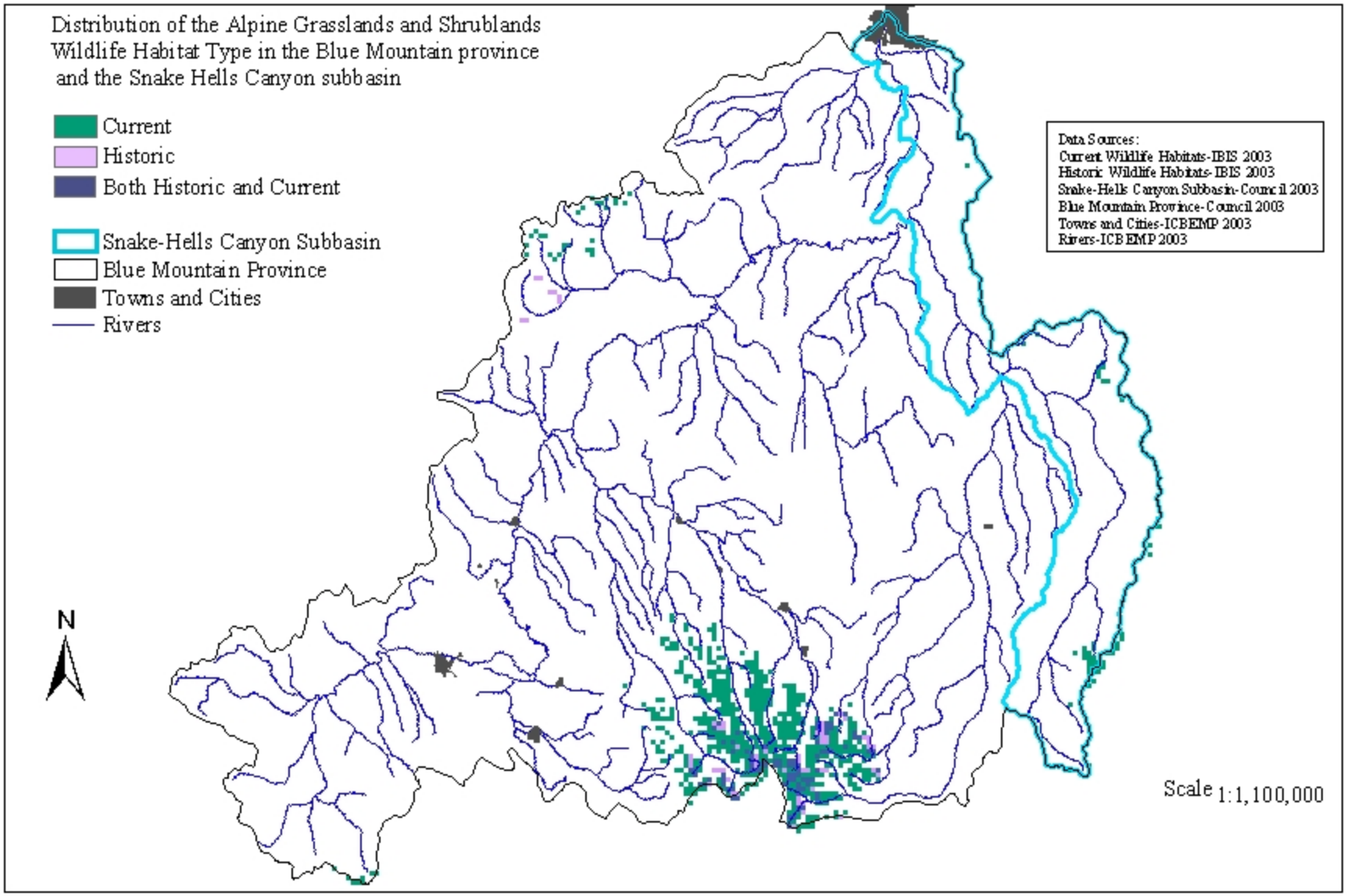
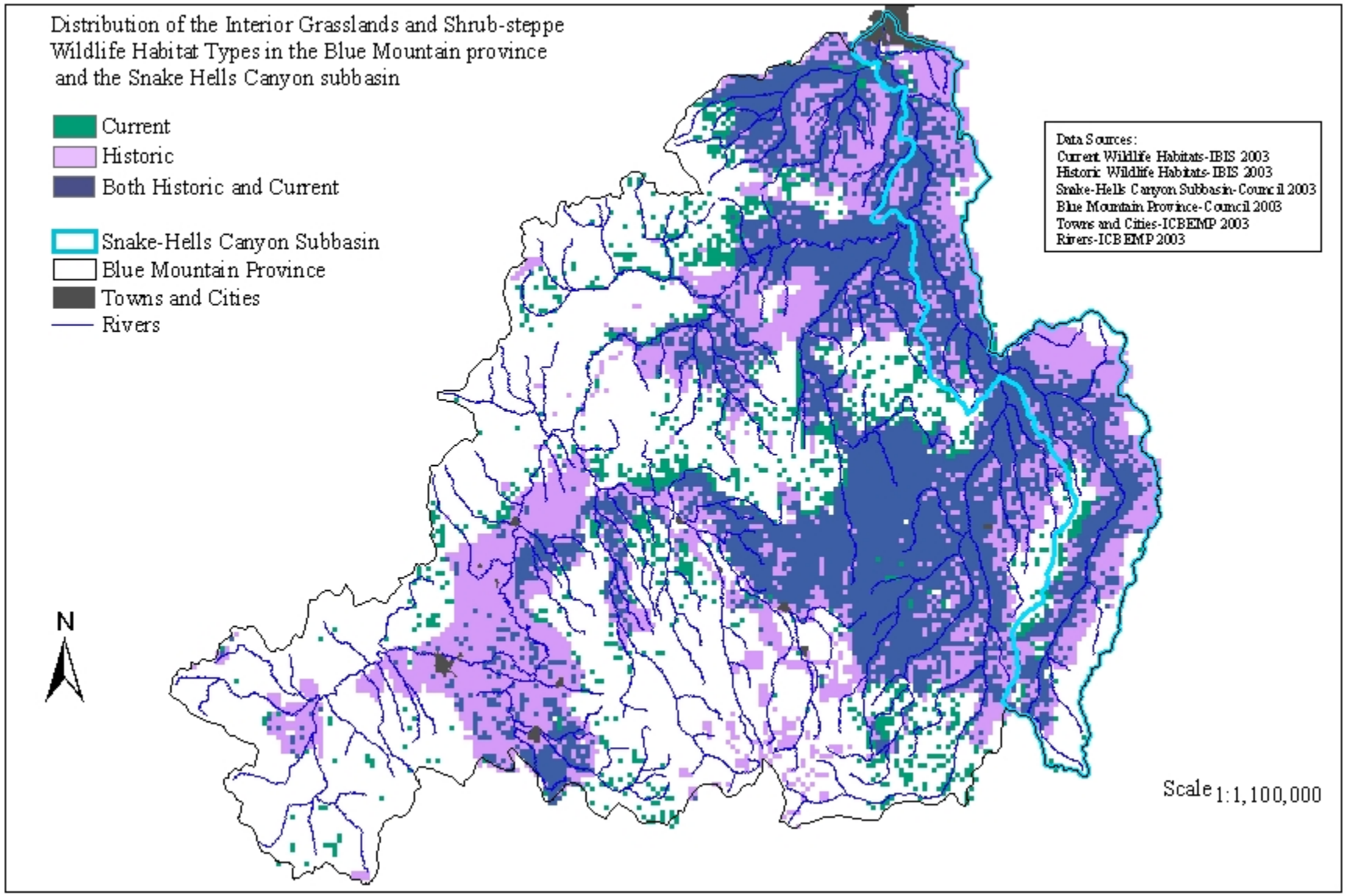
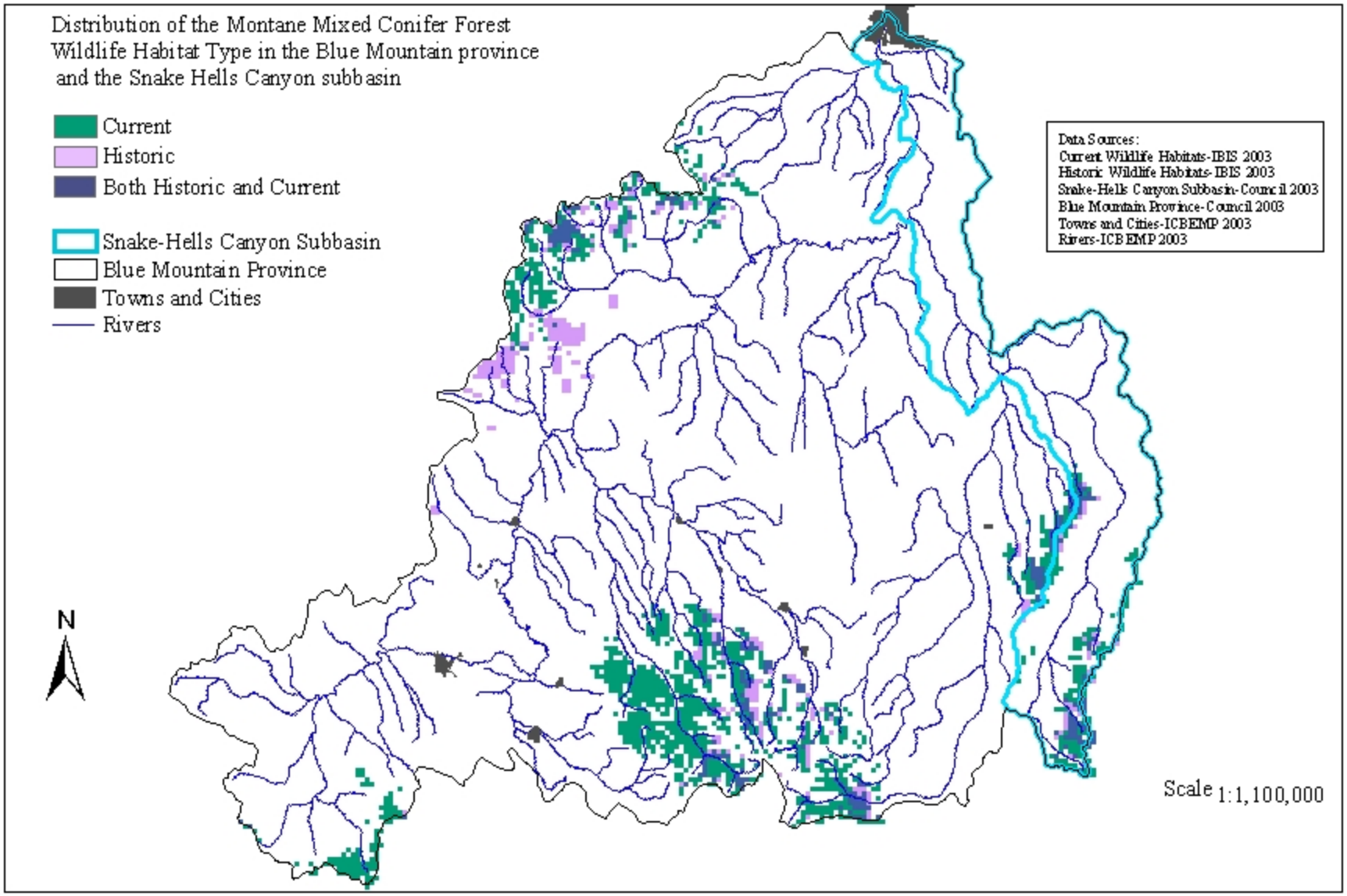
# 6 Appendices

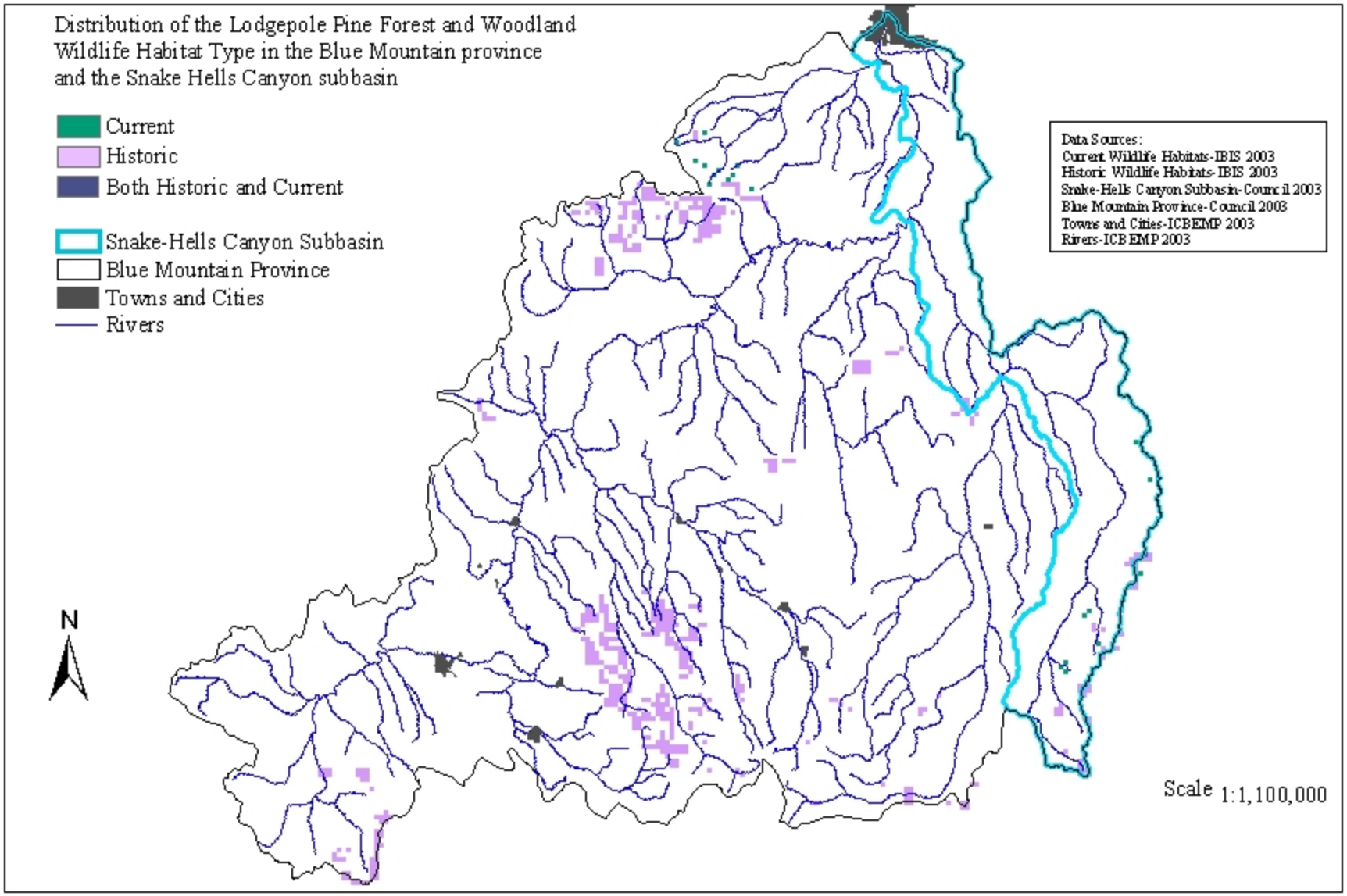
***Appendix A***

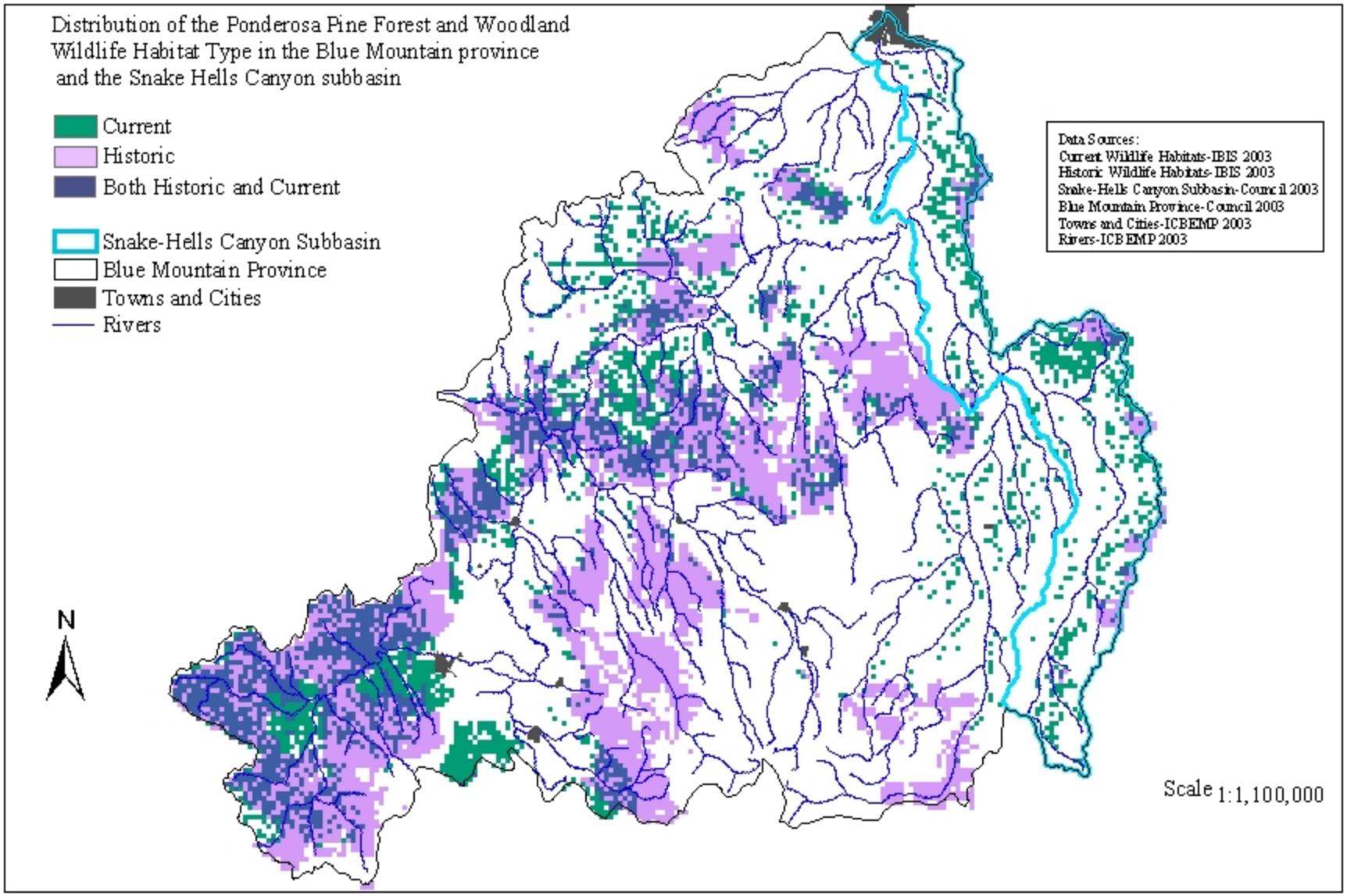
DISTRIBUTION OF CURRENT AND HISTORIC WILDLIFE HABITAT TYPES IN THE SNAKE HELLS CANYON SUBBASIN AND BLUE MOUNTAIN PROVINCE (note some Widlife Habitat Type distributions were not visible at the province scale and so were not displayed)


Distribution of the Alpine Grasslands and Shrublands Wildlife Habitat Type in the Blue Mountain province and the Snake Hells Canyon subbasin
Current
Historic
Both Historic and Current
Snake-Hells Canyon Subbasin
Blue Mountain Province
Towns and Cities
Rivers
Data Sources:
Current Wildlife Habitats-IBIS 2003
Historic Wildlife Habitats-IBIS 2003
Snake-Hells Canyon Subbasin-Council 2003
Blue Mountain Province-Council 2003
Towns and Cities-ICBEMP 2003
Rivers-ICBEMP 2003
N
Scale 1:1,100,000


Distribution of the Interior Grasslands and Shrub-steppe Wildlife Habitat Types in the Blue Mountain province and the Snake Hells Canyon subbasin
Current
Historic
Both Historic and Current
Snake-Hells Canyon Subbasin
Blue Mountain Province
Towns and Cities
Rivers
Data Sources:
Current Wildlife Habitats-IBIS 2003
Historic Wildlife Habitats-IBIS 2003
Snake-Hells Canyon Subbasin-Council 2003
Blue Mountain Province-Council 2003
Towns and Cities-ICBEMP 2003
Rivers-ICBEMP 2003
N
Scale 1:1,100,000


Distribution of the Montane Mixed Conifer Forest
Wildlife Habitat Type in the Blue Mountain province
and the Snake Hells Canyon subbasin
Current
Historic
Both Historic and Current
Snake-Hells Canyon Subbasin
Blue Mountain Province
Towns and Cities
Rivers
Data Sources:
Current Wildlife Habitats-IBIS 2003
Historic Wildlife Habitats-IBIS 2003
Snake-Hells Canyon Subbasin-Council 2003
Blue Mountain Province-Council 2003
Towns and Cities-ICBEMP 2003
Rivers-ICBEMP 2003
N
Scale 1:1,100,000


Distribution of the Lodgepole Pine Forest and Woodland Wildlife Habitat Type in the Blue Mountain province and the Snake Hells Canyon subbasin
Current
Historic
Both Historic and Current
Snake-Hells Canyon Subbasin
Blue Mountain Province
Towns and Cities
Rivers
Data Sources:
Current Wildlife Habitats-IBIS 2003
Historic Wildlife Habitats-IBIS 2003
Snake-Hells Canyon Subbasin-Council 2003
Blue Mountain Province-Council 2003
Towns and Cities-ICBEMP 2003
Rivers-ICBEMP 2003
N
Scale 1:1,100,000


Distribution of the Ponderosa Pine Forest and Woodland
Wildlife Habitat Type in the Blue Mountain province
and the Snake Hells Canyon subbasin
Current
Historic
Both Historic and Current
Snake-Hells Canyon Subbasin
Blue Mountain Province
Towns and Cities
Rivers
Data Sources:
Current Wildlife Habitats-IBIS 2003
Historic Wildlife Habitats-IBIS 2003
Snake-Hells Canyon Subbasin-Council 2003
Blue Mountain Province-Council 2003
Towns and Cities-ICBEMP 2003
Rivers-ICBEMP 2003
N
Scale 1:1,100,000

## *Appendix B*

SPECIES THAT CONTRIBUTED TO THE SELECTION OF PORTIONS OF THE SNAKE HELLS CANYON SUBBASIN IN THE CONSERVATION PORTFOLIO FOR THE MIDDLE ROCKIES-BLUE MOUNTAIN ECOREGION (TNC 2003).

| Common Name | Scientific Name |
|---|---|
| **Fish and Wildlife Species** | |
| Northern goshawk | *Accipiter gentilis* |
| White sturgeon | *Acipenser transmontanus* |
| Grey wolf | *Canis lupus* |
| Townsend's western big-eared bat | *Corynorhinus townsendii townsendii* |
| Bobolink | *Dolichonyx oryzivorus* |
| American peregrine falcon | *Falco peregrinus anatum* |
| Shortface lanx | *Fisherola nuttalli* |
| Columbia pebblesnail | *Flumunicola fuscus* |
| California wolverine | *Gulo gulo luscus* |
| Bald eagle | *Haliaeetus_leucocephalus* |
| Lynx | *Lynx canadensis* |
| Fisher | *Martes pennanti* |
| Westslope cutthroat trout | *Oncorhynchus clarki lewisi* |
| Redband trout | *Oncorhynchus mykiss gairdneri* |
| Steelhead | *Oncorhynchus mykis mykiss* |
| Chinook | *Oncorhynchus tshawytscha* |
| Mountain quail | *Oreortyx pictus* |
| Costate mountainsnail | *Oreohelix idahoensis idahoensis* |
| Boulder Pile mountainsnail | *Oreohelix jugalis* |
| Striate mountainsnail | *Oreohelix strigosa goniogyra* |
| Flammulated owl | *Otus flammeolus* |
| Black-backed woodpecker | *Picoides arcticus* |
| Three-toed woodpecker | *Picoides tridactylus* |
| Bull trout | *Salvelinus confluentus* |
| Pygmy nuthatch | *Sitta pygmaea* |
| Northern Idaho ground squirrel | *Spermophilus brunneus brunneus* |
| **Plants** | |
| Seven Devil's onion | *Allium tolmiei* var. *persimile* |
| Hells Canyon (eared) rockcress | *Arabis hastatula* |
| Green-band mariposa lily | *Calochortus macrocarpus* var.*maculosus* |
| Broad-fruit mariposa lily | *Calochortus_nitidus* |
| Idaho hawksbeard | *Crepis bakeri* ssp. *idahoensis* |
| Davis' fleabane | *Erigeron engelmannii* var. *davisii* |
| Cliff buckwheat | *Eriogonum scopulorum* |

| Common Name | Scientific Name |
|---|---|
| Palouse goldenweed | *Haplopappus liatriformis* |
| Hazel's prickly phlox | *Leptodactylon pungens* ssp. *hazeliae* |
| Membrane-leaved (thinsepal) monkeyflower | *Mimulus hymenophyllus* |
| Stalk-leaved monkeyflower | *Mimulus patulus* |
| MacFarlane's four o'clock | *Mirabilis macfarlanei* |
| Least (small) phacelia | *Phacelia minutissima* |
| Barton's raspberry | *Rubus bartonianus* |
| Spalding's catchfly | *Silene spaldingii* |
| Sand dropseed | *Sporobolus cryptandrus* |
| **Plant Associations and Habitats** | |
| Grand fir | *Abies grandis* |
| Subalpine fir/Whitebark pine | *Abis lasiocarpa/ Pinus albicaulis* |
| Netleaf hackberry/ Bluebunch wheatgrass | *Celtis reticulata/Pseudoroegneria spicata* |
| Curlleaf Mountain Mahogany | *Cerocarpus ledifloius* |
| Onespike Oatgrass/ Sandberg bluegrass | *Danthonia_unispicata-Poa_secunda* |
| Wildbuck wheat/Bluebunch wheatgrass | *Eriogonum heracleoides /Pseudoregneria spicata* |
| Western larch | *Larix occidentalis* |
| Lodgepole pine | *Pinus contorta* |
| Ponderosa pine/ Pinegrass | *Pinus ponderosa/ Calamagrostis rubescens* |
| Quaking aspen, black hawthorn | *Populus tremuloides/Crataegus douglasii* |
| Douglas-fir | *Pseudotsuga menziesii* |
| Douglas-fir/grand fir | *Pseudotsuga menziesii/Abies grandis* |
| Douglas-fir/lodgepole pine | *Pseudotsuga menziesii/Pinus contorta* |
| Western red cedar | *Thuja plicata* |
| Alpine | various |
| Badlands/Breaks | various |
| Big Sagebrush Steppe | various |
| Bitterbrush | various |
| Canyon Grasslands | various |
| Low Sagebrush Steppe | various |
| Mesic Upland Shrubs | various |
| Mixed Mesic Forest | various |
| Mixed Sagebrush Steppe | various |
| Native Grass or Forb | various |
| Ponderosa Pine Forest and Woodland | various |
| Subalpine Fir | various |
| Subalpine Meadow | various |

## *Appendix C*
FISH AND WILDLIFE SPECIES OF THE SNAKE HELLS CANYON SUBBASIN.

Table 50. Fish species currently inhabiting the Snake Hells Canyon subbasin.

| | Origin[1] | Location[2] | Status[3] | Comments |
|---|---|---|---|---|
| Bull trout (*Salvelinus confluentus*) | N | R, T | ESA T | |
| Spring/summer chinook salmon (*Oncorhynchus tshawytscha*) | N | R, T | ESA T | |
| Fall chinook salmon (*O. tshawytscha*) | N | R | ESA T | |
| Summer steelhead (*O. mykiss*) | N | R, T | ESA T | |
| Sockeye salmon (*O. nerka*) | N | R | ESA-E | Migration corridor only |
| Redband trout (*O. mykiss*) | N | R, T | U/C | True redbands are U; generic RBT are C |
| Westslope cutthroat trout (*O. clarki lewisii*) | N | R,T | C | |
| White sturgeon (*Acipenser transmontanus*) | N | R | C | |
| Mountain whitefish (*Prosopium williamsoni*) | N | R, T | C | |
| Pacific lamprey (*Lampetra tridentata*) | N | R, T | ID–E | Idaho–endangered |
| Peamouth (*Mylocheilus caurinus*) | N | R, T | I | |
| Northern pikeminnow (*Ptychocheilus oregonensis*) | N | R, T | C | |
| Bridgelip sucker (*Catostomus columbianus*) | N | R, T | C | |
| Largescale sucker (*Catostomus macrocheilus*) | N | R, T | C | |
| Chiselmouth (*Acrocheilus alutaceus*) | N | R, T | C | |
| Longnose dace (*Rhinichthys cataractae*) | N | R, T | R/I | |
| Speckled dace (*Rhinichthys osculus*) | N | R, T | A | |
| Leopard dace (*Rhinichthys falcatus*) | N | R, T | I | |
| Redside shiner (*Richardsonius balteatus*) | N | R, T | C | |
| Torrent sculpin (*Cottus rhotheus*) | N | R, T | R | |
| Paiute sculpin (*Cottus beldingi*) | N | R, T | C | |
| Shorthead sculpin (*Cottus confusus*) | N | R, T | C | |
| Mottled sculpin (*Cottus bairdi*) | N | R, T | C | |
| Common carp (*Cyprinus carpio*) | E | R, T | R/I | |
| Bullhead, brown (*Ictalurus nebulosus*) | E | R, T | R/I | |
| Channel catfish (*Ictalurus natalis*) | E | R, T | R/I | |
| Smallmouth bass (*Micropterus dolomieu*) | E | R, T | U/I | |
| Largemouth bass (*Micropterus salmoides*) | E | R, T | I | |
| White crappie (*Pomoxis annularis*) | E | R, T | I | |
| American shad (*Alosa sapidissima*) | E | R, T | | |

[1] Origin: N=Native stock, E=exotic

[2] Location: R=mainstem rivers, T=tributaries

[3] Fish species abundance based on average number of fish per $100m^2$: A=abundant, R=rare, U=uncommon, C=common, and I=insufficient data; ESA T=listed threatened under Endangered Species Act; ESA E=listed endangered under Endangered Species Act

Table 51. Wildlife species of the Snake Hells Canyon subbasin (IBIS 2003).

| Amphibians and Reptiles | |
|---|---|
| Long-toed salamander | *Ambystoma macrodactylum* |
| Tiger salamander | *Ambystoma tigrinum* |
| Tailed frog | *Ascaphus truei* |
| Western toad | *Bufo boreas* |
| Rubber boa | *Charina bottae* |
| Painted turtle | *Chrisemys picta* |
| Racer | *Coluber constrictor* |
| Western rattlesnake | *Crotalus viridis* |
| Ringneck snake | *Diadophis punctatus* |
| Idaho giant salamander | *Dicamptodon aterrimus* |
| Northern alligator lizard | *Elgaria coerulea* |
| Western skink | *Eumeces skiltonianus* |
| Night snake | *Hypsiglena torquata* |
| Short-horned lizard | *Phrynosoma douglassi* |
| Gopher snake | *Pituophis catenifer* |
| Pacific tree frog | *Pseudacti regilla* |
| Bullfrog | *Rana catesbeiana* |
| Northern leopard frog | *Rana pipiens* |
| Spotted frog | *Rana pretiosa* |
| Sagebrush lizard | *Sceloporus graciosus* |
| Western fence lizard | *Sceloporus occidentalis* |
| Great Basin spadefoot toad | *Spea intermontana* |
| Western terrestrial garter snake | *Thamnophis elegans* |
| Common garter snake | *Thamnophis sirtalis* |
| **Birds** | |
| Cooper's hawk | *Accipiter cooperii* |
| Northern goshawk | *Accipiter gentilis* |
| Sharp-shinned hawk | *Accipiter striatus* |
| Northern saw-whet owl | *Aegolius acadicus* |
| White-throated swift | *Aeronautes saxatilis* |
| Chukar | *Akctoris chukar* |
| Grasshopper sparrow | *Ammodramus savannarum* |
| American wigeon | *Anas americana* |
| Green-winged teal | *Anas crecca* |
| Mallard | *Anus platyrhynchos* |
| Golden eagle | *Aquila chrysaetos* |
| Great blue heron | *Ardea herodias* |
| Short-eared owl | *Asio flammeus* |

| | |
|---|---|
| Long-eared owl | *Asio otus* |
| Ruffed grouse | *Bonasa umbellus* |
| Canada goose | *Branta canadensis* |
| Bufflehead | *Bucephala albeola* |
| Common goldeneye | *Bucephala clangula* |
| Red-tailed hawk | *Buteo jamaicensis* |
| Rough-legged hawk | *Buteo lagopus* |
| Ferruginous hawk | *Buteo regalis* |
| Swainson's hawk | *Buteo swainsoni* |
| Pine siskin | *Cardeuelis pinus* |
| American goldfinch | *Cardeuelis tristis* |
| Common redpoll | *Carduelis flammea* |
| Cassin's finch | *Carpodacus cassinii* |
| House finch | *Carpodacus mexicanus* |
| Purple finch | *Carpodacus pupureus* |
| Brown creeper | *Certhia americana* |
| Vaux'sSwift | *Chaetura vauxi* |
| Lark sparrow | *Chondestes grammacus* |
| Common nighthawk | *Chordeiles minor* |
| Northern harrier | *Circus cyaneus* |
| Northern flicker | *Colaptes auratus* |
| Olive-sided flycatcher | *Contopus borealis* |
| Western wood-pewee | *Contopus sordidulus* |
| American crow | *Corvus brachyrhnchos* |
| Common raven | *Corvus corax* |
| Blue jay | *Cyanocita cristata* |
| Blue grouse | *Dendrogapus obscurus* |
| Bobolink | *Dolichonyx oryzivorus* |
| Pileated woodpecker | *Dryocopus pileatus* |
| Hammond's flycatcher | *Empidonax hammondii* |
| Dusky flycatcher | *Empidonax oberholseri* |
| Cordilleran flycatcher | *Empidonax occidentalis* |
| Willow flycatcher | *Empidonax traillii* |
| Homed lark | *Eremophilia alpestris* |
| Brewer's blackbird | *Euphagus cyanocephalus* |
| Merlin | *Falco columbus* |
| Prairie falcon | *Falco mexicanus* |
| American kestrel | *Falco sparverius* |
| Common snipe | *Gallinago gallinago* |
| Northern pygmy-owl | *Glaucidium gnoma* |
| Bald eagle | *Haliaeetus leucocephalus* |

| | |
|---|---|
| Barn swallow | *Hirundo rustica* |
| Yellow-breasted chat | *Icteria virens* |
| Northern oriole | *Icterus galbula* |
| Dark-eyed Junco | *Junco hyemalis* |
| Ring-billed gull | *Larus delawarensis* |
| Rosy finch | *Leucosticte arctoa* |
| Red crossbill | *Loxia curvirostra* |
| White-winged crossbill | *Loxia leucoptera* |
| Wild turkey | *Meleagris gallopavo* |
| Lincoln's sparrow | *Melospiza lincolnii* |
| Song sparrow | *Melospiza melodia* |
| Common merganser | *Mergus merganser* |
| Brown-headed cowbird | *Molothrus ater* |
| Clark's nutcracker | *Nucifraga columbiana* |
| Mountain quail | *Oreortyx pictus* |
| Osprey | *Pandion haliaetus* |
| Black-capped chickadee | *Parus atricaphillus* |
| Mountain chickadee | *Parus gambeli* |
| Chestnut-backed chickadee | *Parus rufescens* |
| Savannah sparrow | *Passerculus sandwichensis* |
| Fox sparrow | *Passerella iliaca* |
| Lazuli bunting | *Passerina amoena* |
| Gray jay | *Perisoeus canadensis* |
| Common poorwill | *Phalenoptilus nuttallii* |
| Ring-necked pheasant | *Phasianus colchicus* |
| Black-headed grosbeak | *Pheuticus melanocephalus* |
| Black-billed magpie | *Pica pica* |
| White-headed woodpecker | *Picoides albolarvatus* |
| Black-backed woodpecker | *Picoides arcticus* |
| Pine grosbeak | *Pinicola enucleator* |
| Rufous-sided towhee | *Pipilo erythrophthalmus* |
| Western tanager | *Piranga ludoviciana* |
| Snow bunting | *Plectrophenax nivalis* |
| Vesper sparrow | *Pooecetes gramineus* |
| Bank swallow | *Riparia riparia* |
| Rock wren | *Salpinctes obsoletus* |
| Say's pheobe | *Sayornis saya* |
| Red-breasted nuthatch | *Sitta canadensis* |
| White-breasted nuthatch | *Sitta carolinensis* |
| Pygmy nuthatch | *Sitta pygmue* |
| Burrowing owl | *Speotyto canicularia* |

| | |
|---|---|
| American tree sparrow | *Spizella arborea* |
| Brewer's sparrow | *Spizella breweri* |
| Chipping sparrow | *Spizella passerina* |
| Northern rough-winged swallow | *Stelgidopteryx serripennis* |
| Great gray owl | *Strix nebulosa* |
| Bard owl | *Strix varia* |
| Western meadowlark | *Stumella neglecta* |
| Tree swallow | *Tachycineta bicolor* |
| Violet-green swallow | *Tachycineta thalassina* |
| Greater yellowlegs | *Totanus melanoleucus* |
| Barn owl | *Tyto alba* |
| Yellow-headed blackbird | *Xanthocephalus xanthocephalus* |
| Mourning dove | *Zenaida macmum* |
| White-crowned sparrow | *Zonotrichia leucophrys* |
| Harris' sparrow | *Zonotrichia querula* |
| Spotted sandpiper | *Actitus macularia* |
| Red-winged blackbird | *Agelaius phoeniceus* |
| Northern pintail | *Anas acuta* |
| American pipit | *Anthus spincletta* |
| Black-chinned hummingbird | *Archilochus alexandri* |
| Cedar waxwing | *Bombycilla cedorum* |
| Bohemian waxwing | *Bombycilla garrulus* |
| Great-homed owl | *Bubo virginianus* |
| Lapland longspur | *Calcarius lapponicus* |
| California quail | *Callipepla californica* |
| Turkey vulture | *Cathartes aura* |
| Veery | *Catharus fuscescens* |
| Hermit thrush | *Catharus guttatus* |
| Swainson's thrush | *Catharus ustulatus* |
| Canyon wren | *Catherpes mexicanus* |
| Belted kingfisher | *Ceryle alcyon* |
| Killdeer | *Charadrius vociferus* |
| American dipper | *Cinclus mexicana* |
| Evening grosbeak | *Coccothrastes vespertinus* |
| Yellow-billed cuckoo | *Coccyzus americanus* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Rock dove | *Columba livia* |
| Steller's jay | *Cyanocita stelleri* |
| Black swift | *Cypseloides niger* |
| Yellow-rumped warbler | *Dendroica coronata* |
| Yellow warbler | *Dendroica petechia* |

| | |
|---|---|
| Townsend's warbler | *Dendroica townsendi* |
| Gray catbird | *Dumetella carolinenis* |
| Peregrine falcon | *Falco peregrinus* |
| Common yellowthroat | *Geothylpis trichas* |
| Cliff swallow | *Hirundo pyrrhonota* |
| Varied thrush | *Ixoreus naevius* |
| Northern shrike | *Lanius excubitor* |
| Loggerhead shrike | *Lanius ludovicianus* |
| Herring gull | *Larus argentatus* |
| California gull | *Larus californicus* |
| Lewis' woodpecker | *Melanerpes lewis* |
| Northern mockingbird | *Mimus polyglottos* |
| Townsend's solitaire | *Myadestes townsendi* |
| Macgillivray's warbler | *Oporomis tolmiei* |
| Sage thrasher | *Oreoscoptes montanus* |
| Flammulated owl | *Otus flammeolus* |
| Western screech owl | *Otus kenniwtti* |
| House sparrow | *Passer domesticus* |
| Gray partridge | *Perdix perdix* |
| Downy woodpecker | *Picoides pubescens* |
| Hairy woodpecker | *Picoides villosus* |
| Ruby-crowned ringlet | *Regulus calendula* |
| Golden-crowned ringlet | *Regulus satrapa* |
| Broad-tailed hummingbird | *Selasophomus platycercus* |
| Rufous hummingbird | *Selasphorus rufus* |
| American redstart | *Setophaga ruticilla* |
| Mountain bluebird | *Sialia currucoides* |
| Western bluebird | *Sialia mexicana* |
| Williamson's sapsucker | *Sphyrapicus thyroideus* |
| Calliope hummingbird | *Stellula calliope* |
| European starling | *Sturnus vulgaris* |
| Red-naped sapsucker | *Syhympicus nuchalis* |
| House wren | *Troglodytes aedon* |
| Winter wren | *Troglodytes troglodytes* |
| American robin | *Turdus migratorius* |
| Eastern kingbird | *Tyrannus tyrannus* |
| Western kingbird | *Tyrannus verticalis* |
| Nashville warbler | *Venniwra ruficapilla* |
| Orange-crowned warbler | *Vermivora celata* |
| Warbling vireo | *Vireo gilvus* |
| Red-eyed vireo | *Vireo olivaceus* |

| | |
|---|---|
| Solitary vireo | *Vireo solitatius* |
| Wilson's warbler | *Wilsonia pusilla* |
| | **Mammals** |
| Moose | *Alces alces* |
| Pallid bat | *Antrowus pallidus* |
| Coyote | *Canis latrans* |
| Beaver | *Castor canadensis* |
| Rocky Mountain elk | *Cervus elaphus* |
| Southern red-backed vole | *Clethrionomys gapperi* |
| Big brown bat | *Eptesicu fuscus* |
| Porcupine | *Erethizon dorsatum* |
| Spotted bat | *Euderma maculata* |
| Yellow-pine chipmunk | *Eutamias anwenus* |
| Red-tailed chipmunk | *Eutamius ruficaudus* |
| Mountain lion | *Felis concolor* |
| Lynx | *Felis lynx* |
| Bobcat | *Felis rufus* |
| Northern flying squirrel | *Glaucomys sabrinus* |
| Little brown myotis | *Iuyotis lucifugus* |
| Silver-haired bat | *Lasionycteris noctivagans* |
| Hoary bat | *Lasiurus cinereus* |
| Snowshoe hare | *Lepus americanus* |
| White-tailed jackrabbit | *Lepus townsendii* |
| River otter | *Lutra canadensis* |
| Yellow-bellied marmot | *Marmota flaviventris* |
| Marten | *Martes americana* |
| Striped skunk | *Mephitis mephitis* |
| Pygmy shrew | *Microsorex hoyi* |
| Long-tailed vole | *Microtus longicaudus* |
| Montane vole | *Microtus montanus* |
| House mouse | *Mus musculus* |
| Ermine | *Mustela erminea* |
| Long-tailed weasel | *Mustela frenata* |
| Mink | *Mustela vision* |
| California myotis | *Myotis californicus* |
| Small-footed myotis | *Myotis ciliolabrum* |
| Long-eared myotis | *Myotis evotis* |
| Fringed myotis | *Myotis thysanodes* |
| Long-legged myotis | *Myotis volans* |
| Yuma myotis | *Myotis yumanensis* |
| Bushy-tailed woodrat | *Neotoma cinerea* |

| | |
|---|---|
| Mule deer | *Odocoileus hemionus* |
| White-tailed deer | *Odocoileus virginianus* |
| Muskrat | *Ondatra zibethicus* |
| Bighorn sheep | *Ovis canadensis* |
| Great basin pocket mouse | *Perognathus parvus* |
| Deer mouse | *Peromyscur maniculatus* |
| Western pipistrelle | *Pipstrellus hesperus* |
| Townsend's western big-eared bat | *Corynorhinus townsendii townsendii* |
| Raccoon | *Procyon lotor* |
| Western harvest mouse | *Reithrodontomys megalotis* |
| Coast mole | *Sapanus orarius* |
| Masked shrew | *Sorex cinereus* |
| Dusky shrew | *Sorex monticolus* |
| Water shrew | *Sorex palustris* |
| Preble's shrew | *Sorex preblii* |
| Vagrant shrew | *Sorex vagrans* |
| Merriam's shrew | *Sortx merriami* |
| Columbian ground squirrel | *Spermophilus columbianus* |
| Golden-mantled ground squirrel | *Spermophilus lateralis* |
| Spotted sunk | *Spilogale gracilis* |
| Mountain cottontail | *Sylvilagus nuttallii* |
| Red squirrel | *Tamiasciurus hudsonicus* |
| Badger | *Taxidea taxus* |
| Northern pocket gopher | *Thomomys talpoides* |
| Black bear | *Ursus americanus* |
| Red fox | *Vulpes vulpes* |
| Western jumping mouse | *Zapus princeps* |

## *Appendix D*

CRITICAL FUNCTIONAL LINK SPECIES OF THE BLUE-MOUNTAIN PROVINCE AND THEIR FUNCTIONS (IBIS 2003).

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 1_1_1_13 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Bark/cambium/bole feeder** | American Beaver | *Castor canadensis* | Open Water—Lakes, Rivers, and Streams |
| 1_1_1_13 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Bark/cambium/bole feeder** | Black Bear | *Ursus americanus* | Alpine Grasslands and Shrublands<br>Westside Grasslands<br>Interior Grasslands |
| 1_1_1_3 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Browser (leaf, stem eater)** | Wild Turkey | *Meleagris gallopavo* | Westside Grasslands |
| 1_1_1_3 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Browser (leaf, stem eater)** | White-tailed Deer (eastside) | *Odocoileus virginianus ochrourus* | Agriculture, Pastures, and Mixed Environs |
| 1_1_1_6 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Sap feeder** | House Finch | *Carpodacus mexicanus* | Agriculture, Pastures, and Mixed Environs<br>Urban and Mixed Environs |
| 1_1_1_7 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Root feeders** | Northern Pocket Gopher | *Thomomys talpoides* | Agriculture, Pastures, and Mixed Environs |
| 1_1_1_7 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Root feeders** | Black Bear | *Ursus americanus* | Westside Grasslands<br>Herbaceous Wetlands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 1_1_1_8 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Nectivore (nectar feeder)** | Black-chinned Hummingbird | *Archilochus alexandri* | Shrub-steppe |
| 1_1_1_8 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Nectivore (nectar feeder)** | Rufous Hummingbird | *Selasphorus rufus* | Westside Grasslands |
| 1_1_1_9 | Trophic relationships:<br>Heterotrophic consumer:<br>Primary consumer (herbivore):<br>**Fungivore (fungus feeder)** | Deer Mouse | *Peromyscus maniculatus* | Urban and Mixed Environs |
| 1_1_2_1_3 | Trophic relationships:<br>Heterotrophic consumer<br>Secondary consumer<br>Invertebrate eater<br>**Freshwater or marine zooplankton** | Long-toed Salamander | *Ambystoma macrodactylum* | Upland Aspen Forest<br>Alpine Grasslands and Shrublands<br>Westside Grasslands<br>Montane Coniferous Wetlands |
| 1_1_2_2_1 | Trophic relationships:<br>Heterotrophic consumer:<br>Secondary consumer:<br>Vertebrate eater:<br>**Piscivorous (fish eater)** | Raccoon | *Procyon lotor* | Urban and Mixed Environs |
| 1_1_5 | Trophic relationships:<br>Heterotrophic consumer:<br>**Cannibalistic** | Black Bear | *Ursus americanus* | Mesic Lowlands Conifer-Hardwood Forest<br>Upland Aspen Forest<br>Alpine Grasslands and Shrublands<br>Westside Grasslands |
| 1_1_6 | Trophic relationships:<br>Heterotrophic consumer:<br>**Coprophagous (feeds on fecal material)** | American Pika | *Ochotona princeps* | Alpine Grasslands and Shrublands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 1_1_6 | Trophic relationships:<br>Heterotrophic consumer:<br>**Coprophagous (feeds on fecal material)** | Snowshoe Hare | *Lepus americanus* | Mesic Lowlands Conifer-Hardwood Forest<br>Lodgepole Pine Forest and Woodlands<br>Ponderosa Pine & Interior White Oak Forest and Woodlands<br>Montane Coniferous Wetlands |
| 1_1_7 | Trophic relationships:<br>Heterotrophic consumer:<br>**Feeds on human garbage/refuse** | Mew Gull | *Larus canus* | Open Water—Lakes, Rivers, and Streams |
| 1_1_7_1 | Trophic relationships:<br>Heterotrophic consumer:<br>Feeds on human garbage/refuse:<br>**Aquatic (e.g., offal and bycatch of fishing boats)** | Mew Gull | *Larus canus* | Open Water—Lakes, Rivers, and Streams |
| 3_1 | Organismal relationships:<br>**Controls or depresses insect population peaks** | Big Brown Bat | *Eptesicus fuscus* | Urban and Mixed Environs |
| 3_15 | Organismal relationships:<br>**Pirates food from other species** | American Crow | *Corvus brachyrhynchos* | Agriculture, Pastures, and Mixed Environs<br>Urban and Mixed Environs |
| 3_16 | Organismal relationships:<br>**Interspecific hybridization** | American Crow | *Corvus brachyrhynchos* | Urban and Mixed Environs |
| 3_2 | Organismal relationships:<br>**Controls terrestrial vertebrate populations (through predation or displacement)** | Raccoon | *Procyon lotor* | Urban and Mixed Environs |
| 3_3 | Organismal relationships:<br>**Pollination vector** | Rufous Hummingbird | *Selasphorus rufus* | Alpine Grasslands and Shrublands<br>Westside Grasslands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 3_4_1 | Organismal relationships:<br>Transportation of viable seeds, spores, plants or animals:<br>**Disperses fungi** | Deer Mouse | *Peromyscus maniculatus* | Westside Grasslands<br>Agriculture, Pastures, and Mixed Environs<br>Urban and Mixed Environs |
| 3_4_4 | Organismal relationships:<br>Transportation of viable seeds, spores, plants or animals:<br>**Disperses insects and other invertebrates** | Golden-mantled Ground Squirrel | *Spermophilus lateralis* | Lodgepole Pine Forest and Woodlands<br>Upland Aspen Forest |
| 3_4_6 | Organismal relationships:<br>Transportation of viable seeds, spores, plants or animals:<br>**Disperses vascular plants** | Golden-mantled Ground Squirrel | *Spermophilus lateralis* | Upland Aspen Forest |
| 3_5 | Organismal relationships:<br>**Creates feeding, roosting, denning, or nesting opportunities for other organisms** | Great Blue Heron | *Ardea herodias* | Open Water—Lakes, Rivers, and Streams |
| 3_5_1 | Organismal relationships:<br>Creates feeding, roosting, denning, or nesting opportunities for other organisms:<br>**Creates feeding opportunities (other than direct prey relations)** | Great Blue Heron | *Ardea herodias* | Open Water—Lakes, Rivers, and Streams |
| 3_5_1_1 | Organismal relationships:<br>Creates feeding, roosting, denning, or nesting opportunities for other organisms:<br>Creates feeding opportunities:<br>**Creates sapwells in trees** | Red-breasted Sapsucker | *Sphyrapicus ruber* | Mesic Lowlands Conifer-Hardwood Forest<br>Westside Grasslands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 3_5_2 | Organismal relationships:<br>Creates feeding, roosting, denning, or nesting opportunities for other organisms:<br>**Creates roosting, denning, or nesting opportunities** | Great Blue Heron | *Ardea herodias* | Mesic Lowlands Conifer-Hardwood Forest<br>Westside Grasslands<br>Open Water—Lakes, Rivers, and Streams<br>Herbaceous Wetlands<br>Interior Riparian-Wetlands |
| 3_5_2 | Organismal relationships:<br>Creates feeding, roosting, denning, or nesting opportunities for other organisms:<br>**Creates roosting, denning, or nesting opportunities** | Red Squirrel | *Tamiasciurus hudsonicus* | Montane Mixed Conifer Forest<br>Interior Mixed Conifer Forest<br>Lodgepole Pine Forest and Woodlands<br>Ponderosa Pine & Interior White Oak Forest and Woodlands |
| 3_6_2 | Organismal relationships:<br>Primary creation of structures (possibly used by other organisms):<br>**Ground structures** | Bushy-tailed Woodrat | *Neotoma cinerea* | Upland Aspen Forest<br>Shrub-steppe<br>Agriculture, Pastures, and Mixed Environs<br>Montane Coniferous Wetlands<br>Interior Riparian-Wetlands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 3_6_3 | Organismal relationships:<br>Primary creation of structures (possibly used by other organisms):<br>**Aquatic structures** | American Beaver | *Castor canadensis* | Mesic Lowlands Conifer-Hardwood Forest<br>Montane Mixed Conifer Forest<br>Interior Mixed Conifer Forest<br>Lodgepole Pine Forest and Woodlands<br>Ponderosa Pine & Interior White Oak Forest and Woodlands<br>Upland Aspen Forest<br>Subalpine Parkland<br>Montane Coniferous Wetlands |
| 3_7_1 | Organismal relationships:<br>User of structures created by other species:<br>**Aerial structures** | Black Tern | *Chlidonias niger* | Open Water—Lakes, Rivers, and Streams |
| 3_7_1 | Organismal relationships:<br>User of structures created by other species:<br>**Aerial structures** | Virginia Opossum | *Didelphis virginiana* | Agriculture, Pastures, and Mixed Environs<br>Urban and Mixed Environs |
| 3_7_2 | Organismal relationships:<br>User of structures created by other species:<br>**Ground structures** | Deer Mouse | *Peromyscus maniculatus* | Montane Mixed Conifer Forest<br>Upland Aspen Forest<br>Subalpine Parkland<br>Alpine Grasslands and Shrublands<br>Agriculture, Pastures, and Mixed Environs<br>Urban and Mixed Environs<br>Montane Coniferous Wetlands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 3_7_3 | Organismal relationships:<br>User of structures created by other species:<br>**Aquatic structures** | Fisher | *Martes pennanti* | Subalpine Parkland |
| 3_7_3 | Organismal relationships:<br>User of structures created by other species:<br>**Aquatic structures** | Mink | *Mustela vison* | Lodgepole Pine Forest and Woodlands<br>Upland Aspen Forest<br>Westside Grasslands<br>Interior Grasslands<br>Shrub-steppe |
| 3_8 | Organismal relationships:<br>**Nest parasite** | House Finch | *Carpodacus mexicanus* | Urban and Mixed Environs |
| 3_8_1 | Organismal relationships:<br>Nest parasite:<br>**Interspecies parasite** | Redhead | *Aythya americana* | Open Water—Lakes, Rivers, and Streams |
| 3_8_1 | Organismal relationships:<br>Nest parasite:<br>**Interspecies parasite** | Brown-headed Cowbird | *Molothrus ater* | Mesic Lowlands Conifer-Hardwood Forest<br>Montane Mixed Conifer Forest<br>Interior Mixed Conifer Forest<br>Lodgepole Pine Forest and Woodlands<br>Ponderosa Pine & Interior White Oak Forest and Woodlands<br>Upland Aspen Forest<br>Subalpine Parkland<br>Westside Grasslands<br>Interior Grasslands<br>Shrub-steppe<br>Agriculture, Pastures, and Mixed Environs<br>Montane Coniferous Wetlands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 3_8_2 | Organismal relationships:<br>Nest parasite:<br>**Common interspecific host** | Greater Scaup | *Aythya marila* | Open Water—Lakes, Rivers, and Streams |
| 3_8_2 | Organismal relationships:<br>Nest parasite:<br>**Common interspecific host** | House Finch | *Carpodacus mexicanus* | Urban and Mixed Environs |
| 3_9 | Organismal relationships:<br>**Primary cavity excavator in snags or live trees** | Black Bear | *Ursus americanus* | Interior Grasslands<br>Herbaceous Wetlands |
| 6_1 | Wood structure relationships (either living or dead wood):<br>**Physically fragments down wood** | White-tailed Deer (eastside) | *Odocoileus virginianus ochrourus* | Agriculture, Pastures, and Mixed Environs |
| 6_2 | Wood structure relationships (either living or dead wood):<br>**Physically fragments standing wood** | Black Bear | *Ursus americanus* | Alpine Grasslands and Shrublands<br>Herbaceous Wetlands |
| 7_1 | Water relationships:<br>**Impounds water by creating diversions or dams** | American Beaver | *Castor canadensis* | Mesic Lowlands Conifer-Hardwood Forest<br>Montane Mixed Conifer Forest<br>Interior Mixed Conifer Forest<br>Lodgepole Pine Forest and Woodlands<br>Ponderosa Pine & Interior White Oak Forest and Woodlands<br>Upland Aspen Forest<br>Subalpine Parkland<br>Open Water—Lakes, Rivers, and Streams<br>Herbaceous Wetlands<br>Montane Coniferous Wetlands<br>Interior Riparian-Wetlands |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 7_2 | Water relationships: **Creates ponds or wetlands through wallowing** | American Beaver | *Castor canadensis* | Open Water—Lakes, Rivers, and Streams |
| 7_2 | Water relationships: **Creates ponds or wetlands through wallowing** | Rocky Mountain Elk | *Cervus elaphus nelsoni* | Alpine Grasslands and Shrublands<br>Interior Grasslands<br>Shrub-steppe |
| 8_1 | Vegetation structure and composition relationships: **Creates standing dead trees (snags)** | Black Bear | *Ursus americanus* | Alpine Grasslands and Shrublands<br>Westside Grasslands<br>Interior Grasslands |
| 8_2 | Vegetation structure and composition relationships: **Herbivory on trees or shrubs that may alter vegetation structure and composition (browsers)** | Moose | *Alces alces* | Open Water—Lakes, Rivers, and Streams |
| 8_3 | Vegetation structure and composition relationships: **Herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)** | Canada Goose | *Branta canadensis* | Open Water —Lakes, Rivers, and Streams |
| 8_3 | Vegetation structure and composition relationships: **Herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)** | Montane Vole | *Microtus montanus* | Agriculture, Pastures, and Mixed Environs |

| KEF Code | KEF Description | Species Common Name | Species Scientific Name | Wildlife Habitat Type |
|---|---|---|---|---|
| 8_3 | Vegetation structure and composition relationships: **Herbivory on grasses or forbs that may alter vegetation structure and composition (grazers)** | Rocky Mountain Elk | *Cervus elaphus nelsoni* | Mesic Lowlands Conifer-Hardwood Forest |

## *Appendix E*

DESCRIPTIONS OF FOREST AND GRASSLAND STRUCTURAL CONDITIONS (Johnson and O'Neil 2001).

Table 52. Descriptions of structural conditions in forest habitats

| Structural Condition | Description |
|---|---|
| Grass/Forb–Open | Grass/Forb dominated with <70% coverage by grasses and forbs. Shrubs and small seedlings may be present, but do not dominate stand, (seedlings < 10% canopy cover), and there can be remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover. |
| Grass/Forb–Closed | Grass/Forb dominated with >70% coverage by grasses and forbs. Shrubs and small seedlings may be present, but do not dominate stand, (seedlings < 10% canopy cover), and there can be remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover. |
| Shrub/Seedling–Open | Seedlings are large enough to add structure to the stand but are small enough that the structure is similar to shrubs and may have remnant trees (trees remaining from the previous stand) that can provide <10% canopy cover. There is <70% cover of shrubs or seedlings. Tree size has <1" dbh, and there is only a single canopy stratum. |
| Shrub/Seedling–Closed | Seedlings are large enough to add structure to the stand but are small enough that the structure is similar to shrubs. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is >70% cover of shrubs or seedlings. Tree size has <1" dbh, and there is only a single canopy stratum. |
| Sapling/Pole–Open | The canopy is open enough that understory vegetation may be abundant. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of sapling and pole-sized trees. Tree size is 1"-9" dbh, and there is a single canopy stratum. |
| Sapling/Pole–Moderate | Understory development is hampered by available light and moisture. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of sapling and pole-sized trees. Tree size is 1"-9" dbh, and there is a single canopy stratum. |
| Sapling/Pole–Closed | The understory is depauperate or absent. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is > 70% cover of sapling and pole-sized trees. Tree size is 1"- 9" dbh and there is a single canopy stratum. |
| Small Tree–Single Story–Open | A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of small trees, with <10% cover of other tree sizes. Tree size is 10-14" dbh, and there is a single canopy stratum. |
| Small Tree–Single Story–Moderate | Some grass/forb or shrub understory may be present. Remnant trees (green trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of small trees with <10% cover of other sized trees. Tree size is 10-14" dbh, and there is a single canopy stratum. |
| Small Tree–Single Story–Closed | Grass/Forb or shrub understory minor or absent. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is > 70% cover of small trees, with <10% cover of other sized trees. Tree size is 10-14" dbh, and there is a single canopy stratum. |

| Structural Condition | Description |
|---|---|
| Medium Tree–Single Story–Open | A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 10-39% cover of medium trees, with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum. |
| Medium Tree–Single Story–Moderate | Grass/Forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is 40-69% cover of medium trees with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum. |
| Medium Tree–Single Story–Closed | A grass/forb or shrub understory may be present. Remnant trees (trees remaining from the previous stand) can provide <10% canopy cover. There is >70% cover of medium trees with <10% cover of other sized trees. Tree size is 15-19" dbh, and there is a single canopy stratum. |
| Large Tree–Single Story–Open | Grasses, shrubs, and/or seedlings may occur in the understory. There is 10-39% cover of large and/or giant size trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum. |
| Large Tree–Single Story–Moderate | Some grass/forb or shrub understory may be present. There is 40-69% cover of large and/or giant trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum. |
| Large Tree–Single Story–Closed | Grasses, shrubs, and/or seedlings may occur in the understory. There is >70% cover of large and/or giant trees with <10% cover of other sized trees. Tree size is 20"-29" dbh, and there is a single canopy stratum. |
| Small Tree–Multistory–Open | These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present. There is 10-39% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10"-14" dbh, and there are two or more canopy strata. |
| Small Tree–Multistory–Moderate | These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 40-69% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10"-14" dbh, and there are two or more canopy strata. |
| Small Tree–Multistory–Closed | These stands have an overstory of small trees with a distinct subcanopy of saplings and/or poles. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory extremely limited or absent. There is >70% total canopy cover dominated by small trees, at least 10% or more canopy cover of 1 or more other smaller tree sizes. Tree size is 10-14" dbh, and there are two or more canopy strata. |

| Structural Condition | Description |
|---|---|
| Medium Tree - Multistory- Open | These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 10-39% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"-19" dbh, and there are two or more canopy strata. |
| Medium Tree– Multistory– Moderate | These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb or shrub understory may be present, but is probably limited. There is 40-69% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"-19" dbh, and there are two or more canopy strata. |
| Medium Tree– Multistory– Closed | These stands have an overstory of medium trees with a distinct subcanopy of smaller trees. Scattered larger trees may be present but make up less than 10% canopy cover. Grass/forb understory may be present, but is probably limited. There is >70% total canopy cover dominated by medium trees, at least 10% or more canopy cover of 1 or more smaller tree sizes. Tree size is 15"- 19" dbh, and there are two or more canopy strata. |
| Large Tree– Multistory– Open | These stands have an overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multistoried" stage. In westside forests, stands dominated by large trees, usually have giant trees scattered in the stand, with lower numbers in eastside forests. Grass/Forb or shrub understory often present, especially in canopy gaps. There is 10-39% total canopy cover, with at least 10% or more canopy cover from large and/or giant trees and another 10% or more canopy cover from 1 or more smaller tree size classes. Tree size is 20"-29" dbh, and there are two or more canopy strata. |
| Large Tree– Multistory– Moderate | These stands have an overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multistoried" stage. In westside forests, stands dominated by large trees, usually have giant trees scattered in the stand, with lower numbers in eastside forests. Grass/Forb or shrub understory often present, especially in canopy gaps. There is 40-69% total canopy cover, at least 10% or more canopy cover from large trees with another 10% or more canopy cover from 1 or more smaller tree size classes. Tree size is 20"-29" dbh, and there are two or more canopy strata. |
| Large Tree– Multistory– Closed | These stands have an overstory of large or giant sized trees with one or more distinct canopy layers of smaller trees. Stands > 40% cover of giant trees are classified in the "Giant, multistoried" stage. In westside forests, stands dominated by large trees, usually have giant trees scattered in the stand, with lower numbers in eastside forests. Grass/Forb or shrub understory often present, especially in canopy gaps. There is >70% total canopy cover, at least 10% or more canopy cover from large trees with another 10% or more canopy cover from 1 or more smaller tree size classes. Tree size is 20"- 29" dbh, and there are two or more canopy strata. |
| Giant Tree– Multistory | These stands have an overstory of giant sized trees with one or more distinct canopy layers of smaller trees. Stands with <40% canopy cover are classified in the "large tree–multistory–open", stage. There is > 40% canopy cover. Tree size is > 30" dbh, and there are two or more canopy strata. |

Table 53. Descriptions of structural conditions in grassland habitats

| Structural Condition | Description |
|---|---|
| Grass/Forb - Open | Grasslands that have <10% shrub cover and < 10% tree canopy cover. Grasses and forbs cover less than 70% of the ground, and bare ground is evident. |
| Grass/Forb– Closed | Grasslands that have <10% shrub cover and <10% tree canopy cover. Grasses and forbs cover >70% of the ground. |
| Low shrub– Open Shrub Overstory– Seedling/Young | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70% and may have <10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Low shrub– Open Shrub Overstory– Mature | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70% and may have <10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is < 25%. |
| Low shrub– Open Shrub Overstory– Old | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >10% and <70% and may have <10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%. |
| Low shrub– Closed Shrub Overstory– Seedling/Young | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70% and may have <10% tree canopy cover. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Low shrub– Closed Shrub Overstory– Mature | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70% and may have <10% tree canopy cover < 10%. Crown decadence is < 25%. |
| Low shrub– Closed Shrub Overstory– Old | Shrublands with shrubs < 0.5 m (1.6 ft) tall and shrub canopy cover >70% and may have <10% tree canopy cover. Crown decadence is > 25%. |
| Medium shrub– Open Shrub Overstory– Seedling/Young | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Medium shrub– Open Shrub Overstory Mature | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is < 25%. |

| Structural Condition | Description |
|---|---|
| Medium shrub–<br>Open Shrub Overstory–<br>Old | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%. |
| Medium shrub–Closed Shrub Overstory–Seedling/Young | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Medium shrub–<br>Closed Shrub Overstory–<br>Mature | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is < 25% |
| Medium shrub–<br>Closed Shrub Overstory–<br>Old | Shrublands with shrubs 0.5–2.0 m tall (1.6–6.5 ft.) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is > 25%. |
| Tall shrub–<br>Open Shrub Overstory–<br>Seedling/Young | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6–16.5 ft) and shrub canopy cover >10% and <70%, and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Tall shrub–<br>Open Shrub Overstory–<br>Mature | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6–16.5 ft) and shrub canopy cover >10% and <70% and may have < 10% tree canopy cover. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is < 25%. |
| Tall shrub–<br>Open Shrub Overstory–<br>Old | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6–16.5 ft) and shrub canopy cover >10% and <70%, and may have tree canopy cover < 10%. Areas with less than 10% shrub cover are categorized as Grass/Forb. Crown decadence is > 25%. |
| Tall shrub–<br>Closed Shrub Overstory–<br>Seedling/Young | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6–16.5 ft) and shrub canopy cover >70%, and may have tree canopy cover < 10%. These are post-disturbance regenerating shrublands dominated by seedlings or young shrubs. Mature, legacy shrubs may persist from before the disturbance, but occur as scattered singles or widely scattered clumps. Crown decadence is negligible. |
| Tall shrub–<br>Closed Shrub Overstory–<br>Mature | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6–16.5 ft) and shrub canopy cover >70%, and may have tree canopy cover < 10%. Crown decadence is < 25%. |
| Tall shrub–<br>Closed Shrub Overstory–<br>Old | Shrublands with shrubs > 2.0 m and <5.0 m tall (6.6- 16.5 ft) and shrub canopy cover >70%, and may have < 10% tree canopy cover. Crown decadence is > 25%. |

## *Appendix F*

ATTRIBUTES OF IDAHO SUBWATERSHEDS AS THEY RELATE TO BULL TROUT THREATS (REPRODUCED FROM IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY 1998).

| **Subwatershed Name** ($5^{th}$, $6^{th}$ and $7^{th}$ code HUC) | **HUC Code** | **Area of Subwater-shed** (Acres) a=approx. | **Ownership** list in order of most ownership 1=USFS 2=BLM 3=COE 4=IDL 5=IDFG 6=Plum Creek 7=Potlatch 8=Other | **Bull Trout Distribution** | | **Threats to Bull Trout** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Current** (Since 1985) | **Historical** (Prior to 1985) | **Passage Barrier** C=Culvert D=Dam I=Irrigation Diversion (include number | **Illegal Harvest** H=Hi impact L=Low impact N=No impact | **Brook Trout** Y=Yes N=No U=Unknown | **Roads** Miles/Sq Mile | **Timber Harvest** Percent Cut <15% 15-25% 25-50% 50-75% 75-100% |
| | | | | SER=Spawning / Early Rearing SAR=Sub Adult and Adult Rearing SNF=Surveyed Not Found DNP=Documented Not Present SSR=Suspected Spawning/Rearing SNP=Suspected Not Present UKN=Unknown | | | | | | |
| Snake River | 0000 | 248,800 | 1,8,4,2 | SAR | SAR | Dam | L | Y | 1-3/m2 | <5% |
| Divide Creek | 0201 | 19,738 | 8,4,2,1 | SNF | SNF | | N | N | 1-3/m2 | <10% |
| Dry Creek | 0103 | 7,040 a | 8,2 | SNF | SNF | | N | N | <1/m2 | 0 |
| Wolf Creek | 0301 | 26,740 | 8,4,2 | SNF | SNF | | N | N | 1-3/m2 | <15% |
| Getta Creek | 0402 | 11,520 a | 8,2,4,1 | SNF | SNF | | N | N | 1-3/m2 | <15% |
| Highrange Creek | 0401 | 3,840 a | 8,2,1 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Big Canyon Creek | 0501 | 6,600 a | 1,8 | SNF | SNF | | N | N | <1/m2 | <5% |
| Kurry Creek | 0502 | 5,440 a | 1 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Klopton Creek | 0503 | 4,350 a | 1 | SNF | SNF | | N | N | <1/m2 | <5% |
| Kirkwood Creek | 0602 | 9,280 a | 1,8 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Sheep Creek | 0702 | 24,580 a | 1,8 | SER | SER | | L | N | <0.5/m2 | <5% |
| Bernard Creek | 0801 | 5,060 a | 1 | SNF | SNF | | N | N | 0/m2 | 0 |
| Granite Creek | 0901 | 20,800 a | 1 | SER | SER | | L | N | 0/m2 | 0 |
| Tammany Creek | 0101 | 20,500 a | 8 Private | SNF | SNF | | N | N | >3/m2 | 0% |
| Tenmile | 0202 | 8,320 a | 8 | SNF | SNF | | N | N | 1-3/m2 | 0% |
| Redbird Creek | 0201 | 5,760 a | 8,5 | SNF | SNF | | N | N | <1/m2 | 0% |
| Captain John Creek | 0302 | 16,720 | 5,2,4,8 | SNF | SNF | | N | N | 1-3/m2 | 0-15%% |
| Corral Creek | 0403 | 5,120 a | 2,5,8 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Cottonwood Creek | 0501 | 5,760 a | 1,2,4,5,8 | SNF | SNF | | N | N | <1/m2 | 0% |

## *Appendix G*

REGIONAL IMPACTS OF OUT-OF-SUBBASIN FACTORS IMPACTING ANADROMOUS FISH SPECIES.

Information on out-of-subbasin effects to aquatic species is taken from the memo by Mobrand Biometrics (2003a) describing how these effects were addressed in regional EDT modeling efforts. EDT estimates survival and capacity of a focal species (e.g., spring chinook salmon) within a defined study area (e.g., a subbasin) based on habitat characteristics and combines this with predefined survival rates outside the study area. These predefined survival rates have been termed the "out-of-subbasin effects" or OOSE. These survival rates have been determined only for spring and fall chinook salmon; No rates are available regarding steelhead.

As a contribution to the need to supply subbasin planners with a set of assumptions regarding the out-of-subbasin effects, Mobrand Biometrics (2003a) provided the assumptions that are currently incorporated in the Ecosystem Diagnosis and Treatment model that is being used by subbasin planners. These out-of-subbasin assumptions in EDT were developed as part of the Council's Multi-species Framework Project. Calculations behind the results provided here were documented in the final project report to the Council from Mobrand Biometrics and in Marcot et al. (2002). The Framework assumptions were intended to capture conditions prevailing in the region around the year 2000. The current out-of-subbasin assumptions in EDT are based on passage and hydrologic modeling done by the Council, National Marine Fisheries Service and other participants in the Council's Framework Project.

The OOSE are defined by Mobrand Biometrics (2003a) as the total survival rate of juvenile fish from the mouth of the subbasin to their return to the subbasin as adults. OOSE accounts for survival conditions through the hydroelectric system, the Columbia River below Bonneville Dam, the estuary, the ocean and any harvest occurring outside the subbasin. To be specific, OOSE = Survival through the hydro system X survival in the lower Columbia River X survival through the estuary X survival in the ocean X overall harvest rate. This definition of the OOSE makes it equivalent to the smolt to adult survival rate or SAR that has been used in other modeling efforts. The SAR is specific for a species and is related to the position of the subbasin within the Columbia Basin and especially relative to its position within the hydroelectric system. In other words, because the SAR (OOSE) is affected by survival through the hydroelectric system (see equation above), the SAR is affected by the number of dams that fish must traverse to get to and from the subbasin. As a result, we see SARs generally decline going upstream through the Columbia River basin.

Because the out-of-subbasin assumptions reduce to the SARs that result from the model, Mobrand Biometrics (2003a) represents the combined effect of all current OOSE assumptions in EDT as the SARs for spring and fall chinook salmon projected from various points in the Columbia Basin (Table 54). These SARs include all considerations for dam passage, survival below Bonneville Dam, survival through the Columbia estuary and the ocean and assumed harvest outside the subbasin. The hope is that by focusing on the SARs (which can be related to empirical survival estimates), the region can avoid becoming embroiled in debates over details of individual survival components as part of the subbasin planning process. This is consistent with direction provided by the Council in previous reports on the OOSE issue.

The results in Table 54 are provided to clarify the assumptions that are available to subbasin planners regarding the SARs in EDT. SAR has been estimated from empirical data in a few subbasins in the PATH process and elsewhere. Mobrand Biometrics has compared the estimated SARs in EDT to available empirical estimates of SARs and find them generally in agreement.

Table 54. Smolt-to-adult survival rates (SAR) for spring and fall chinook currently used in the Ecosystem Diagnosis and Treatment model.

| | *Spring Chinook* | | *Fall Chinook migrants* | |
|---|---|---|---|---|
| | **SAR** | **Expl. Rate** | **SAR** | **Expl. Rate** |
| **Lower Granite Pool** | 0.9% | 6.8% | 0.4% | 45% |
| **Little Goose Pool** | 1.0% | | 0.4% | |
| **Lower Monumental Pool** | 1.1% | | 0.5% | |
| **Ice Harbor Pool** | 1.3% | | 0.6% | |
| **Lower Snake** | 1.4% | | 0.8% | |
| | | | | |
| **McNary Pool** | 1.4% | 6.8% | 0.7% | 45% |
| **John Day Pool** | 1.5% | | 0.8% | |
| **The Dalles Pool** | 2.0% | | 0.9% | |
| **Bonneville Pool** | 2.2% | | 1.0% | |
| | | | | |
| **Lower Columbia** | 3.1% | | 1.4% | |
| | | | | |
| **Wells Pool** | 0.7% | 6.8% | 0.3% | 45% |
| **Rock Island Pool** | 0.9% | | 0.4% | |
| **Wanapum Pool** | 1.1% | | 0.4% | |
| **Priest Rapids Pool** | 1.2% | | 0.6% | |
| **Hanford Reach** | 1.4% | | 0.8% | |

The results in Table 54 approximate the survival rates that would be applied to spring and fall chinook entering the Columbia River or Snake River at the points in the table. For example, spring chinook entering the Snake River at the head of Lower Granite pool (from the Snake Hells Canyon subbasin) would be subject to a SAR of 0.9% in EDT. This SAR incorporates an assumed harvest on spring chinook of 6.8%. Fall chinook from the Snake Hells Canyon subbasin would be subject to a SAR of 0.4% in EDT. This SAR incorporates an assumed harvest on spring chinook of 45%. The SARs for fall chinook represent survival of actively migrating juveniles. Because fall chinook also include a component of fish that rear for some period within the mainstem Columbia and Snake Rivers, total survival of fall chinook from each point may differ from the results in Table 1.

The SARs in Table 54 represent survival under "typical" conditions in the Columbia River and the ocean. Empirical estimates of SAR that have been reported in the PATH process and elsewhere vary widely between years reflecting environmental variation including regime shifts in ocean survival conditions. However, the EDT assessment is intended to characterize the potential of current habitat in a subbasin with respect to a focal species and does not include environmental variability.

Table 55 and Table 56 provide the schedule of survival rates at each dam for each month of the year for spring and fall chinook salmon. In EDT, fish leave the subbasin and enter the mainstem across a range of months. They move down at travel speeds related to flow, encountering daily survival rates in the reservoirs. Fish are then passed through a dam where they encounter the

survival rates in the tables below. A portion of the fish may be transported downstream. The dam survival rates below were calculated using the National Marine Fisheries Service's SimPass model with conditions specified in the Biological Opinion prevailing in 2000. Other mainstem passage survival assumptions are described in Marcot et al. (2002).

Table 55. Yearling (spring) chinook dam survival rates currently used in EDT (Marcot et al. 2002).

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower Granite | 0.9 | 0.9 | 0.93 | 0.98 | 0.98 | 0.98 | 0.95 | 0.95 | 0.95 | 0.95 | 0.9 | 0.9 |
| Little Goose | 0.9 | 0.9 | 0.93 | 0.98 | 0.98 | 0.98 | 0.95 | 0.95 | 0.95 | 0.95 | 0.9 | 0.9 |
| Lower Monumental | 0.9 | 0.9 | 0.93 | 0.96 | 0.96 | 0.96 | 0.94 | 0.94 | 0.94 | 0.94 | 0.9 | 0.9 |
| Ice Harbor | 0.9 | 0.9 | 0.94 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.95 | 0.95 | 0.9 | 0.9 |
| McNary | 0.9 | 0.9 | 0.94 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.97 | 0.97 | 0.97 | 0.97 |
| John Day | 0.9 | 0.9 | 0.93 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.94 | 0.94 | 0.9 | 0.9 |
| The Dalles | 0.9 | 0.9 | 0.94 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.9 | 0.9 | 0.9 | 0.9 |
| Bonneville | 0.9 | 0.9 | 0.92 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.93 | 0.93 | 0.9 | 0.9 |
| Rocky Reach | 0.89 | 0.89 | 0.89 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.89 | 0.89 | 0.89 | 0.89 |
| Rock Island | 0.89 | 0.89 | 0.89 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.89 | 0.89 | 0.89 | 0.89 |
| Wanapum | 0.89 | 0.89 | 0.89 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.89 | 0.89 | 0.89 | 0.89 |
| Priest Rapids | 0.89 | 0.89 | 0.89 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.89 | 0.89 | 0.89 | 0.89 |
| Wells | 0.9 | 0.9 | 0.9 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.89 | 0.89 | 0.89 | 0.89 |

Table 56. Subyearling (fall) chinook dam survival rates currently used in EDT (Marcot et al. 2002).

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower Granite | 0.9 | 0.9 | 0.95 | 0.96 | 0.96 | 0.96 | 0.95 | 0.95 | 0.95 | 0.95 | 0.9 | 0.9 |
| Little Goose | 0.9 | 0.9 | 0.94 | 0.96 | 0.96 | 0.96 | 0.94 | 0.94 | 0.94 | 0.94 | 0.9 | 0.9 |
| Lower Monumental | 0.9 | 0.9 | 0.94 | 0.95 | 0.95 | 0.95 | 0.95 | 0.94 | 0.94 | 0.93 | 0.9 | 0.9 |
| Ice Harbor | 0.9 | 0.9 | 0.93 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.94 | 0.94 | 0.9 | 0.9 |
| McNary | 0.9 | 0.9 | 0.96 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.95 | 0.95 | 0.95 | 0.95 |
| John Day | 0.9 | 0.9 | 0.95 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.95 | 0.95 | 0.9 | 0.9 |
| The Dalles | 0.9 | 0.9 | 0.93 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.9 | 0.9 | 0.9 | 0.9 |
| Bonneville | 0.9 | 0.9 | 0.91 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.91 | 0.91 | 0.9 | 0.9 |
| Rocky Reach | 0.89 | 0.89 | 0.91 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.89 | 0.89 | 0.89 | 0.89 |
| Rock Island | 0.89 | 0.89 | 0.9 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.89 | 0.89 | 0.89 | 0.89 |
| Wanapum | 0.89 | 0.89 | 0.91 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.89 | 0.89 | 0.89 | 0.89 |
| Priest Rapids | 0.89 | 0.89 | 0.9 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.89 | 0.89 | 0.89 | 0.89 |
| Wells | 0.89 | 0.89 | 0.94 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.89 | 0.89 | 0.89 | 0.89 |

## *Appendix H*

RAW DATA AND RESULTS OF THE QUALITATIVE HABITAT ASSESSMENT (QHA) MODEL.

Various input and output information from the QHA model is presented to provide transparency regarding data inputs, and allow readers the opportunity to consider possible alternative interpretations of outputs. All data inputs represent professional judgments since no suitable and timely method could be developed for defensibly transforming real habitat data into categorical classifications used by the QHA model. Regional biologists within IDFG and ODFW most familiar with the streams of interest populated the QHA model, and their input was subsequently reviewed by the subbasin aquatic technical team. No changes were requested or made to original data inputs based on technical team review.

To aid in interpretation, within each of the tables presented below names of streams located in Oregon have been shaded; names of streams in Idaho are unshaded.

The following information is presented in this appendix:

Model Inputs:

1. Existing conditions
2. Reference conditions
3. Species habitat hypotheses
4. Species use/distribution

Model Outputs:

1. Habitat scores
2. Habitat ranks
3. Confidence scores
4. Summary table of model outputs and revised restoration scores[4]
5. Tornado diagram—Illustration of habitat scores (protection and/or restoration) by reach including both original and revised restoration scores.

Readers interested in detailed explanation of the QHA model development and function are referred to the QHA Users Guide (Mobrand Biometrics 2003b).

[4] Revision of restoration scores is discussed in section 4.1. To account for the differing amount of habitat (length of stream used by steelhead) between streams QHA restoration scores were standardized based on the average usable length (2.0 miles) of each stream used by steelhead within the subbasin. The estimated length utilized within each individual stream was divided by 2.0; the result was then multiplied by the original QHA restoration score for that reach.

## Existing Conditions:

| Scoring | |
|---|---|
| Confidence Rating | Attribute Rating |
| 0 = Unknown | 0 = <20% of |
| 1 = Speculative | 1 = 40% of |
| 2 = Expert Opinion | 2 = 60% of |
| 3 = Well Documented | 3 = 80% of |
| | 4 = 100% of |

Describe the existing physical structure of the stream



Definitions

| Attribute Confidence | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach Name | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions | Reach Confidence |
| Bernard Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Big Canyon Creek | 1.0 | 2.0 | 1.5 | 3.0 | 3.0 | 2.0 | 3.0 | 3.0 | 1.0 | 3.0 | 3.0 | 1 |
| Brush Creek | 3.0 | 2.0 | 2.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Captain John Creek | 2.0 | 3.0 | 3.0 | 3.0 | 3.0 | 2.0 | 4.0 | 4.0 | 3.0 | 3.0 | 4.0 | 2 |
| Cave Gulch | 1.0 | 1.0 | 1.0 | 3.0 | 2.5 | 1.5 | 3.0 | 3.0 | 1.0 | 3.0 | 3.0 | 1 |
| Corral Creek (N) | 1.0 | 2.0 | 1.0 | 3.0 | 1.5 | 1.0 | 3.0 | 2.5 | 1.0 | 3.0 | 2.5 | 1 |
| Corral Creek (S) | 1.0 | 1.0 | 1.0 | 3.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.5 | 3.0 | 2.0 | 0 |
| Cottonwood Creek | 2.0 | 2.0 | 2.0 | 2.5 | 2.0 | 2.0 | 3.0 | 3.0 | 2.5 | 3.0 | 3.0 | 2 |
| Divide Creek | 1.0 | 2.0 | 1.0 | 2.0 | 2.0 | 1.0 | 3.0 | 3.0 | 2.0 | 2.0 | 2.5 | 2 |
| Dry Creek | 1.0 | 1.0 | 1.0 | 3.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.0 | 3.0 | 3.0 | 1 |
| Getta Creek | 1.0 | 2.0 | 2.0 | 3.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.0 | 1.0 | 2.5 | 1 |
| Granite Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Jones Creek | 2.0 | 2.0 | 2.0 | 3.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.0 | 3.0 | 1.0 | 0 |
| Kirby Creek | 2.0 | 2.0 | 2.0 | 3.5 | 3.0 | 2.0 | 4.0 | 4.0 | 2.0 | 3.0 | 3.0 | 0 |
| Kirkwood Creek | 2.0 | 2.5 | 2.5 | 3.5 | 3.0 | 2.5 | 3.5 | 4.0 | 3.0 | 2.0 | 3.0 | 1 |
| Little Granite Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 1 |
| Redbird Creek | 1.0 | 2.0 | 2.0 | 3.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 1 |
| Saddle Creek | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sheep Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sluice Creek | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Somers Creek | 4.0 | 4.0 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Temperance Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 2 |
| West Creek | 2.0 | 2.0 | 2.0 | 4.0 | 2.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 2.0 | 0 |
| Wolf Creek | 1.0 | 2.0 | 1.0 | 1.0 | 2.0 | 1.0 | 3.0 | 3.0 | 1.0 | 1.0 | 2.5 | 2 |
| Three Creeks | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Cook Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Deep Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Lookout Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Tryon Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Pleasant Valley Cr. | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Durham Creek | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Two Corral Creek | 3.0 | 4.0 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Salt Creek | 3.0 | 4.0 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sand Creek | 2.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rush Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rattlesnake Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rough Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Wild Sheep Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Bull Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Battle Creek | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |

## Reference Conditions:

| Scoring | | |
|---|---|---|
| Confidence Rating | | Attribute Rating |
| 0 = Unknown | | 0 = <20% of |
| 1 = Speculative | | 1 = 40% of |
| 2 = Expert Opinion | | 2 = 60% of |
| 3 = Well Documented | | 3 = 80% of |
| | | normative |

Describe the natural physical condition of the stream



Definitions

| Attribute Confidence | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach Name | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions | Reach Confidence |
| Bernard Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Big Canyon Creek | 2.0 | 3.0 | 2.0 | 4.0 | 3.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 1 |
| Brush Creek | 3.0 | 2.0 | 2.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Captain John Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Cave Gulch | 2.0 | 2.0 | 2.0 | 4.0 | 3.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 1 |
| Corral Creek (N) | 2.0 | 3.0 | 3.0 | 4.0 | 2.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 1 |
| Corral Creek (S) | 2.0 | 2.0 | 2.0 | 4.0 | 2.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 2.0 | 0 |
| Cottonwood Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Divide Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 2 |
| Dry Creek | 2.0 | 2.0 | 2.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 1 |
| Getta Creek | 2.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Granite Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Jones Creek | 2.0 | 2.0 | 2.0 | 4.0 | 2.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 2.0 | 0 |
| Kirby Creek | 2.0 | 2.0 | 2.0 | 4.0 | 3.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 3.0 | 1 |
| Kirkwood Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 2 |
| Little Granite Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 1 |
| Redbird Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 1 |
| Saddle Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sheep Creek | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sluice Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Somers Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Temperance Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| West Creek | 2.0 | 2.0 | 2.0 | 4.0 | 2.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 2.0 | 0 |
| Wolf Creek | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1 |
| Three Creeks | 3.0 | 3.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 1.0 |
| Cook Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Deep Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Lookout Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Tryon Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Pleasant Valley Cr. | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Durham Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Two Corral Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Salt Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Sand Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rush Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rattlesnake Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Rough Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Wild Sheep Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Bull Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |
| Battle Creek | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 2 |

## Species Habitat Hypotheses:

Species habitat hypothesis

**Assign a weight to each attribute (0-2) relative to its importance to the life stage**

| Habitat utilization life stages | Life Stage Weight (1-3) | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spawning and incubation | 3 | 2.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 |
| Growth and feeding | 3 | 1.0 | 1.0 | 2.0 | 0.0 | 1.0 | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Migration (A&J) | 1 | 1.0 | 1.0 | 1.0 | 0.5 | 1.0 | 0.0 | 0.5 | 1.0 | 0.0 | 0.0 | 2.0 |

## Species use/distribution

| | Reference Condition | | | | | Current Condition | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Describe how reaches would be used by focal spp. | | | | Confidence in | Describe how reaches are used by focal spp. | | | | Confidence in |
| Reach Name | Range | Spawn/Inc | Growth/Feed | Migration | Reference distn | Range | Spawn/Inc | Growth/Feed | Migration | Current distn |
| Bernard Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Big Canyon Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Brush Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Captain John Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Cave Gulch | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Corral Creek (N) | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Corral Creek (S) | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Cottonwood Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Divide Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Dry Creek | 1 | 1 | 1 | | 1 | 1 | 1 | | | 2 |
| Getta Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Granite Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Jones Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Kirby Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Kirkwood Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Little Granite Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Redbird Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Saddle Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Sheep Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Sluice Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Somers Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Temperance Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| West Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Wolf Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Three Creeks | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Cook Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Deep Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Lookout Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Tryon Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Pleasant Valley Cr. | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Durham Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Two Corral Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Salt Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Sand Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Rush Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Rattlesnake Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Rough Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Wild Sheep Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Bull Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Battle Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| N.Fk. Battle Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Stud Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |
| Hells Canyon Creek | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | 2 |

## Habitat Scores:

Habitat scores can range between -1 and +1. Weighted protection scores are indices of what is "good" about a stream The weighted restoration scores are what is "bad" about a stream, i.e. a high (negative) protection score means that the reach or attribute is close to the reference condition and hence might be considered for protection, whereas a high (positive) restoration score means the reach or attributes is far from the reference condition and might be considered for restoration.

| | Weighted Protection Habitat Scores | | | | | | | | | | | | Weighted Restoration Habitat Scores | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach Name | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
| Bernard Creek | -0.53 | -0.8 | -0.4 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.4 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Big Canyon Creek | -0.35 | -0.3 | -0.3 | -0.4 | -0.8 | -0.8 | -0.3 | -0.4 | -0.4 | -0.1 | -0.4 | 0.0 | 0.11 | 0.3 | 0.1 | 0.1 | 0.3 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Brush Creek | -0.50 | -0.8 | -0.3 | -0.5 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.4 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Captain John Creek | -0.47 | -0.5 | -0.4 | -0.8 | -0.8 | -0.8 | -0.3 | -0.5 | -0.5 | -0.4 | -0.4 | 0.0 | 0.17 | 0.5 | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 |
| Cave Gulch | -0.31 | -0.3 | -0.1 | -0.3 | -0.8 | -0.6 | -0.2 | -0.4 | -0.4 | -0.1 | -0.4 | 0.0 | 0.14 | 0.3 | 0.1 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Corral Creek (N) | -0.29 | -0.3 | -0.3 | -0.3 | -0.8 | -0.4 | -0.1 | -0.4 | -0.3 | -0.1 | -0.4 | 0.0 | 0.18 | 0.3 | 0.1 | 0.5 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.0 |
| Corral Creek (S) | -0.30 | -0.3 | -0.1 | -0.3 | -0.8 | -0.5 | -0.1 | -0.4 | -0.4 | -0.2 | -0.4 | 0.0 | 0.13 | 0.3 | 0.1 | 0.3 | 0.3 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Cottonwood Creek | -0.37 | -0.5 | -0.3 | -0.5 | -0.6 | -0.5 | -0.3 | -0.4 | -0.4 | -0.3 | -0.4 | 0.0 | 0.16 | 0.3 | 0.1 | 0.3 | 0.4 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Divide Creek | -0.28 | -0.3 | -0.3 | -0.3 | -0.5 | -0.5 | -0.1 | -0.4 | -0.4 | -0.3 | -0.3 | 0.0 | 0.25 | 0.5 | 0.1 | 0.5 | 0.5 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.0 |
| Dry Creek | -0.28 | -0.3 | -0.1 | -0.1 | -0.8 | -0.5 | -0.1 | -0.4 | -0.4 | -0.1 | -0.4 | 0.0 | 0.17 | 0.3 | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Getta Creek | -0.31 | -0.3 | -0.3 | -0.5 | -0.8 | -0.5 | -0.1 | -0.4 | -0.4 | -0.1 | -0.1 | 0.0 | 0.20 | 0.3 | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.1 | 0.1 | 0.3 | 0.4 | 0.0 |
| Granite Creek | -0.64 | -1.0 | -0.5 | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Jones Creek | -0.35 | -0.5 | -0.3 | -0.5 | -0.8 | -0.5 | -0.1 | -0.4 | -0.4 | -0.1 | -0.4 | 0.0 | 0.08 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Kirby Creek | -0.43 | -0.5 | -0.3 | -0.5 | -0.9 | -0.8 | -0.3 | -0.5 | -0.5 | -0.3 | -0.4 | 0.0 | 0.02 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| Kirkwood Creek | -0.45 | -0.5 | -0.3 | -0.6 | -0.9 | -0.8 | -0.3 | -0.4 | -0.5 | -0.4 | -0.3 | 0.0 | 0.09 | 0.3 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.3 | 0.0 |
| Little Granite Creek | -0.64 | -1.0 | -0.5 | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Redbird Creek | -0.36 | -0.3 | -0.3 | -0.5 | -0.8 | -0.5 | -0.3 | -0.4 | -0.4 | -0.4 | -0.4 | 0.0 | 0.17 | 0.5 | 0.1 | 0.3 | 0.3 | 0.3 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 |
| Saddle Creek | -0.56 | -0.8 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.02 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Sheep Creek | -0.64 | -1.0 | -0.5 | -1.0 | -1.0 | -1.0 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Sluice Creek | -0.56 | -0.8 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.02 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Somers Creek | -0.56 | -1.0 | -0.5 | -0.8 | -0.8 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.02 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Temperance Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| West Creek | -0.43 | -0.5 | -0.3 | -0.5 | -1.0 | -0.5 | -0.3 | -0.5 | -0.5 | -0.3 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wolf Creek | -0.24 | -0.3 | -0.3 | -0.3 | -0.3 | -0.5 | -0.1 | -0.4 | -0.4 | -0.1 | -0.1 | 0.0 | 0.30 | 0.5 | 0.1 | 0.5 | 0.8 | 0.3 | 0.3 | 0.1 | 0.1 | 0.3 | 0.4 | 0.0 |
| Three Creeks | -0.53 | -0.8 | -0.4 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.4 | -0.5 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cook Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Deep Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lookout Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tryon Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pleasant Valley Cr. | -0.56 | -0.8 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Durham Creek | -0.56 | -0.8 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Two Corral Creek | -0.53 | -0.8 | -0.5 | -0.8 | -0.8 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Salt Creek | -0.53 | -0.8 | -0.5 | -0.8 | -0.8 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Sand Creek | -0.53 | -0.5 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rush Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rattlesnake Creek | -0.58 | -1.0 | -0.5 | -0.8 | -1.0 | -0.8 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Habitat Ranks:

This page ranks the habitat scores. The highest weighted score in either protection or restoration categories is ranked 1 and is formated in red. On the protection side the number 1 rank goes to reaches or attributes that are in the best shape (hence highest protection ranking) whereas for restoration the number 1 rank goes to the reach or attribute that is in the worst condition relative to the reference condition. Remember that scores are weighted by the Habitat Hypothesis and are not strictly a measure of distance from the reference condition.

NPC= Not present currently

**Protection Habitat Ranking**

| Reach Name | Reach Rank | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bernard Creek | 23 | 2 | 8 | 2 | 1 | 2 | 8 | 5 | 5 | 8 | 5 | 11 |
| Big Canyon Creek | 35 | 7 | 7 | 3 | 1 | 1 | 7 | 3 | 3 | 10 | 3 | 11 |
| Brush Creek | 28 | 2 | 10 | 4 | 1 | 2 | 8 | 4 | 4 | 8 | 4 | 11 |
| Captain John Creek | 29 | 4 | 7 | 1 | 1 | 1 | 10 | 4 | 4 | 7 | 7 | 11 |
| Cave Gulch | 37 | 6 | 9 | 6 | 1 | 2 | 8 | 3 | 3 | 9 | 3 | 11 |
| Corral Creek (N) | 40 | 6 | 6 | 6 | 1 | 2 | 9 | 2 | 5 | 9 | 2 | 11 |
| Corral Creek (S) | 39 | 6 | 9 | 6 | 1 | 2 | 9 | 3 | 3 | 8 | 3 | 11 |
| Cottonwood Creek | 33 | 2 | 9 | 2 | 1 | 2 | 9 | 5 | 5 | 8 | 5 | 11 |
| Divide Creek | 41 | 5 | 5 | 5 | 1 | 1 | 10 | 3 | 3 | 5 | 5 | 11 |
| Dry Creek | 41 | 6 | 7 | 7 | 1 | 2 | 7 | 3 | 3 | 7 | 3 | 11 |
| Getta Creek | 38 | 6 | 6 | 2 | 1 | 2 | 8 | 4 | 4 | 8 | 8 | 11 |
| Granite Creek | 1 | 1 | 5 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 11 |
| Jones Creek | 35 | 2 | 8 | 2 | 1 | 2 | 9 | 5 | 5 | 9 | 5 | 11 |
| Kirby Creek | 31 | 3 | 8 | 3 | 1 | 2 | 8 | 3 | 3 | 8 | 7 | 11 |
| Kirkwood Creek | 30 | 4 | 8 | 3 | 1 | 2 | 8 | 6 | 4 | 7 | 10 | 11 |
| Little Granite Creek | 1 | 1 | 5 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 11 |
| Redbird Creek | 34 | 8 | 8 | 2 | 1 | 2 | 8 | 4 | 4 | 4 | 4 | 11 |
| Saddle Creek | 14 | 2 | 5 | 2 | 1 | 2 | 10 | 5 | 5 | 5 | 5 | 11 |
| Sheep Creek | 1 | 1 | 5 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 11 |
| Sluice Creek | 14 | 2 | 5 | 2 | 1 | 2 | 10 | 5 | 5 | 5 | 5 | 11 |
| Somers Creek | 14 | 1 | 5 | 2 | 2 | 2 | 10 | 5 | 5 | 5 | 5 | 11 |
| Temperance Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |
| West Creek | 31 | 2 | 8 | 2 | 1 | 2 | 8 | 2 | 2 | 8 | 2 | 11 |
| Wolf Creek | 43 | 4 | 4 | 4 | 4 | 1 | 8 | 2 | 2 | 8 | 8 | 11 |
| Three Creeks | 23 | 2 | 8 | 2 | 1 | 2 | 8 | 5 | 5 | 8 | 5 | 11 |
| Cook Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |
| Deep Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |
| Lookout Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |
| Tryon Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |
| Pleasant Valley Cr. | 14 | 2 | 5 | 2 | 1 | 2 | 10 | 5 | 5 | 5 | 5 | 11 |
| Durham Creek | 14 | 2 | 5 | 2 | 1 | 2 | 10 | 5 | 5 | 5 | 5 | 11 |
| Two Corral Creek | 23 | 1 | 5 | 1 | 1 | 1 | 10 | 5 | 5 | 5 | 5 | 11 |
| Salt Creek | 23 | 1 | 5 | 1 | 1 | 1 | 10 | 5 | 5 | 5 | 5 | 11 |
| Sand Creek | 23 | 4 | 4 | 2 | 1 | 2 | 10 | 4 | 4 | 4 | 4 | 11 |
| Rush Creek | 4 | 1 | 5 | 3 | 1 | 3 | 10 | 5 | 5 | 5 | 5 | 11 |

NPR = Not present in reference condition

**Restoration Habitat Ranking**

| Reach Rank | Riparian Condition | Channel form | Channel Stability | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 1 | 3 | 3 | 1 | 9 | 9 | 3 | 3 | 3 | 3 | 9 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 6 | 2 | 2 | 2 | 2 | 9 | 9 | 6 | 6 | 9 |
| 9 | 1 | 4 | 1 | 1 | 4 | 10 | 4 | 4 | 4 | 4 | 11 |
| 4 | 2 | 5 | 1 | 2 | 5 | 5 | 5 | 4 | 5 | 5 | 11 |
| 10 | 1 | 4 | 1 | 1 | 10 | 4 | 4 | 4 | 9 | 4 | 10 |
| 8 | 2 | 5 | 2 | 1 | 2 | 5 | 5 | 5 | 10 | 5 | 11 |
| 2 | 1 | 7 | 1 | 1 | 4 | 4 | 7 | 7 | 7 | 4 | 11 |
| 5 | 1 | 6 | 1 | 1 | 1 | 1 | 6 | 6 | 6 | 6 | 11 |
| 3 | 2 | 8 | 2 | 2 | 2 | 2 | 8 | 8 | 2 | 1 | 11 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 7 | 7 | 7 | 1 | 7 | 2 | 2 | 2 | 2 | 2 | 7 |
| 17 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 1 | 3 |
| 12 | 1 | 5 | 3 | 3 | 8 | 5 | 5 | 8 | 8 | 1 | 8 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 5 | 2 | 2 | 2 | 5 | 5 | 5 | 10 | 5 | 10 |
| 17 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 2 | 8 | 2 | 1 | 5 | 5 | 8 | 8 | 5 | 4 | 11 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 14 | 1 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | 1 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

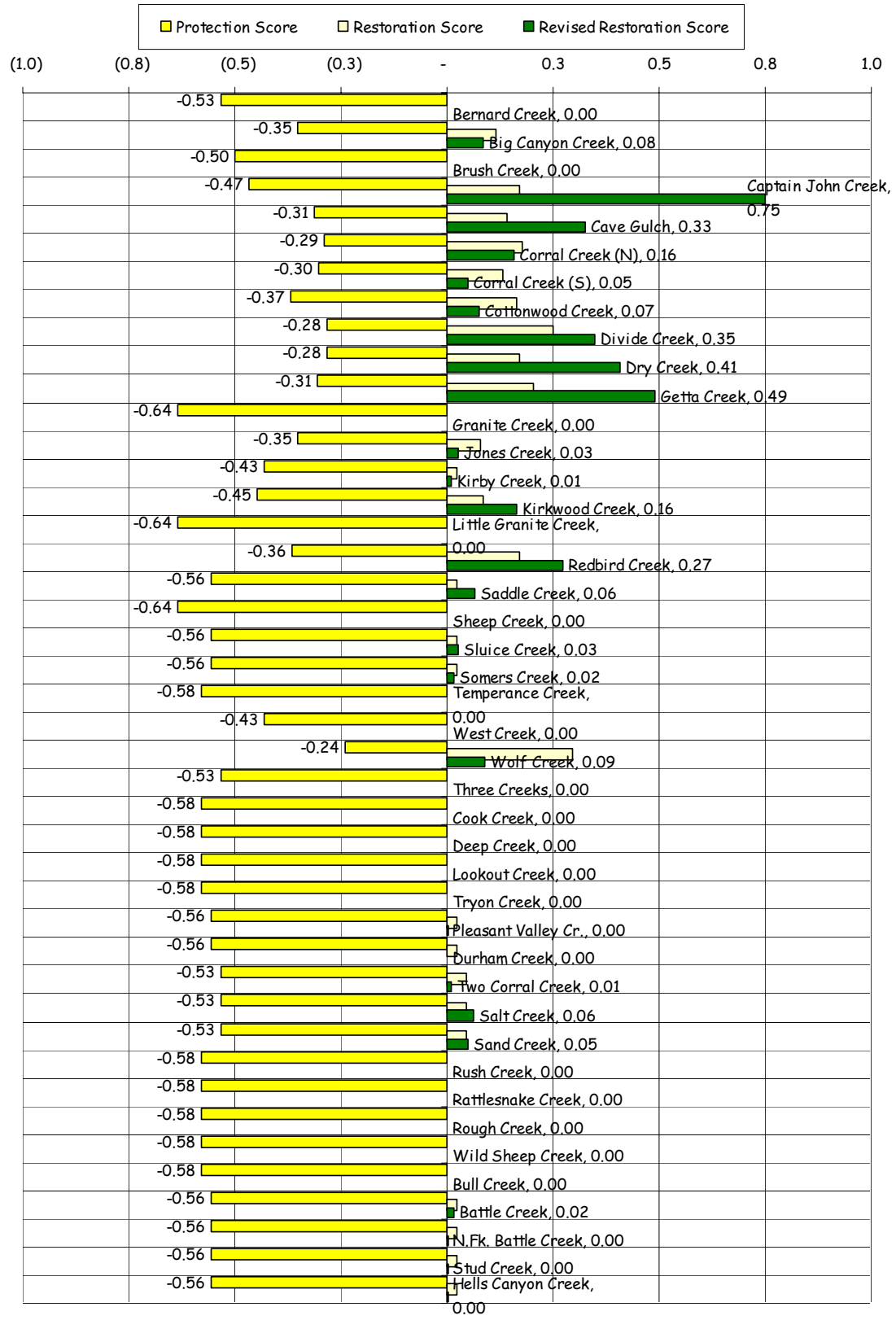
## Confidence Scores:

| | Current Condition Confidence Scores | | | | | | | | | | | | Reference Condition Confidence Scores | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Attribute Confidence | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | |
| Stream Name | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions | Reach Confidence | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions | Reach Confidence |
| Bernard Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Big Canyon Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Brush Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Captain John Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Cave Gulch | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Corral Creek (N) | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Corral Creek (S) | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Cottonwood Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Divide Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Dry Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Getta Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Granite Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Jones Creek | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Kirby Creek | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Kirkwood Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Little Granite Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Redbird Creek | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Saddle Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Sheep Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Sluice Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Somers Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Temperance Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| West Creek | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Wolf Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Three Creeks | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Cook Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Deep Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Lookout Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Tryon Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Pleasant Valley Cr. | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Durham Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Two Corral Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Salt Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Sand Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Rush Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Rattlesnake Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Rough Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Wild Sheep Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Bull Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Battle Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| N.Fk. Battle Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Stud Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| Hells Canyon Creek | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |

**Summary of Model Outputs and Revised Restoration Scores:**

| Reach Name | QHA Protection Score | QHA Restoration Score | Steelhead Habitat miles | Revised (*{miles/2}) Restoration Score |
|---|---|---|---|---|
| Bernard Creek | -0.53 | 0.00 | 1.5 | 0.00 |
| Big Canyon Creek | -0.35 | 0.11 | 1.5 | 0.08 |
| Brush Creek | -0.50 | 0.00 | 0.8 | 0.00 |
| Captain John Creek | -0.47 | 0.17 | 8.8 | 0.75 |
| Cave Gulch | -0.31 | 0.14 | 4.6 | 0.33 |
| Corral Creek (N) | -0.29 | 0.18 | 1.8 | 0.16 |
| Corral Creek (S) | -0.30 | 0.13 | 0.7 | 0.05 |
| Cottonwood Creek | -0.37 | 0.16 | 0.9 | 0.07 |
| Divide Creek | -0.28 | 0.25 | 2.8 | 0.35 |
| Dry Creek | -0.28 | 0.17 | 4.8 | 0.41 |
| Getta Creek | -0.31 | 0.20 | 4.8 | 0.49 |
| Granite Creek | -0.64 | 0.00 | 14.9 | 0.00 |
| Jones Creek | -0.35 | 0.08 | 0.7 | 0.03 |
| Kirby Creek | -0.43 | 0.02 | 1.0 | 0.01 |
| Kirkwood Creek | -0.45 | 0.09 | 3.9 | 0.16 |
| Little Granite Creek | -0.64 | 0.00 | 1.3 | 0.00 |
| Redbird Creek | -0.36 | 0.17 | 3.2 | 0.27 |
| Saddle Creek | -0.56 | 0.02 | 5.7 | 0.06 |
| Sheep Creek | -0.64 | 0.00 | 2.3 | 0.00 |
| Sluice Creek | -0.56 | 0.02 | 2.2 | 0.03 |
| Somers Creek | -0.56 | 0.02 | 1.4 | 0.02 |
| Temperance Creek | -0.58 | 0.00 | 2.5 | 0.00 |
| West Creek | -0.43 | 0.00 | 1.1 | 0.00 |
| Wolf Creek | -0.24 | 0.30 | 0.6 | 0.09 |
| Three Creeks | -0.53 | 0.00 | Unknown | 0.00 |
| Cook Creek | -0.58 | 0.00 | 0.6 | 0.00 |
| Deep Creek | -0.58 | 0.00 | 0.5 | 0.00 |
| Lookout Creek | -0.58 | 0.00 | 0.3 | 0.00 |
| Tryon Creek | -0.58 | 0.00 | 0.3 | 0.00 |
| Pleasant Valley Cr. | -0.56 | 0.02 | 0.3 | 0.00 |
| Durham Creek | -0.56 | 0.02 | 0.1 | 0.00 |
| Two Corral Creek | -0.53 | 0.05 | 0.5 | 0.01 |
| Salt Creek | -0.53 | 0.05 | 2.8 | 0.06 |
| Sand Creek | -0.53 | 0.05 | 2.1 | 0.05 |
| Rush Creek | -0.58 | 0.00 | 2.0 | 0.00 |
| Rattlesnake Creek | -0.58 | 0.00 | 0.4 | 0.00 |
| Rough Creek | -0.58 | 0.00 | 0.3 | 0.00 |
| Wild Sheep Creek | -0.58 | 0.00 | 0.3 | 0.00 |
| Bull Creek | -0.58 | 0.00 | 0.3 | 0.00 |
| Battle Creek | -0.56 | 0.02 | 1.5 | 0.02 |
| N.Fk. Battle Creek | -0.56 | 0.02 | 0.3 | 0.00 |
| Stud Creek | -0.56 | 0.02 | 0.3 | 0.00 |
| Hells Canyon Creek | -0.56 | 0.02 | 0.2 | 0.00 |

Tornado Diagram:



## *Appendix I*

OCCURRENCE OF NOXIOUS WEED SPECIES IN THE COUNTIES PARTIALLY CONTAINED BY THE SNAKE HELLS CANYON SUBBASIN.

| Genus | Species | Common Name | Noxious In | Asotin | Adams | Idaho | Nez Perce | Wallowa |
|---|---|---|---|---|---|---|---|---|
| *Abutilon* | *theophrasti* | velvetleaf | OR,WA | | | X | | |
| *Agropyron* | *repens* | quackgrass | OR | X | | X | X | |
| *Ambrosia* | *artemisiifolia* | common ragweed | OR | | | X | X | |
| *Anchusa* | *officinalis* | common bugloss | WA | | | | | X |
| *Arctium* | *minus* | common burdock | WY | | | X | X | |
| *Artemisia* | *absinthium* | absinth woodworm | WA | X | | X | | X |
| *Bryonia* | *alba* | white bryony | WA | | | | X | |
| *Cardaria* | *draba* | hoary cress | ID,OR,WA | X | X | X | X | X |
| *Carduus* | *pycnocephalus* | Italian thistle | OR,WA | | | X | | |
| *Carduus* | *nutans* | musk thistle | ID,OR,WA, | | | X | X | X |
| *Carduus* | *acanthoides* | plumeless thistle | WA | | | X | X | |
| *Cenchrus* | *longispinus* | longspine sandbur | WA | X | | X | X | X |
| *Centaurea* | *macrocephala* | bighead knapweed | OR,WA | | | X | | |
| *Centaurea* | *nigra* | black knapweed | WA | | | X | | |
| *Centaurea* | *diffusa* | diffuse knapweed | ID,OR,WA | X | X | X | X | X |
| *Centaurea* | *calcitrapa* | purple starthistle | OR,WA | X | | | | |
| *Centaurea* | *repens* | Russian knapweed | ID,OR,WA, | X | X | X | X | |
| *Centaurea* | *maculosa* | spotted knapweed | ID,OR,WA, | X | X | X | X | X |
| *Centaurea* | *solstitialis* | yellow starthistle | ID,OR,WA | X | X | X | X | X |
| *Chaenorrhinum* | *minus* | dwarf snapdragon | WA | | | X | X | |
| *Chondrilla* | *juncea* | rush skeletonweed | ID,OR,WA | X | X | X | X | X |
| *Chrysanthemum* | *leucanthemum* | oxeye daisy | WA | X | X | X | X | X |
| *Cirsium* | | bull thistle | OR,WA | X | X | X | X | X |
| *Cirsium* | *arvense* | Canada thistle | ID,OR,WA | X | X | X | X | X |
| *Conium* | *maculatum* | poison hemlock | ID,OR,WA | X | | X | X | X |
| *Convolvulus* | *arvensis* | field bindweed | ID,OR,WA | | | X | X | X |
| *Crupina* | *vulgaris* | common crupina | ID,OR,WA | | | X | X | |
| *Cynoglossum* | *officinale* | houndstongue | OR,WA | X | | X | X | X |
| *Cytisus* | *scoparius* | Scotch broom | ID,OR,WA | | | X | | |
| *Daucus* | *carota* | wild carrot | WA | | X | X | | X |
| *Echium* | *vulgare* | blueweed | WA | | | X | | |
| *Equisetum* | *arvense* | field horsetail | OR | X | | X | | X |
| *Equisetum* | *telmateia* | giant horsetail | OR | | | X | | |
| *Euphorbia* | *esula* | leafy spurge | ID,OR,WA | X | X | X | X | X |
| *Euphorbia* | *dentata* | toothed spurge | ID | | | X | | |
| *Hieracium* | *aurantiacum* | orange hawkweed | ID,WA | | X | X | | |
| *Hyoscyamus* | *niger* | black henbane | ID,WA | | | | X | X |
| *Hypericum* | *perforatum* | St. Johnswort | OR,WA | X | X | X | X | X |
| *Hypochaeris* | *radicata* | spotted cats ear | WA | | | X | | |
| *Isatis* | *tinctoria* | dyer's woad | ID,OR,WA | | X | X | | |
| *Kochia* | *scoparia* | kochia | OR,WA | X | | | | X |
| *Lepidium* | *latifolium* | perennial pepperweed | ID,OR,WA | X | X | | X | |
| *Lepyrodiclis* | *holosteoides* | lepyrodiclis | OR,WA | | | | X | |

| Genus | Species | Common Name | Noxious In | Asotin | Adams | Idaho | Nez Perce | Wallowa |
|---|---|---|---|---|---|---|---|---|
| *Linaria* | *dalmatica* | dalmatian toadflex | ID,OR,WA | X | X | X | X | X |
| *Linaria* | *vulgaris* | yellow toadflax | ID,OR,WA | | X | X | X | X |
| *Lythrum* | *salicaria* | purple loosestrife | ID,OR,WA, | | X | X | | |
| *Matricaria* | *maritima* | scentless chamomile | WA | | | | X | |
| *Milium* | *vernale* | spring millet grass | ID | | | X | | |
| *Mirabilis* | *nyctaginea* | wild four o'clock | WA | | | | X | |
| *Myriophyllum* | *brasiliense* | parrotfeather | WA | | | | X | |
| *Onopordum* | *acanthium* | Scotch thistle | ID,OR,WA | X | X | X | X | X |
| *Panicum* | *miliaceum* | wild proso millet | OR | | | X | X | |
| *Phalaris* | *arundinacea* | reed canarygrass | WA | X | X | X | X | |
| *Polygonum* | *sachalinense* | giant knotweed | OR,WA | | | X | | X |
| *Polygonum* | *cuspidatum* | Japanese knotweed | OR,WA | | | X | X | |
| *Potentilla* | *recta* | sulfur cinquefoil | OR,WA | | | X | X | |
| *Rubus* | *discolor* | Himalaya blackberry | OR | X | | X | X | X |
| *Salvia* | *sclarea* | clary sage | WA | | X | X | | |
| *Salvia* | *pratensis* | meadow sage | WA | | X | X | | |
| *Salvia* | *aethiopis* | Mediterranean sage | OR,WA | | X | X | | |
| *Secale* | *cereale* | cultivated rye | WA | | | X | X | |
| *Senecio* | *jacobaea* | tansy ragwort | ID,OR,WA | | | | | X |
| *Silene* | *latifolia* | white catchfly | WA | X | | X | X | X |
| *Solanum* | *rostratum* | buffalobur | ID,OR,WA | X | | X | X | X |
| *Solanum* | *elaeagnifolium* | silverleaf nightshade | ID,OR,WA | X | | X | | |
| *Sonchus* | *arvensis* | perennial sowthistle | ID,WA | | | | | X |
| *Sorghum* | *halepense* | Johnsongrass | ID,OR,WA | X | | X | | |
| *Taeniatherum* | *caput-medusae* | medusahead | OR | X | | | X | X |
| *Tamarix* | *spp.* | tamarix complex | WA | X | | | | |
| *Tanacetum* | *vulgare* | common tansy | WA | X | | X | | |
| *Torilis* | *arvensis* | field hedge-parsley | WA | | | X | | |
| *Tribulus* | *terrestris* | puncturevine | ID,OR,WA | X | | X | X | X |
| *Xanthium* | *spinosum* | spiny cocklebur | OR,WA | X | X | X | X | |

## *Appendix J*

DEFENITIONS OF KEY ENVIRONMENAL CORRELATES (Johnson and O'Neil 2001).

**FOREST, SHRUBLAND AND GRASSLAND HABITAT ELEMENTS**

Biotic, naturally occurring attributes of forest and shrubland communities and the information that follows are for positive relationships only.

**1.1 forest/woodland vegetative elements or substrates** - *Biotic components found within a forested context and these are positive influences only.*

**1.1.1 down wood** - Includes downed logs, branches, and rootwads.

**1.1.1.1 decay class** - A system by which down wood is classified based on its deterioration.

**1.1.1.1.1 hard** [class 1, 2] - Little wood decay evident; bark and branches present; log resting on branches, not fully in contact with ground; includes classes 1 and 2 as described in Thomas (1979).

**1.1.1.1.2 moderate** [class 3] - Moderate decay present; some branches and bark missing or loose; most of log in contact with ground; includes class 3 as described in Thomas (1979).

**1.1.1.1.3 soft** [class 4, 5] - Well decayed logs; bark and branches missing; fully in contact with ground; includes classes 4 and 5 as described in Thomas (1979).

**1.1.1.2 down wood in riparian areas** - Includes down wood in the terrestrial portion of riparian zones in forest habitats. Does not refer to in-stream woody debris.

**1.1.1.3 down wood in upland areas** - Includes downed wood in upland areas of forest habitats.

**1.1.2 litter** - The upper layer of loose, organic (primarily vegetative) debris on the forest floor. Decomposition may have begun, but components still recognizable.

**1.1.3 duff** - The matted layer of organic debris beneath the litter layer. Decomposition more advanced than in litter layer; intergrades with uppermost humus layer of soil.

**1.1.4 shrub layer** - Refers to the shrub strata within forest stands.

**1.1.4.1 shrub size** - Refers to shrub height.

**1.1.4.2 percent shrub canopy cover** - Percent of ground covered by vertical projection of shrub crown diameter.

**1.1.4.3 shrub canopy layers** - Within a shrub community, differences in shrub height and growth form produce multi-layered shrub canopies in the forest understory.

**1.1.5 moss** - Large group of green plants without flowers but with small leafy stems growing in clumps.

**1.1.6 flowers** - A modified plant branch for the production of seeds and bearing leaves specialized into floral organs.

**1.1.7 lichens** - Any of a various complex of lower plants made up of an alga and a fungus growing as a unit on a solid surface.

**1.1.8 forbs** - Broad-leaved herbaceous plants. Does not include: grasses, sedges or rushes.

**1.1.9 cactus** - Any of a large group of drought-resistant plants with fleshy, usually jointed stems and leaves replaced by scales or prickles.

**1.1.10 fungi** - Mushrooms, molds, yeasts, rusts, etc.

**1.1.11 roots, tubers, underground plant parts** - Any underground part of a plant that functions in nutrient absorption, aeration, storage, reproduction and/or anchorage.

**1.1.12 ferns** - Any of a group of flowerless, seedless vascular green plants.

**1.1.13 herbaceous layer** - Understory non-woody vegetation layer beneath shrub layer (forest context). May include forbs, grasses, ferns.

**1.1.14 trees** - Includes both coniferous and hardwood species.

**1.1.14.1 snags** - Standing dead trees.

**1.1.14.1.1 decay class** - A system by which snags are classified based on their deterioration.

**1.1.14.1.1.1 hard** - Little wood decay evident; bark, branches, top, present; recently dead; includes class 1 as described in Brown (1985).

**1.1.14.1.1.2 moderate** - Moderately decayed wood; some branches and bark missing and/or loose; top broken; includes classes 2 and 3 as described in Brown (1985).

**1.1.14.1.1.3 soft** - Well decayed wood; bark and branches generally absent; top broken; includes classes 4 and 5 as described in Brown (1985).

**1.1.14.2 snag size** - Measured in diameter at breast height, (dbh), the standard measurement for standing trees taken at 4.5 feet above the ground.

| | | |
|---|---|---|
| **1.1.14.2.1** | **seedling** | <1" dbh |
| **1.1.14.2.2** | **sapling/pole** | 1"-9" 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** - Measured in diameter at breast height, (dbh), the standard measurement for standing trees taken at 4.5 feet above the ground.

| | | |
|---|---|---|
| **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** - Dense masses of deformed branches caused by any type of broom-forming parasite (fungal or plant).

**1.1.14.5 dead parts of live tree** - Portions of live trees with rot; can include broken tops; branches with decay; tree base with rot.

**1.1.14.6 hollow living trees (chimney trees)** - Tree bole with large hollow chambers.

**1.1.14.7 tree cavities** - Smaller chamber in a tree; can be in bole, limbs, or forks of live or dead trees. May be excavated or result from decay or damage.

**1.1.14.8 bark** - Includes crevices/fissures, and loose or exfoliating bark.

**1.1.14.9 live remnant/legacy trees** - A live mature or old-growth tree remaining from the previous stand. Context is remnant trees in recently harvested or burned stands up through young forested stands. See dead parts of live trees, hollow living trees, tree cavities, and bark to see which species benefit from remnant trees with these attributes.

**1.1.14.10 large live tree branches** - Large branches often growing horizontally out from the tree bole.

**1.1.14.11 tree canopy layer** - Refers to the strata occupied by tree crowns.

**1.1.14.11.1 sub-canopy** - The space below the predominant tree crowns.

**1.1.14.11.2 above canopy** - The space above the predominant tree crowns

**1.1.14.11.3 tree bole** - The tree trunk.

**1.1.14.11.4 canopy** - The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

**1.1.15 fruits/seeds/nuts** - Plant reproductive bodies that are used by animals.

**1.1.16 edges** - The place where plant communities meet or where successional stages or vegetative conditions within plant communities come together.

**1.2 shrubland/grassland vegetative elements or substrates** - *Biotic components found within a shrubland or grassland context and these are positive influences only.*

**1.2.1 herbaceous layer** - Zone of understory non-woody vegetation beneath shrub layer (non-forest context). May include forbs, grasses.

**1.2.2 fruits/seeds/nuts** - Plant reproductive bodies that are used by animals.

**1.2.3 moss** - Large group of green plants without flowers but with small leafy stems growing in clumps.

**1.2.4 cactus** - Any of a large group of drought-resistant plants with fleshy, usually jointed stems and leaves replaced by scales or prickles.

**1.2.5 flowers** - A modified plant branch for the production of seeds and bearing leaves specialized into floral organs.

**1.2.6 shrubs** - Plant with persistent woody stems and less than 16 feet tall; usually produces several basal shoots as opposed to a single bole.

**1.2.6.1 shrub size** - Refers to shrub height.

**1.2.6.1.1 small** <20"
**1.2.6.1.2 medium** 20"- 6.5'
**1.2.6.1.3 large** 6.6' – 16.5'

**1.2.6.2 percent shrub canopy cover** - Percent of ground covered by vertical projection of shrub crown diameter.

**1.2.6.3 shrub canopy layer** - Within a shrub community, differences in shrub height and growth form produce multi-layered shrub canopies.

**1.2.6.3.1 sub-canopy** - The space below the predominant shrub crowns.
**1.2.6.3.2 above canopy** - The space above the predominant shrub crowns.

**1.2.7 fungi** - Mushrooms, molds, yeasts, rusts, etc.

**1.2.8 forbs** - Broad-leaved herbaceous plants. Does not include: grasses, sedges or rushes.

**1.2.9 bulbs/tubers** - Any underground part of a plant that functions in nutrient absorption, aeration, storage, reproduction and/or anchorage.

**1.2.10 grasses** - Members of the Graminae family.

**1.2.11 cryptogamic crusts** - Non-vascular plants that grow on the soil surface. Primarily lichens, mosses and algae. Often found in arid or semi-arid regions. May form soil surface pinnacles.

**1.2.12 trees** (located in a shrubland/grassland context) - Small groups of trees or isolated individuals.

**1.2.12.1 snags** - Standing dead trees.

**1.2.12.1.1 decay class** - System by which snags are classified based on their deterioration.

**1.2.12.1.1.1 hard** - Little wood decay evident; bark, branches, top, present; recently dead; includes class 1 as described in Brown (1985).
**1.2.12.1.1.2 moderate** - Moderately decayed wood; some branches and bark missing and/or loose; top broken; includes classes 2 and 3 as described in Brown (1985).
**1.2.12.1.1.3 soft** - Well decayed wood; bark and branches generally absent; top broken; includes classes 4 and 5 as described in Brown (1985).

**1.2.12.2 snag size** (dbh) - Measured in diameter at breast height, (dbh), the standard measurement for standing trees taken at 4.5 feet above the ground.

**1.2.12.2.1 shrub/seedling** <1" 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** - Measured in diameter at breast height (dbh) the standard measurement for standing trees taken at 4.5 feet above the ground.

**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** - The place where plant communities meet or where successional stages or vegetative conditions within plant communities come togethe

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**2) ECOLOGICAL HABITAT ELEMENTS**

Selected interspecies relationships within the biotic community, and they include both positive and negative influences.

**2.1 exotic species** - Exotic species are defined as any non-native plant or animal, including cats, dogs, and cattle.

**2.1.1 plants** - This field refers to the relationship between an exotic plant species and animal species.

**2.1.2 animals** - This field refers to the relationship between an exotic animal species and the animal species.

**2.1.2.1 predation** - The species queried is preyed upon by or preys upon an exotic species.

**2.1.2.2 direct displacement** - The species queried is physically displaced by an exotic species, either by competition or actual disturbance.

**2.1.2.3 habitat structure change** - The species queried is affected by habitat structural changes caused by an exotic species, for example, cattle grazing.

**2.1.2.4 other** - Any other effects of an exotic species on a native species (not used by panelists).

**2.2 insect population irruptions** - The species directly benefits from insect population eruptions (i.e., benefits from the insects themselves, not the resulting tree mortality or loss of foliage).

**2.2.1 mountain pine beetle** - The species directly benefits from mountain pine beetle eruptions.

**2.2.2 spruce budworm** - The species directly benefits from spruce budworm eruptions.

**2.2.3 gypsy moth** - The species directly benefits from gypsy moth eruptions.

**2.3 beaver/muskrat activity** - The results of beaver activity including dams, lodges, and ponds, that are beneficial to other species.

**2.4 burrows** - Aquatic or terrestrial cavities produced by burrowing animals that are beneficial to other species.

**3) <u>NON-VEGETATIVE, ABIOTIC, TERRESTRIAL HABITAT ELEMENTS</u>**

Non-living components found within any ecosystem. Primarily positive influences with a few exceptions as indicated.

**3.1 rocks** - Solid mineral deposits.

**3.1.1 gravel** - Particle size from 0.2 - 7.6 cm in diameter; gravel bars associated with streams and rivers are a separate category.

**3.1.2 talus** - Accumulations of rocks at the base of cliffs or steep slopes; rock/boulder sizes varied and determine what species can inhabit the spaces between them.

**3.1.3 talus-like** - Refers to areas that contain many rocks and boulders but are not associated with cliffs or steep slopes.

**3.2 soils** - Various soil characteristics.

**3.2.1 soil depth** - The distance from the top layer of the soil to the bedrock or hardpan below.

**3.2.2 soil temperature** - Any measure of soil temperature or range of temperatures that are key to the queried species.

**3.2.3 soil moisture** - The amount of water contained within the soil.

**3.2.4 soil organic matter** - The accumulation of decomposing plant and animal materials found within the soil.

**3.2.5 soil texture** - Refers to size distribution and amount of mineral particles (sand, silt, and clay) in the soil; examples are sandy clay, sandy loam, silty clay etc.

**3.3 rock substrates** - Various rock formations.

**3.3.1 avalanche chute** - An area where periodic snow or rock slides prevent the establishment of forest conditions; typically shrub and herb dominated (sitka alder and/or vine maple).

**3.3.2 cliffs** - A high, steep formation, usually of rock. Coastal cliffs are a separate category under Marine Habitat Elements.

**3.3.3 caves** - An underground chamber open to the surface with varied opening diameters and depths; includes cliff-face caves, intact lava tubes, coastal caves, and mine shafts.

**3.3.4 rocky outcrops and ridges** - Areas of exposed rock.

**3.3.5 rock crevices** - Refers to the joint spaces in cliffs, and fissures and openings

between slab rock; crevices among rocks and boulders in talus fields are a separate category (talus).

**3.3.6 barren ground** - Bare exposed soil with >40% of area not vegetated; includes mineral licks and bare agricultural fields; natural bare exposed rock is under the rocky outcrop category.

**3.3.7 playa (alkaline, saline)** - Shallow desert basins that are without natural drainage-ways where water accumulates and evaporates seasonally.

**3.4 snow** - Selected features of snow.

**3.4.1 snow depth** - Any measure of the distance between the top layer of snow and the ground below.

**3.4.2 glaciers, snow field** - Areas of permanent snow and ice.

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**4) <u>FRESHWATER RIPARIAN AND AQUATIC BODIES HABITAT ELEMENTS</u>**

Includes selected forms and characteristics of any body of freshwater.

**4.1 water characteristics** - *Includes various freshwater attributes. Ranges of continuous attributes that are key to the queried species, if known, will be in the comments.*

**4.1.1 dissolved oxygen** - Amount of oxygen passed into solution.

**4.1.2 water depth** - Distance from the surface of the water to the bottom substrate.

**4.1.3 dissolved solids** - A measure of dissolved minerals in water.

**4.1.4 water pH** - A measure of water acidity or alkalinity.

**4.1.5 water temperature** - Water temperature range that is key to the queried species, if known, is in the comments field.

**4.1.6 water velocity** - Speed or momentum of water flow.

**4.1.7 water turbidity** - Refers to the amount of roiled sediment within the water.

**4.1.8 free water** - Water derived from any source.

**4.1.9 salinity and alkalinity** - The presence of salts.

**4.2 rivers & streams** - Various characteristics of streams and rivers.

**4.2.1 oxbows** - A pond or wetland created when a river bend is cut off from the main channel of the river.

**4.2.2 order and class** - Systems of stream classification.

**4.2.2.1 intermittent** - Streams/rivers which contain non-tidal flowing water for only part of the year, water may remain in isolated pools.

**4.2.2.2 upper perennial** - Streams/rivers with a high gradient, fast water velocity, no tidal influence, some water flowing throughout the year, substrate consists of rock, cobbles, or gravel with occasional patches of sand, little floodplain development.

**4.2.2.3 lower perennial** - Streams/rivers with a low gradient, slow water velocity, no

tidal influence, some water flowing throughout the year, substrate consists mainly of sand and mud, floodplain is well developed.

**4.2.3 zone** - System of water body classification based on the horizontal strata of the water column.

**4.2.3.1 open water** - Open water areas not closely associated with the shoreline or bottom.

**4.2.3.2 submerged/benthic** - Relating to the bottom of a body of water, includes the substrate and the overlaying body of water within one meter of the substrate.

**4.2.3.3 shoreline** - Continually exposed substrate that is subject to splash, waves, and/or periodic flooding. Includes gravel bars, islands, and immediate nearshore areas.

**4.2.4 in-stream substrate** - The bottom materials in a body of water.

**4.2.4.1 rocks** - Rocks > 256 mm (10") in diameter.

**4.2.4.2 cobble/gravel** - Rocks or pebbles, 4-256 mm in diameter (10), substrata may consist of cobbles, gravel, shell, and sand with no one substratum type exceeding 70 percent cover.

**4.2.4.3 sand/mud** - Fine substrata < 4 mm in diameter, little gravel present, may be mixed with organics.

**4.2.5 vegetation** - Herbaceous plants.

**4.2.5.1 submergent vegetation** - Rooted aquatic plants that do not emerge above the water surface.

**4.2.5.2 emergent vegetation** - Rooted aquatic plants that emerge above the water surface.

**4.2.5.3 floating mats** - Un-rooted plants that form vegetative masses on the surface of the water.

**4.2.6 coarse woody debris in streams and rivers** - Any piece of woody material (debris piles, stumps, root wads, fallen trees) that intrudes into or lies within a river or stream.

**4.2.7 pools** - Portions of the stream with reduced current velocity, often with water deeper than surrounding areas.

**4.2.8 riffles** - Shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but where standing waves are absent.

**4.2.9 runs/glides** - Areas of swiftly flowing water, without surface agitation or waves, which approximates uniform flow and in which the slope of the water surface is roughly parallel to the overall gradient of the stream reach.

**4.2.10 overhanging vegetation** - Herbaceous plants that cascade over stream and river banks and are < 1 meter above the water surface.

**4.2.11 waterfalls** - Steep decent of water within a stream or river.

**4.2.12 banks** - Rising ground that borders a body of water.

**4.2.13 seeps or springs** - A concentrated flow of ground water issuing from openings in the ground.

**4.3 ephemeral pools** - Pools that contain water for only brief periods of time usually associated with periods of high precipitation.

**4.4 sand bars** - Exposed areas of sand or mud substrate.

**4.5 gravel bars** - Exposed areas of gravel substrate.

**4.6 lakes/ponds/reservoirs** - Various characteristics of lakes, ponds, and reservoirs.

**4.6.1 zone** - System of water body classification based on the horizontal strata of the water column.

**4.6.1.1 open water** - Open water areas not closely associated with the shoreline or bottom substrates.

**4.6.1.2 submerged/benthic** - Relating to the bottom of a body of water, includes the substrate and the overlaying body of water within one meter of the substrate.

**4.6.1.3 shoreline** - Continually exposed substrate that is subject to splash, waves, and/or periodic flooding. Includes gravel bars, islands, and immediate nearshore areas.

**4.6.2 in-water substrate** - The bottom materials in a body of water.

**4.6.2.1 rock** - Rocks > 256 mm (10 inches) in diameter.

**4.6.2.2 cobble/gravel** - Rocks or pebbles, 4-256 mm in diameter, substrata may consist of cobbles, gravel, shell, and sand with no one substratum type exceeding 70 percent cover.

**4.6.2.3 sand/mud** - Fine substrata < 4 mm in diameter, little gravel present, may be mixed with organics.

**4.6.3 vegetation** - Herbaceous plants.

**4.6.3.1 submergent vegetation** - Rooted aquatic plants that do not emerge above the water surface.

**4.6.3.2 emergent vegetation** - Rooted aquatic plants that emerge above the water surface.

**4.6.3.3 floating mats** - Unrooted plants that form vegetative masses on the surface of the water.

**4.6.4 size** - Refers to whether or not the species is differentially associated with water bodies based on their size.

**4.6.4.1 ponds** - <2ha

**4.6.4.2 lakes** - >=2ha

**4.7 wetlands/marshes/wet meadows/bogs and swamps** - Various components and characteristics related to any of these systems.

**4.7.1 riverine wetlands** - Wetlands found in association with rivers.

**4.7.2 context** - When checked, indicates that the setting of the wetland, marsh, wet meadow, bog or swamp is key to the queried species.

**4.7.2.1 forest** - Wetlands within a forest.

**4.7.2.2 non-forest** - Wetlands that are not surrounded by forest.

**4.7.3 size** - When checked, indicates that the queried species is differentially associated with a wetland, marsh, wet meadow, bog or swamp based on the size of the water body.

**4.7.4 marshes** - Frequently or continually inundated wetlands characterized by emergent herbaceous vegetation (grasses,sedges, reeds) adapted to saturated soil conditions.

**4.7.5 wet meadows** - Grasslands with waterlogged soil near the surface but without standing water for most of the year.

**4.8 islands** - A piece of land made up of either rock and/or unconsolidated material that projects above and is completely surrounded by water.

**4.9 seasonal flooding** - Flooding that occurs periodically due to precipitation patterns.

**5) MARINE HABITAT ELEMENTS**

Selected biotic and abiotic components and characteristics of marine systems.

**5.1 zone** - System of marine classification based on water depth, and relationship to substrate.

**5.1.1 supratidal** - The zone that extends landward from the higher high water line up to either the top of a coastal cliff or the landward limit of marine process (i.e., storm surge limit).

**5.1.2 intertidal** - The zone between the higher high water line and the lower low water line.

**5.1.3 nearshore subtidal** - The zone that extends from the lower low water line seaward to the 20 meter isobath, typically within 1 kilometer of shore.

**5.1.4 shelf** - The area between the 20 and 200 meter isobath, typically within 60 kilometers of shore.

**5.1.5 oceanic** - The zone that extends seaward from the 200 meter isobath.

**5.2 substrates** - The bottom materials in a body of water.

**5.2.1 bedrock** - The solid rock underlying surface materials.

**5.2.2 boulders** - Large, worn, rocks > 256 mm (10 inches) in diameter.

**5.2.3 hardpan** - Consolidated clays forming a substratum firm enough to support an epibenthos and too firm to support a normal infauna (clams, worms, etc.), but with an unstable surface which sloughs frequently.

**5.2.4 cobble** - Rocks or pebbles, 64-256 mm in diameter, may be a mix of cobbles, gravel, shells, and sand, with no one type exceeding 70 percent cover.

**5.2.5 mixed-coarse** - Substrata consisting of cobbles, gravel, shell, and sand with no one substratum type exceeding 70 percent cover.

**5.2.6 gravel** - Small rocks or pebbles, 4-64 mm in diameter.

**5.2.7 sand** - Fine substrata < 4 mm in diameter, little gravel present, may be mixed with

organics.

**5.2.8 mixed-fine** - Mixture of sand and mud particles < 4 mm in diameter, little gravel present.

**5.2.9 mud** - Fine substrata < 0.06 mm in diameter, little gravel present, usually mixed with organics.

**5.2.10 organic** - Substrata composed primarily of organic matter such as wood chips, leaf litter, or other detritus.

**5.3 energy** - Degree of exposure to oceanic swell, currents, and wind waves.

**5.3.1 protected** - No sea swells, little or no current, and restricted wind fetch.

**5.3.2 semi-protected** - Shorelines protected from sea swell, but may receive waves generated by moderate wind fetch, and/or moderate to weak tidal currents.

**5.3.3 partially exposed** - Oceanic swell attenuated by offshore reefs, islands, or headlands, but shoreline substantially exposed to wind waves, and/or strong to moderated tidal currents.

**5.3.4 exposed** - Highly exposed to oceanic swell, wind waves, and/or very strong currents.

**5.4 vegetation** - Includes herbaceous plants and plants lacking vascular systems.

**5.4.1 mixed macro algae** - Includes brown, green, and red algae.

**5.4.2 kelp** - Subaquatic rooted vegetation found in the nearshore marine environment.

**5.4.3 eelgrass** - Subaquatic rooted vegetation found in an estuarine environment.

**5.5 water depth** - Refers to the vertical layering of the water column.

**5.5.1 surface layer** - The uppermost part of the water column.

**5.5.1.1 tide rip** - A current of water disturbed by an opposing current, especially in tidal water or by passage over an irregular bottom.

**5.5.1.2 surface microlayer***(neuston)* - The thin uppermost layer of the water's surface.

**5.5.2 euphotic** - Upper layer of a water body that receives sufficient sunlight for the photosynthesis of plants.

**5.5.3 disphotic** - Area below the euphotic zone where photosynthesis ceases.

**5.5.4 demersal/benthic** - Submerged lands including vegetated and unvegetated areas.

**5.6 water temperature** - Measure of ocean water temperature.

**5.7 salinity** - The presence and concentration of salts; salinity range that is key to the species, if it is known, will be in the comments field. Positive or negative influences were noted.

**5.8 forms** - Morphological elements within marine areas.

**5.8.1 beach** - An accumulation of unconsolidated material (sand, gravel, angular fragments) formed by waves and wave-induced currents in the intertidal and subtidal zones.

**5.8.2 off-shore islands/rocks/sea stacks/off-shore cliffs** - A piece of land made up of either rock and/or unconsolidated material that projects above and is completely surrounded

by water at higher high water for large (spring) tide. Includes off-shore marine cliffs.

**5.8.3 marine cliffs** *(mainland)* - A sloping face steeper than 20 degrees usually formed by erosional processes and composed of either bedrock and/or unconsolidated materials.

**5.8.4 delta** - An accumulation of sand, silt, and gravel deposited at the mouth of a stream where it discharges into the sea.

**5.8.5 dune** - In a marine context; a mound or ridge formed by the transportation and deposition of wind-blown material (sand and occasionally silt).

**5.8.6 lagoon** - Shallow depression within the shore zone continuously occupied by salt or brackish water lying roughly parallel to the shoreline and separated from the open sea by a barrier.

**5.8.7 salt marsh** - A coastal wetland area which is periodically inundated by tidal brackish or salt water and which supports significant (15% cover) non-woody vascular vegetation (e.g., grasses, rushes, sedges) for at least part of the year.

**5.8.8 reef** - A rock outcrop, detached from the shore, with maximum elevations below the high-water line.

**5.8.9 tidal flat** - A level or gently sloping (less than 5 degrees) constructional surface exposed at low tide, usually consisting primarily of sand or mud with or without detritus, and resulting from tidal processes.

**5.9 water clarity** - As influenced by sediment load.

**6)** *(No Data)* - Formerly contained topographic information such as elevation that has been moved to the life history matrix.

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**7) FIRE AS A HABITAT ELEMENT**

Refers to species that benefit from fire. The time frame after which the habitat is suitable for the species, if known, will be found in the comments field.

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**8) ANTHROPOGENIC - RELATED HABITAT ELEMENTS**

This section contains selected examples of human-related Habitat Elements that may be a key part of the environment for many species. These Habitat Element's may have either a negative or positive influence on the queried species.

**8.1 campgrounds/picnic areas** - Sites developed and maintained for camping and picnicking.

**8.2 roads** - Roads that are either paved or unpaved.

**8.3 buildings** - Permanent structures.

**8.4 bridges** - Permanent structures typically over water or ravines.

**8.5 diseases transmitted by domestic animals** - Some domestic animal diseases may be a source of mortality or reduced vigor for wild species.

**8.6 animal harvest or persecution** - Includes illegal harvest/poaching, incidental take (resulting from fishing net by-catch, or by hay mowing, for example), and targeted removal for pest control.

**8.7 fences/corrals** - Wood, barbed wire, or electric fences.

**8.8 supplemental food** - Food deliberately provided for wildlife (e.g. bird feeders, ungulate feeding programs, etc.) as well as spilled or waste grain along railroads and cattle feedlots.

**8.9 refuse** - Any source of human-derived garbage (includes landfills).

**8.10. supplemental boxes, structures and platforms** - Includes bird houses, bat boxes, raptor and waterfowl nesting platforms.

**8.11 guzzlers and waterholes** - Water sources typically built for domestic animal use.

**8.12 toxic chemical use** - Proper use of regulated chemicals; documented effects only.

**8.12.1 herbicides/fungicides** - Chemicals used to kill vegetation and fungi.

**8.12.2 insecticides** - Chemicals used to kill insects.

**8.12.3 pesticides** - Chemicals used to kill vertebrate species.

**8.12.4 fertilizers** - Chemicals used to enhance vegetative growth.

**8.13 hedgerows/windbreaks** - Woody and/or shrubby vegetation either planted or that develops naturally along fencelines and field borders.

**8.14 sewage treatment ponds** - Settling ponds associated with sewage treatment plants.

**8.15 repellents** - Various methods purposely used against wildlife species that damage crops or property (excluding pesticides and insecticides).

**8.15.1 chemical** *(taste, smell, or tactile)* - Chemical substances that repel wildlife.

**8.15.2 noise or visual disturbance** - Non-chemical methods to deter wildlife.

**8.16 culverts** - Drain crossings under roads or railroads.

**8.17 irrigation ditches/canals** - Ditches built to transport water to agricultural crops or to

handle runoff.

**8.18 powerlines/corridors** - Utility lines, poles, and rights-of-way associated with transmission, telephone, and gas lines.

**8.19 pollution** - Human-caused environmental contamination.

**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**

**8.27 dredge spoil islands**

**8.28 hatchery facilities and fish**