dbh
1.1.14.2.4) medium tree 15-19" dbh
1.1.14.2.5) large tree 20-29" dbh
1.1.14.2.6) giant tree >= 30" dbh
1.1.14.3) tree size (dbh)
1.1.14.3.1) seedling <1" dbh
1.1.14.3.2) sapling/pole 1-9" dbh
1.1.14.3.3) small tree 10-14" dbh
1.1.14.3.4) medium tree 15-19" dbh
1.1.14.3.5) large tree 20-29" dbh

1.1.14.3.6) giant tree >= 30" dbh
1.1.14.4) mistletoe brooms/witches brooms
1.1.14.5) dead parts of live tree
1.1.14.6) hollow living trees (chimney trees)
1.1.14.7) tree cavities
1.1.14.8) bark (includes crevices/fissures, loose or exfoliating bark)
1.1.14.9) live remnant/legacy trees
1.1.15) fruits/seeds/nuts
1.1.16) edges
1.1.2) litter
1.1.3) duff
1.1.4) shrub layer
1.1.4) shrub size (height)
1.1.4.1) shrub layer
1.1.4.1) shrub size
1.1.4.1) shrub size (height)
1.1.4.2) percent shrub canopy cover
1.1.4.3) shrub canopy layers
1.1.5) moss
1.1.6) flowers
1.1.7) lichens
1.1.8) forbs
1.2) shrubland/grassland vegetative elements or substrates
1.2.1) herbaceous layer
1.2.2) fruits/seeds/nuts
1.2.3) moss
1.2.5) flowers
1.2.6) shrubs
1.2.6.1) shrub size (height)
1.2.6.1.1) small - <20"
1.2.6.1.1) small <20"'
1.2.6.1.1) small shrub
1.2.6.1.2) medium 20"-6.5'
1.2.6.1.3) large shrub 6.6' - 16.5'
1.2.6.2) percent shrub canopy cover
1.2.6.3) shrub canopy layer
1.2.6.3.1) sub canopy
1.2.6.3.2) above canopy
1.2.7) fungi
1.2.8) forbs
1.2.9) bulbs/tubers
1.2.10) grasses
1.2.11) cryptogamic crusts
1.2.12) trees (located in a shrubland/grassland context)
1.2.12.1) snags
1.2.12.1.1) decay class
1.2.12.1.1.1) hard
1.2.12.1.1.1) hard [class 1, 2]
1.2.12.1.1.2) moderate
1.2.12.1.1.3) soft
1.2.12.1.2) moderate
1.2.12.2) snag size (dbh)
1.2.12.2.2) sapling/pole 1-9" dbh
1.2.12.2.3) small tree 10-14" dbh
1.2.12.2.4) medium tree 15-19" dbh
1.2.12.2.5) large tree 20-29" dbh
1.2.12.2.6) giant tree >= 30" dbh
1.2.12.3) tree size (dbh)

1.2.12.3.1) shrub/seedling <1" dbh
1.2.12.3.2) sapling/pole 1-9" dbh
1.2.12.3.3) small tree 10-14" dbh
1.2.12.3.4) medium tree 15-19" dbh
1.2.12.3.5) large tree 20-29" dbh
1.2.12.3.6) giant tree >= 30" dbh
1.2.13) edges
1.2.13..3) small tree 10-14" dbh
1.2.13.3.2) sapling/pole 1-9" dbh
1.2.13.3.3) small tree 10-14" dbh
1.2.13.3.4) medium tree 15-19" dbh
1.2.13.3.5) large tree 20-29" dbh
1.2.13.3.6) giant tree >= 30" dbh
2) Ecological Habitat Elements
2.1) exotic species (specify whether the species is negatively or positively influenced by the presence of introduced plants or animals)
2.1.1) exotic plants
2.1.2) exotic animals
2.1.2.1) predation
2.1.2.2) direct displacement
2.1.2.3) habitat structure change
2.1.2.4) other
2.1.3) habitat structure change
2.2) insect population irruptions
2.2.1) mountain pine beetle
2.2.2) spruce budworm
2.2.3) douglas-fir tussock moth
2.3) beaver/muskrat activity (dams, lodges, ponds) (Positive only)
2.4) burrows (aquatic or terrestrial) (Positive only)
3) Non-vegetative, Abiotic Habitat Elements
3.1) rocks
3.1.1) gravel
3.1.2) talus
3.1.3) talus-like habitats
3.2) soils (Specify whether negative or positive relationship in comments)
3.2.1) soil depth
3.2.3) soil moisture
3.2.4) soil organic matter
3.2.5) soil texture
3.3) rock substrates
3.3.1) avalanche chute
3.3.2) cliffs
3.3.3) caves
3.3.4) rocky outcrops and ridges
3.3.5) rock crevices
3.3.6) barren ground
3.3.7) playa (alkaline, saline)
3.4) snow
3.4.1) snow depth
3.4.2) glaciers, snow field (permanent snow/ice)
4) Freshwater Riparian & Aquatic Bodies Habitat Elements
4.1) water characteristics (specify whether negative or positive relationship in comments)
4.1.1) dissolved oxygen
4.1.2) water depth
4.1.3) dissolved solids
4.1.4) water pH
4.1.5) water temperature

4.1.6) water velocity
4.1.7) water turbidity
4.1.8) free water (derived from any source)
4.1.9) salinity and alkalinity
4.2) rivers & streams
4.2.1) oxbows
4.2.2) order and class
4.2.2.1) intermittent
4.2.2.2) upper perennial
4.2.2.3) lower perennial
4.2.3) zone
4.2.3.1) open water
4.2.3.2) submerged/benthic
4.2.3.3) shoreline
4.2.4) in-stream substrate
4.2.4.1) rocks
4.2.4.2) cobble/gravel
4.2.4.3) sand/mud
4.2.5) vegetation
4.2.5.1) submergent vegetation
4.2.5.2) emergent vegetation
4.2.5.3) floating mats
4.2.6) coarse woody debris in streams and rivers
4.2.7) pools
4.2.8) riffles
4.2.9) runs/glides
4.2.10) overhanging vegetation
4.2.11) waterfalls
4.2.12) banks
4.2.13) seeps or springs
4.3) ephemeral pools
4.4) sand bars
4.5) gravel bars
4.6) lakes/ponds/reservoirs
4.6.1) zone
4.6.1.1) open water
4.6.1.2) submerged/benthic
4.6.1.3) shoreline
4.6.2) in-water substrate
4.6.2.1) rock
4.6.2.2) cobble/gravel
4.6.2.3) sand/mud
4.6.3) vegetation
4.6.3.1) submergent vegetation
4.6.3.2) emergent vegetation
4.6.3.3) floating mats
4.6.4) size
4.6.4.1) ponds (<2ha)
4.6.4.2) lakes (>=2ha)
4.7) wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)
4.7.1) riverine wetlands
4.7.2) context of surrounding landscape
4.7.2.1) forest
4.7.2.2) non-forest
4.7.3) size
4.7.4) marshes
4.7.5) wet meadows
4.8) islands

4.9) seasonal flooding
5.5.1) surface layer
5.5.1.1) fronts (e.g. tide rips, and confluence zones)
5.8.1) beach
5.8.2) off-shore islands/rocks/sea stacks/off-shore cliffs
5.8.3) marine cliffs (mainland)
5.8.4) delta
5.8.5) dune
5.8.6) lagoon
5.8.7) salt marsh
5.8.9) tidal flat
7) Fire as a Habitat Element
8) Anthropogenic-related Habitat Elements
8.1) campgrounds/picnic areas
8.2) Often nests in cutbanks.
8.2) roads
8.2.4) water diversion structures
8.3) buildings
8.4) bridges
8.5) diseases transmitted by domestic animals
8.6) harvest/persecution (of animals) (includes legal and illegal harvest, and
incidental take)
8.7) fences/corrals
8.8) supplemental food
8.9) refuse (includes landfills)
8.10) supplemental boxes, structures and platforms
8.11) guzzlers and waterholes
8.12) toxic chemical use (indicate only documented affects)
8.12.1) herbicides/fungicides
8.12.2) insecticides
8.12.3) pesticides
8.12.4) fertilizers
8.13) hedgerows/windbreaks
8.14) sewage treatment plant
8.15) repellents
8.15.1) chemical
8.15.2) noise or visual disturbance
8.16) culverts
8.17) irrigation ditches/canals
8.18) powerlines/corridors
8.19) pollution
8.19.1) chemical
8.19.2) sewage
8.19.3) water
8.20) piers
8.21) mooring piles, dolphins, buoys
8.22) bulkheads, seawalls, revetment
8.23) jetties, groins, breakwaters
8.24) water diversion structures
8.25) log boom
8.26) boats/ships
8.28) hatchery facilities and fish

Table 2. Total species count for the main categories of KECs in each IBIS biome.

Hab elements	Agriculture, Pastures, and Mixed Environs	Alpine Grasslands and Shrublands	Eastside (Interior) Grasslands	Eastside (Interior) Mixed Conifer Forest	Eastside (Interior) Riparian-Wetlands	Herbaceous Wetlands	Lodgepole Pine Forest and Woodlands	Montane Coniferous Wetlands	Montane Mixed Conifer Forest	Open Water - Lakes, Rivers, and Streams	Ponderosa Pine Forest and Woodlands	Shrub-steppe	Subalpine Parkland	Upland Aspen Forest	Urban and Mixed Environs	Total
1) Forest, Shrubland, & Grassland KECs	162	84	**96**	**144**	173	101	106	95	**124**	43	136	90	124	103	131	1712
2) Ecological KECs	165	67	90	125	161	107	90	81	103	64	122	83	100	93	118	1569
3) Non-vegetative, Abiotic KECs	108	55	78	85	96	75	64	53	69	45	79	74	70	65	71	1087
4) Freshwater Riparian & Aquatic Bodies KECs	124	51	75	83	**113**	**139**	62	58	71	**106**	75	62	66	56	77	1218
7) Fire as a KEC	55	26	37	51	59	26	43	30	41	5	54	38	45	42	38	590
8) Anthropogenic-related KECs	197	77	111	139	177	149	108	89	115	103	137	104	110	104	144	1864
Totals	811	360	487	627	779	597	473	406	523	366	603	451	515	463	579	8040

Table 3. Distressed species count for the main categories of KECs in each IBIS biome.

Hab elements	Agriculture, Pastures, and Mixed Environs	Alpine Grasslands and Shrublands	Eastside (Interior) Grasslands	Eastside (Interior) Mixed Conifer Forest	Eastside (Interior) Riparian-Wetlands	Herbaceous Wetlands	Lodgepole Pine Forest and Woodlands	Montane Coniferous Wetlands	Montane Mixed Conifer Forest	Open Water - Lakes, Rivers, and Streams	Ponderosa Pine Forest and Woodlands	Shrub-steppe	Subalpine Parkland	Upland Aspen Forest	Urban and Mixed Environs	Total
1) Forest, Shrubland, & Grassland KECs	15	9	11	10	17	16	7	8	9	12	9	7	7	8	8	153
2) Ecological KECs	17	6	16	8	19	16	5	5	6	13	11	12	3	10	7	154
3) Non-vegetative, Abiotic KECs	12	7	11	10	14	8	6	6	7	4	12	11	6	10	9	133
4) Freshwater Riparian & Aquatic Bodies KECs	16	8	10	7	15	27	6	7	8	22	6	6	6	4	6	154
7) Fire as a KEC	5	0	5	2	5	0	1	0	0	0	3	5	0	3	2	31
8) Anthropogenic-related KECs	22	8	16	11	22	26	7	7	9	21	12	12	6	11	9	199
Totals	87	38	69	48	92	93	32	33	39	72	53	53	28	46	41	824

Table 4. Distressed species count/ Total species for the main categories of KECs in each IBIS biome. Characters in bold highlight the highest values in a KEC Category.

Hab elements	Agriculture, Pastures, and Mixed Environs	Alpine Grasslands and Shrublands	Eastside (Interior) Grasslands	Eastside (Interior) Mixed Conifer Forest	Eastside (Interior) Riparian-Wetlands	Herbaceous Wetlands	Lodgepole Pine Forest and Woodlands	Montane Coniferous Wetlands	Montane Mixed Conifer Forest	Open Water - Lakes, Rivers, and Streams	Ponderosa Pine Forest and Woodlands	Shrub-steppe	Subalpine Parkland	Upland Aspen Forest	Urban and Mixed Environs
1) Forest, Shrubland, & Grassland KECs	0.09	0.11	0.11	0.07	0.10	**0.16**	0.07	0.08	0.07	**0.28**	0.07	0.08	0.06	0.08	0.06
2) Ecological KECs	0.10	0.09	**0.18**	0.06	0.12	0.15	0.06	0.06	0.06	**0.20**	0.09	0.14	0.03	0.11	0.06
3) Non-vegetative, Abiotic KECs	0.11	0.13	0.14	0.12	**0.15**	0.11	0.09	0.11	0.10	0.09	**0.15**	**0.15**	0.09	**0.15**	0.13
4) Freshwater Riparian & Aquatic Bodies KECs	0.13	0.16	0.13	0.08	0.13	**0.19**	0.10	0.12	0.11	**0.21**	0.08	0.10	0.09	0.07	0.08
7) Fire as a KEC	0.09		**0.14**	0.04	0.08		0.02				0.06	**0.13**		0.07	0.05
8) Anthropogenic-related KECs	0.11	0.10	**0.14**	0.08	0.12	**0.17**	0.06	0.08	0.08	0.20	0.09	0.12	0.05	0.11	0.06
Totals	0.64	0.58	**0.85**	0.45	0.70	0.78	0.40	0.46	0.42	**0.98**	0.53	0.71	0.32	0.59	0.44

Table 5. Species associated with forest KECs which are also found in forest biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Forest vegetative Hab elements	Eastside (Interior) Mixed Conifer Forest			Montane Mixed Conifer Forest		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
1.1.1.2) down wood in riparian areas	2	15	0.13	1	13	0.08
1.1.1.3) down wood in upland areas	2	17	0.12	1	13	0.08
1.1.4) shrub layer	2	50	0.04	2	40	0.05
1.1.4.1) shrub size	1	13	0.08	1	10	0.10
1.1.4.2) percent shrub canopy cover	1	23	0.04	1	15	0.07
1.1.4.3) shrub canopy layers	0	14		0	10	
1.1.8) forbs	3	23	0.13	3	18	0.17
1.1.13) herbaceous layer	1	28	0.04	1	22	0.05
1.1.14) trees	6	100	0.06	7	89	0.08
1.1.14.1) snags	2	49	0.04	3	46	0.07
1.1.14.1.1) decay class	0	17		0	16	
1.1.14.11) tree canopy layer	0	47		0	42	
1.1.14.11.1) sub-canopy	1	26	0.04	1	20	0.05
1.1.14.11.4) canopy	1	25	0.04	1	19	0.05
1.1.14.2) snag size (dbh)	2	37	0.05	3	35	0.09
1.1.14.2.4) medium tree 15-19" dbh	0	26		0	23	
1.1.14.2.5) large tree 20-29" dbh	2	34	0.06	3	32	0.09
1.1.14.2.6) giant tree >= 30" dbh	2	34	0.06	2	31	0.06
1.1.14.3) tree size (dbh)	4	71	0.06	5	63	0.08
1.1.14.3.1) seedling <1" dbh	1	10	0.10	1	8	0.13

Table 5. Species associated with forest KECs which are also found in forest biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Forest vegetative Hab elements	Eastside (Interior) Mixed Conifer Forest			Montane Mixed Conifer Forest		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
1.1.14.3.2) sapling/pole 1-9" dbh	1	24	0.04	1	16	0.06
1.1.14.3.3) small tree 10-14" dbh	1	36	0.03	2	29	0.07
1.1.14.3.4) medium tree 15-19" dbh	4	53	0.08	5	46	0.11
1.1.14.3.5) large tree 20-29" dbh	5	63	0.08	6	55	0.11
1.1.14.3.6) giant tree >= 30" dbh	5	61	0.08	5	52	0.10
1.1.14.7) tree cavities	2	36	0.06	3	34	0.09
1.1.14.8) bark (includes crevices/fissures, loose or exfoliating bark)	1	14	0.07	1	12	0.08
1.1.15) fruits/seeds/nuts	1	44	0.02	1	34	0.03
1.1.16) edges	6	82	0.07	6	69	0.09

Table 6. Species associated with grassland KECs listed according to their presence in the grassland biome. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Forest vegetative Hab elements	Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
1.2.1) herbaceous layer	5	34	0.15	1	50	0.18
1.2.2) fruits/seeds	1	14	0.07	1	15	0.20
1.2.2) fruits/seeds/nuts	1	13	0.08	2	17	0.06
1.2.6) shrubs	4	39	0.10	1	42	0.05
1.2.6.1) shrub size (height)	2	21	0.10	1	25	0.04

Table 6. Species associated with grassland KECs listed according to their presence in the grassland biome. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Forest vegetative Hab elements	Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
1.2.6.1.2) medium shrub	2	13	0.15	0	15	0.07
1.2.6.1.3) large – 6.6' – 16.5'	1	3	0.33	3	4	
1.2.6.1.3) large shrub	1	10	0.10	1	8	0.13
1.2.6.2) percent shrub canopy cover	2	18	0.11	2	19	0.11
1.2.6.3) shrub canopy layers	1	15	0.07	1	15	0.07
1.2.6.3.1) sub-canopy	1	15	0.07	0	12	
1.2.8) forbs	2	19	0.11	4	29	0.14
1.2.10) grasses	5	30	0.17	9	48	0.19
1.2.12) trees (located in a shrubland/grassland context)	4	40	0.10	2	38	0.05
1.2.12.1) snags	0	11		0	13	
1.2.12.2) snag size (dbh)	1	10	0.10	0	10	
1.2.12.2.4) medium tree 15-19" dbh	0	8		0	8	
1.2.12.2.5) large tree 20-29" dbh	1	10	0.10	0	9	
1.2.12.2.6) giant tree >= 30" dbh	1	9	0.11	0	8	
1.2.12.3) tree size (dbh)	4	26	0.15	1	24	0.04
1.2.12.3.1) shrub/seedling <1" dbh	2	9	0.22	1	6	0.17
1.2.12.3.2) sapling/pole 1-9" dbh	2	14	0.14	1	15	0.07
1.2.12.3.3) small tree 10-14" dbh	1	16	0.06	0	16	
1.2.12.3.4) medium tree 15-19" dbh	2	16	0.13	0	18	

Table 6. Species associated with grassland KECs listed according to their presence in the grassland biome. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Forest vegetative Hab elements	Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
1.2.12.3.5) large tree 20-29" dbh	3	19	0.16	0	16	
1.2.12.3.6) giant tree >= 30" dbh	2	17	0.12	0	13	
1.2.13) edges	5	40	0.13	8	43	0.19

Table 7. Species associated with riparian KECs listed according to their presence in the riparian and wetlands biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Riparian Habitat Elements	Riparian			Herbacious Wetlands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
4.1.1) dissolved oxygen	1	3	0.33	1	3	0.33
4.1.2) water depth	2	18	0.28	5	50	0.34
4.1.3) dissolved solids	0	1	1.00	1	1	1.00
4.1.4) water pH	0	1	1.00	1	3	0.67
4.1.5) water temperature	1	3	0.33	1	2	
4.1.6) water velocity	1	14	0.14	2	20	0.15
4.1.8) free water (derived from any source)	2	13	0.08	1	11	0.18
4.1.9) salinity and alkalinity	2	7	0.57	4	13	0.62
4.2) rivers & streams	5	71	0.18	13	96	0.24
4.2.1) oxbows	1	29	0.28	8	38	0.37
4.2.2) order and class	2	35	0.23	8	49	0.31
4.2.2.2) upper perennial	1	14	0.07	1	5	
4.2.2.3) lower perennial	1	29	0.24	7	47	0.32

Table 7. Species associated with riparian KECs listed according to their presence in the riparian and wetlands biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Riparian Habitat Elements	Riparian			Herbacious Wetlands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
4.2.3) zone	2	41	0.20	8	71	0.25
4.2.3.1) open water	2	31	0.26	8	57	0.32
4.2.3.2) submerged/benthic	1	7	0.29	2	9	0.56
4.2.3.3) shoreline	0	32	0.16	5	54	0.20
4.2.4) in-stream substrate	2	16	0.25	4	24	0.33
4.2.4.1) rocks	1	5	0.20	1	3	
4.2.4.2) cobble/gravel	1	8	0.13	1	4	
4.2.4.3) sand/mud	1	11	0.27	3	23	0.35
4.2.5) vegetation	1	16	0.13	2	31	0.23
4.2.5.1) submergent vegetation	0	8	0.25	2	16	0.38
4.2.5.2) emergent vegetation	0	10	0.10	1	20	0.15
4.2.7) pools	0	11		0	7	0.14
4.2.8) riffles	1	6	0.17	1	2	
4.2.10) overhanging vegetation	0	6	0.17	1	6	0.17
4.2.11) waterfalls	1	2	0.50	1	2	0.50
4.2.13) seeps or springs	2	23	0.17	4	23	0.13
4.3) ephemeral pools	1	29	0.17	5	57	0.23
4.4) sand bars	0	17		0	30	0.07
4.5) gravel bars	0	18		0	29	0.03
4.6) lakes/ponds/reservoirs	2	52	0.15	8	97	0.23
4.6.1) zone	2	42	0.19	8	80	0.25

Table 7. Species associated with riparian KECs listed according to their presence in the riparian and wetlands biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Riparian Habitat Elements	Riparian			Herbacious Wetlands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
4.6.1.1) open water	2	33	0.24	8	68	0.29
4.6.1.2) submerged/benthic	2	7	0.43	3	14	0.50
4.6.1.3) shoreline	0	33	0.15	5	61	0.16
4.6.2) in-water substrate	2	11	0.27	3	27	0.30
4.6.2.3) sand/mud	2	11	0.27	3	27	0.30
4.6.3) vegetation	1	25	0.20	5	59	0.27
4.6.3.1) submergent vegetation	1	13	0.31	4	35	0.37
4.6.3.2) emergent vegetation	1	19	0.26	5	45	0.33
4.6.3.3) floating mats	0	10	0.10	1	20	0.15
4.6.4) size	1	8	0.25	2	25	0.32
4.6.4.1) ponds (<2ha)	0	5	0.40	2	6	0.33
4.6.4.2) lakes (>=2ha)	1	4		0	20	0.30
4.7) wetlands/marshes/wet meadows/bogs and swamps (Positive relationships only)	3	90	0.11	10	122	0.19
4.7.1) riverine wetlands	1	58	0.12	7	70	0.20
4.7.2) context of surrounding landscape	3	45	0.09	4	51	0.16
4.7.2.1) forest	3	38	0.08	3	35	0.17
4.7.2.2) non-forest	0	20	0.05	1	29	0.07
4.7.3) size	0	6	0.33	2	19	**0.26**
4.7.4) marshes	1	45	0.18	8	84	0.24

Table 7. Species associated with riparian KECs listed according to their presence in the riparian and wetlands biomes. Distressed species are those species which are indicated to be either in decline or decreasing according to the IBIS Canada database.

Riparian Habitat Elements	Riparian			Herbacious Wetlands		
	Distressed Species	Total Species	Distressed / Total Species	Distressed Species	Total Species	Distressed / Total Species
4.7.5) wet meadows	1	21	0.05	1	26	0.15
4.8) islands	0	11	0.09	1	30	0.10
4.9) seasonal flooding	0	25	0.16	4	45	**0.24**

Table 8a. Ecological KECs.

Ecological KECs	Agriculture, Pastures, and Mixed Environs			Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands			Eastside (Interior) Mixed Conifer Forest			Eastside (Interior) Riparian-Wetlands		
2.1.1) exotic plants	8	72	0.11	1	22	0.05	9	46	**0.20**	2	29	0.07	7	46	0.15
2.1.2) exotic animals	8	94	0.09	2	40	0.05	7	52	0.13	3	69	0.04	11	86	0.13
2.1.2.1) predation	4	61	0.07	2	28	0.07	3	31	0.10	1	44	0.02	3	55	0.05
2.1.2.2) direct displacement	2	20	0.10	0	8		1	13	0.08	0	17		4	22	**0.18**
2.1.2.3) habitat structure change	3	36	0.08	2	15	0.13	2	19	0.11	1	26	0.04	3	32	0.09
2.2) insect population irruptions	5	44	0.11	4	22	0.18	4	23	0.17	2	43	0.05	5	50	0.10
2.3) beaver/muskrat activity (dams, lodges, ponds) (Positive only)	3	27	0.11	2	14	0.14	2	16	0.13	2	17	0.12	6	35	0.17
2.4) burrows (aquatic or terrestrial) (Positive only)	6	31	0.19	1	16	0.06	7	24	**0.29**	5	33	**0.15**	8	38	**0.21**

Table 8b. Ecological KECs continued.

Ecological KECs	Herbaceous Wetlands	Herbaceous Wetlands	Herbaceous Wetlands	Lodgepole Pine Forest and Woodlands	Lodgepole Pine Forest and Woodlands	Lodgepole Pine Forest and Woodlands	Montane Coniferous Wetlands	Montane Coniferous Wetlands	Montane Coniferous Wetlands	Montane Mixed Conifer Forest	Montane Mixed Conifer Forest	Montane Mixed Conifer Forest
2.1.1) exotic plants	3	48	0.06	1	20	0.05	0	14		0	24	
2.1.2) exotic animals	6	50	0.12	0	47		3	44	0.07	2	55	0.04
2.1.2.1) predation	3	31	0.10	0	32		1	27	0.04	1	33	0.03
2.1.2.2) direct displacement	4	13	**0.31**	0	11		2	11	**0.18**	1	16	0.06
2.1.2.3) habitat structure change	1	20	0.05	0	16		1	16	0.06	1	20	0.05
2.2) insect population irruptions	5	19	**0.26**	1	28	0.04	2	29	0.07	2	35	0.06
2.3) beaver/muskrat activity (dams, lodges, ponds) (Positive only)	10	37	**0.27**	2	13	0.15	3	17	**0.18**	3	17	**0.18**
2.4) burrows (aquatic or terrestrial) (Positive only)	2	23	0.09	3	25	0.12	1	22	0.05	2	25	0.08

Table 8c. Ecological KECs continued.

Ecological KECs	Open Water - Lakes, Rivers, and Streams			Ponderosa Pine Forest and Woodlands			Shrub-steppe			Subalpine Parkland		
2.1.1) exotic plants	2	28	0.07	5	33	0.15	9	46	0.20	0	24	
2.1.2) exotic animals	4	20	0.20	6	70	0.09	7	52	0.13	1	59	0.02
2.1.2.1) predation	1	11	0.09	3	48	0.06	3	32	0.09	1	36	0.03
2.1.2.2) direct displacement	4	8	**0.50**	1	19	0.05	1	10	0.10	0	15	
2.1.2.3) habitat structure change	0	7		1	22	0.05	2	18	0.11	1	22	0.05
2.2) insect population irruptions	4	10	**0.40**	1	39	0.03	0	18		2	38	0.05
2.3) beaver/muskrat activity (dams, lodges, ponds) (Positive only)	9	29	**0.31**	3	16	**0.19**	1	15	0.07	1	16	0.06
2.4) burrows (aquatic or terrestrial) (Positive only)	1	10	0.10	7	30	**0.23**	7	21	**0.33**	1	24	0.04

Table 8d. Ecological KECs continued.

Ecological KECs	Upland Aspen Forest	Upland Aspen Forest	Upland Aspen Forest	Urban and Mixed Environs	Urban and Mixed Environs	Urban and Mixed Environs
2.1.1) exotic plants	3	22	0.14	5	35	0.14
2.1.2) exotic animals	4	46	0.09	6	74	0.08
2.1.2.1) predation	0	28		4	60	0.07
2.1.2.2) direct displacement	0	12		1	15	0.07
2.1.2.3) habitat structure change	1	17	0.06	2	19	0.11
2.2) insect population irruptions	2	32	0.06	1	36	0.03
2.3) beaver/muskrat activity (dams, lodges, ponds) (Positive only)	2	12	**0.17**	1	19	0.05
2.4) burrows (aquatic or terrestrial) (Positive only)	7	28	**0.25**	4	25	**0.16**

Table 9a. Non-vegetative, Abiotic KECs

Non-vegetative, Abiotic KECs	Agriculture, Pastures, and Mixed Environs			Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands			Eastside (Interior) Mixed Conifer Forest			Eastside (Interior) Riparian-Wetlands		
3.1) rocks	6	36	0.17	1	15	0.07	7	31	0.23	4	35	0.11	8	36	0.22
3.1.1) gravel	1	14	0.07	0	5		1	12	0.08	0	13		1	11	0.09
3.1.2) talus	5	20	**0.25**	1	12	0.08	6	18	**0.33**	4	21	**0.19**	7	23	**0.30**
3.1.3) talus-like habitats	4	20	**0.20**	0	9		5	18	**0.28**	3	20	0.15	5	22	0.23
3.2) soils	2	30	0.07	0	8		2	15	0.13	1	14	0.07	1	17	0.06
3.2.1) soil depth	1	9	0.11	0	5		1	6	0.17	1	10	0.10	1	9	0.11
3.2.3) soil moisture	1	20	0.05	0	2		1	7	0.14	0	4		0	7	
3.2.5) soil texture	1	13	0.08	0	3		1	7	0.14	1	9	0.11	1	8	0.13
3.3) rock substrates	8	75	0.11	5	40	**0.13**	7	54	0.13	8	56	0.14	12	67	0.18
3.3.1) avalanche chute	1	8	0.13	2	14	**0.14**	0	4		2	13	0.15	3	13	0.23
3.3.2) cliffs	1	19	0.05	1	17	0.06	1	20	0.05	1	21	0.05	2	18	0.11
3.3.3) caves	1	12	0.08	2	12	0.17	2	12	0.17	2	14	0.14	4	16	0.25
3.3.4) rocky outcrops and ridges	6	37	0.16	1	22	0.05	6	34	0.18	4	33	0.12	7	33	0.21
3.3.5) rock crevices	4	27	0.15	2	19	0.11	5	26	0.19	5	30	**0.17**	6	29	0.21
3.3.7) playa (alkaline, saline)	1	29	0.03	0	16		1	20	0.05	0	13		1	19	0.05
3.4) snow	3	30	0.10	2	23	0.09	3	23	0.13	1	23	0.04	2	28	0.07
3.4.1) snow depth	3	25	0.12	2	20	0.10	3	21	0.14	1	20	0.05	2	24	0.08

Table 9b. Non-vegetative, Abiotic KECs continued.

Non-vegetative, Abiotic KECs	Herbaceous Wetlands			Lodgepole Pine Forest and Woodlands			Montane Coniferous Wetlands			Montane Mixed Conifer Forest		
3.1) rocks	2	20	0.10	2	25	0.08	1	18	0.06	1	23	0.04
3.1.1) gravel	1	7	0.14	0	8		0	6		0	9	
3.1.2) talus	1	12	0.08	2	15	0.13	1	10	0.10	1	12	0.08
3.1.3) talus-like habitats	0	13		1	16	0.06	0	11		0	11	
3.2) soils	1	25	0.04	1	9	0.11	0	8		1	10	0.10
3.2.1) soil depth	0	6		1	6	**0.17**	0	6		1	8	0.13
3.2.3) soil moisture	1	18	0.06	0	2		0	2		0	2	
3.2.5) soil texture	0	10		1	6	**0.17**	0	5		1	6	**0.17**
3.3) rock substrates	5	52	0.10	5	41	0.12	5	31	0.16	5	44	0.11
3.3.1) avalanche chute	1	3	**0.33**	1	9	0.11	2	9	**0.22**	2	13	0.15
3.3.2) cliffs	1	15	0.07	1	14	0.07	1	11	0.09	1	18	0.06
3.3.3) caves	2	12	0.17	2	11	0.18	2	11	**0.18**	2	11	0.18
3.3.4) rocky outcrops and ridges	1	22	0.05	2	24	0.08	1	12	0.08	1	22	0.05
3.3.5) rock crevices	2	22	0.09	3	20	0.15	2	16	0.13	2	20	0.10
3.3.7) playa (alkaline, saline)	1	25	0.04	0	12		0	7		0	12	
3.4) snow	2	17	0.12	0	18		1	14	0.07	1	22	0.05
3.4.1) snow depth	2	16	0.13	0	16		1	13	0.08	1	20	0.05

Table 9c. Non-vegetative, Abiotic KECs continued.

Non-vegetative, Abiotic KECs	Open Water - Lakes, Rivers, and Streams			Ponderosa Pine Forest and Woodlands			Shrub-steppe			Subalpine Parkland		
3.1) rocks	0	10		6	36	0.17	7	30	0.23	1	20	0.05
3.1.1) gravel	0	5		1	13	0.08	1	12	0.08	0	7	
3.1.2) talus	0	4		5	22	0.23	6	19	**0.32**	1	14	0.07
3.1.3) talus-like habitats	0	5		5	21	0.24	5	19	**0.26**	0	11	
3.2) soils	1	23	0.04	1	10	0.10	2	12	0.17	0	11	
3.2.1) soil depth	0	2		1	7	0.14	1	4	0.25	0	8	
3.2.3) soil moisture	1	18	0.06	0	2		1	6	0.17	0	4	
3.2.5) soil texture	0	6		1	7	0.14	1	6	0.17	0	6	
3.3) rock substrates	3	38	0.08	10	54	0.19	7	54	0.13	5	45	0.11
3.3.1) avalanche chute	0	0		1	10	0.10	0	5		2	18	0.11
3.3.2) cliffs	0	7		2	19	0.11	1	20	0.05	1	19	0.05
3.3.3) caves	1	4	**0.25**	3	12	**0.25**	2	12	0.17	2	12	0.17
3.3.4) rocky outcrops and ridges	0	9		6	31	0.19	6	35	0.17	1	22	0.05
3.3.5) rock crevices	2	10	0.20	7	28	**0.25**	5	27	0.19	2	21	0.10
3.3.7) playa (alkaline, saline)	1	23	0.04	1	15	0.07	1	22	0.05	0	12	
3.4) snow	0	1		1	20	0.05	3	23	0.13	1	26	0.04
3.4.1) snow depth	0	1		1	18	0.06	3	23	0.13	1	23	0.04

Table 9d. Non-vegetative, Abiotic KECs continued.

Non-vegetative, Abiotic KECs	Upland Aspen Forest	Upland Aspen Forest	Upland Aspen Forest	Urban and Mixed Environs	Urban and Mixed Environs	Urban and Mixed Environs
3.1) rocks	6	27	0.22	4	28	0.14
3.1.1) gravel	0	7		1	10	0.10
3.1.2) talus	6	18	**0.33**	3	16	**0.19**
3.1.3) talus-like habitats	5	19	0.26	3	17	**0.18**
3.2) soils	1	9	0.11	0	8	
3.2.1) soil depth	1	8	0.13	0	4	
3.2.3) soil moisture	0	2		0	2	
3.2.5) soil texture	1	7	0.14	0	5	
3.3) rock substrates	9	42	0.21	7	49	0.14
3.3.1) avalanche chute	2	8	**0.25**	1	6	0.17
3.3.2) cliffs	2	15	0.13	1	16	0.06
3.3.3) caves	3	12	0.25	1	11	0.09
3.3.4) rocky outcrops and ridges	6	24	0.25	4	29	0.14
3.3.5) rock crevices	6	22	**0.27**	4	24	0.17
3.3.7) playa (alkaline, saline)	0	9		1	15	0.07
3.4) snow	0	17		2	23	0.09
3.4.1) snow depth	0	14		2	20	0.10

Table 10a. Anthropogenic-related KECs.

Anthropogenic-related KECs	Agriculture, Pastures, and Mixed Environs			Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands			Eastside (Interior) Mixed Conifer Forest			Eastside (Interior) Riparian-Wetlands		
8.1) campgrounds/picnic areas	2	25	0.08	2	10	0.20	2	8	**0.25**	1	24	0.04	2	27	0.07
8.2) roads	9	63	0.14	3	30	0.10	10	46	0.22	7	57	0.12	11	66	0.17
8.2.4) water diversion structures	1	1	1.00	0	0		1	1	1.00	0	0		1	1	1.00
8.3) buildings	2	27	0.07	2	8	**0.25**	1	15	0.07	1	22	0.05	1	25	0.04
8.5) diseases transmitted by domestic animals	4	14	0.29	2	11	0.18	2	8	0.25	1	9	0.11	2	12	0.17
8.6) harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	7	50	0.14	4	24	0.17	5	35	0.14	5	37	0.14	7	47	0.15
8.7) fences/corrals	2	39	0.05	1	15	0.07	1	29	0.03	0	13		1	21	0.05
8.8) supplemental food	4	62	0.06	2	29	0.07	3	30	0.10	1	40	0.03	4	53	0.08
8.9) refuse (includes landfills)	1	19	0.05	2	6	**0.33**	1	9	0.11	1	9	0.11	1	11	0.09
8.10) supplemental boxes, structures and platforms	1	26	0.04	1	9	0.11	0	10		2	26	0.08	2	29	0.07
8.11) guzzlers and waterholes	4	28	0.14	1	12	0.08	4	25	0.16	0	20		3	24	0.13
8.12) toxic chemical use (indicate only documented affects)	4	54	0.07	3	23	0.13	3	37	0.08	3	32	0.09	4	49	0.08
8.12.1) herbicides/fungicides	1	19	0.05	2	8	0.25	1	14	0.07	1	7	0.14	0	12	
8.12.2) insecticides	2	29	0.07	1	13	0.08	2	24	0.08	0	15		1	23	0.04
8.12.3) pesticides	3	13	**0.23**	1	3	**0.33**	3	11	**0.27**	1	6	0.17	2	9	**0.22**

Table 10a. Anthropogenic-related KECs.

Anthropogenic-related KECs	Agriculture, Pastures, and Mixed Environs			Alpine Grasslands and Shrublands			Eastside (Interior) Grasslands			Eastside (Interior) Mixed Conifer Forest			Eastside (Interior) Riparian-Wetlands		
8.12.4) fertilizers	0	1		0	0		0	1		0	0		0	0	
8.13) hedgerows/windbreaks	3	61	0.05	1	24	0.04	3	35	0.09	0	30		3	49	0.06
8.14) sewage treatment plant	10	53	**0.19**	4	13	**0.31**	5	24	**0.21**	3	13	**0.23**	10	32	**0.31**
8.15) repellents	1	7	0.14	1	1	1.00	1	5	0.20	0	2		0	3	
8.15.2) noise or visual disturbance	1	6	0.17	1	1	1.00	1	4	0.25	0	2		0	3	
8.16) culverts	1	6	0.17	1	2	0.50	0	2		2	3	**0.67**	2	7	**0.29**
8.17) irrigation ditches/canals	4	28	0.14	1	8	0.13	3	22	0.14	1	15	0.07	5	31	0.16
8.18) powerlines/corridors	4	72	0.06	2	32	0.06	3	36	0.08	1	55	0.02	4	70	0.06
8.20) piers	0	2		0	0		0	1		0	0		0	1	
8.22) bulkheads, seawalls, revetment	0	1		0	0		0	0		0	0		0	2	
8.23) jetties, groins, breakwaters	0	11		0	1		0	2		0	0		0	1	
8.24) water diversion structures	2	18	0.11	1	6	0.17	0	10		2	8	0.25	3	16	0.19
8.25) log boom	1	13	0.08	0	1		0	2		0	0		1	4	**0.25**
8.26) boats/ships	1	7	0.14	0	2		0	1		0	1		1	6	0.17
8.28) hatchery facilities and fish	2	17	0.12	1	8	0.13	1	9	0.11	1	10	0.10	4	20	0.20

Table 10b. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Herbaceous Wetlands			Lodgepole Pine Forest and Woodlands			Montane Coniferous Wetlands			Montane Mixed Conifer Forest		
8.1) campgrounds/picnic areas	1	13	0.08	1	18	0.06	1	19	0.05	1	22	0.05
8.2) roads	3	36	0.08	4	45	0.09	2	33	0.06	4	48	0.08
8.2.4) water diversion structures	1	1	1.00	0	0		0	0		0	0	
8.3) buildings	0	14		0	18		1	18	0.06	1	21	0.05
8.5) diseases transmitted by domestic animals	4	9	0.44	1	8	0.13	1	5	0.20	1	8	0.13
8.6) harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	6	40	0.15	3	28	0.11	4	28	0.14	4	34	0.12
8.7) fences/corrals	1	24	0.04	0	11		0	9		0	12	
8.8) supplemental food	3	27	0.11	1	32	0.03	2	26	0.08	1	36	0.03
8.9) refuse (includes landfills)	1	15	0.07	1	8	0.13	1	7	0.14	1	8	0.13
8.10) supplemental boxes, structures and platforms	5	18	**0.28**	2	19	0.11	2	19	0.11	2	23	0.09
8.11) guzzlers and waterholes	2	17	0.12	0	16		0	15		0	18	
8.12) toxic chemical use (indicate only documented affects)	2	33	0.06	0	22		2	18	0.11	2	23	0.09
8.12.1) herbicides/fungicides	1	10	0.10	0	4		1	5	0.20	1	5	0.20
8.12.2) insecticides	1	15	0.07	0	10		0	10		0	11	
8.12.3) pesticides	2	9	0.22	0	4		0	4		0	5	

Table 10b. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Herbaceous Wetlands			Lodgepole Pine Forest and Woodlands			Montane Coniferous Wetlands			Montane Mixed Conifer Forest		
8.12.4) fertilizers	1	1	1.00	0	0		0	0		0	0	
8.13) hedgerows/windbreaks	1	31	0.03	0	24		0	19		0	24	
8.14) sewage treatment plant	19	61	0.31	2	10	**0.20**	4	12	**0.33**	4	13	**0.31**
8.15) repellents	0	3		0	2		0	2		0	2	
8.15.2) noise or visual disturbance	0	3		0	2		0	2		0	2	
8.16) culverts	0	6		1	1	1.00	1	2	0.50	2	2	1.00
8.17) irrigation ditches/canals	4	32	0.13	0	11		1	10	0.10	1	11	0.09
8.18) powerlines/corridors	1	38	0.03	0	43		1	33	0.03	1	43	0.02
8.20) piers	0	1		0	0		0	0		0	0	
8.22) bulkheads, seawalls, revetment	0	1		0	0		0	0		0	0	
8.23) jetties, groins, breakwaters	0	8		0	0		0	0		0	0	
8.24) water diversion structures	2	18	0.11	1	6	0.17	2	7	**0.29**	2	7	**0.29**
8.25) log boom	1	12	0.08	0	0		0	0		0	0	
8.26) boats/ships	6	20	0.30	0	1		0	0		0	1	
8.28) hatchery facilities and fish	7	28	0.25	1	10	0.10	2	8	0.25	2	10	0.20

Table 10c. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Open Water - Lakes, Rivers, and Streams			Ponderosa Pine Forest and Woodlands			Shrub-steppe			Subalpine Parkland		
8.1) campgrounds/picnic areas	0	7		1	22	0.05	2	9	0.22	1	20	0.05
8.2) roads	1	13	0.08	7	53	0.13	10	48	0.21	3	44	0.07
8.2.4) water diversion structures	1	1	1.00	1	1	1.00	1	1	1.00	0	0	
8.3) buildings	0	11		1	22	0.05	1	14	0.07	1	16	0.06
8.5) diseases transmitted by domestic animals	3	4	0.75	1	9	0.11	0	5		1	9	0.11
8.6) harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	2	18	0.11	5	32	0.16	5	33	0.15	3	30	0.10
8.7) fences/corrals	1	1	1.00	0	15		1	24	0.04	0	16	
8.8) supplemental food	1	3	0.33	1	44	0.02	3	31	0.10	1	40	0.03
8.9) refuse (includes landfills)	0	11		0	9		1	10	0.10	1	5	0.20
8.10) supplemental boxes, structures and platforms	5	11	0.45	2	25	0.08	0	12		1	16	0.06
8.11) guzzlers and waterholes	1	9	0.11	2	23	0.09	4	22	0.18	0	14	
8.12) toxic chemical use (indicate only documented affects)	0	13		2	35	0.06	3	39	0.08	2	28	0.07
8.12.1) herbicides/fungicides	0	1		0	8		1	11	0.09	1	10	0.10
8.12.2) insecticides	0	4		0	16		2	23	0.09	0	16	
8.12.3) pesticides	1	4	0.25	1	5	**0.20**	3	11	0.27	0	5	
8.12.4) fertilizers	0	0		0	0		0	1		0	1	
8.13) hedgerows/windbreaks	0	1		1	37	0.03	3	34	0.09	0	31	
8.14) sewage treatment plant	20	62	0.32	4	15	**0.27**	1	16	0.06	2	15	0.13
8.15) repellents	0	0		0	2		1	5	0.20	0	2	

Table 10c. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Open Water - Lakes, Rivers, and Streams			Ponderosa Pine Forest and Woodlands			Shrub-steppe			Subalpine Parkland		
8.15.2) noise or visual disturbance	0	0		0	2		1	4	0.25	0	2	
8.16) culverts	0	1		1	2	**0.50**	0	1		2	3	**0.67**
8.17) irrigation ditches/canals	2	21	0.10	4	18	0.22	3	21	0.14	1	10	0.10
8.18) powerlines/corridors	1	14	0.07	2	60	0.03	3	35	0.09	1	46	0.02
8.20) piers	1	4	0.25	0	0		0	1		0	0	
8.22) bulkheads, seawalls, revetment	1	3	0.33	0	0		0	0		0	0	
8.23) jetties, groins, breakwaters	1	15	0.07	0	0		0	2		0	1	
8.24) water diversion structures	2	16	0.13	1	7	0.14	0	9		2	9	0.22
8.25) log boom	1	17	0.06	0	0		0	2		0	1	
8.26) boats/ships	5	17	0.29	0	1		0	2		0	1	
8.28) hatchery facilities and fish	5	31	0.16	1	10	0.10	1	11	0.09	1	8	0.13

Table 10d. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Upland Aspen Forest	Upland Aspen Forest	Upland Aspen Forest	Urban and Mixed Environs	Urban and Mixed Environs	Urban and Mixed Environs
8) Anthropogenic-related KECs	11	104	0.11	9	144	0.06
8.1) campgrounds/picnic areas	2	18	0.11	1	28	0.04
8.2) roads	7	45	0.16	5	55	0.09
8.2.4) water diversion structures	0	0		1	1	1.00
8.3) buildings	0	18		2	27	0.07
8.5) diseases transmitted by domestic animals	1	6	0.17	1	10	0.10
8.6) harvest/persecution (of animals) (includes legal and illegal harvest, and incidental take)	5	30	0.17	4	34	0.12
8.7) fences/corrals	0	10		2	25	0.08
8.8) supplemental food	1	27	0.04	2	60	0.03
8.9) refuse (includes landfills)	1	7	0.14	1	19	0.05
8.10) supplemental boxes, structures and platforms	2	18	0.11	0	25	
8.11) guzzlers and waterholes	0	15		3	23	0.13
8.12) toxic chemical use (indicate only documented affects)	2	22	0.09	3	40	0.08
8.12.1) herbicides/fungicides	0	7		1	11	0.09
8.12.2) insecticides	0	8		1	22	0.05

Table 10d. Anthropogenic-related KECs continued.

Anthropogenic-related KECs	Upland Aspen Forest	Upland Aspen Forest	Upland Aspen Forest	Urban and Mixed Environs	Urban and Mixed Environs	Urban and Mixed Environs
8.12.3) pesticides	1	5	**0.20**	2	7	**0.29**
8.12.4) fertilizers	0	0		0	0	
8.13) hedgerows/windbreaks	1	25	0.04	2	50	0.04
8.14) sewage treatment plant	3	14	0.21	3	24	0.13
8.15) repellents	0	2		1	6	0.17
8.15.2) noise or visual disturbance	0	2		1	5	0.20
8.16) culverts	0	1		1	5	0.20
8.17) irrigation ditches/canals	1	12	0.08	4	24	0.17
8.18) powerlines/corridors	2	48	0.04	2	57	0.04
8.20) piers	0	0		0	1	
8.22) bulkheads, seawalls, revetment	0	0		0	1	
8.23) jetties, groins, breakwaters	0	0		0	8	
8.24) water diversion structures	0	6		1	14	0.07
8.25) log boom	0	0		1	8	0.13
8.26) boats/ships	0	0		0	3	
8.28) hatchery facilities and fish	1	7	0.14	2	19	0.11