

**Formations and Rock Types**

The maps on pages 8 and 9 depict WRB geology according to two classification systems, the more detailed *formations*, and summary categories based on the predominate rock type, called major *lithology*. The tables below, derived from a U.S. Geological Survey report <sup>27</sup> show both how the formations are grouped into rock types and how the formation names denote geological time.

The table on the facing page provides a guide to the geological time scale. Under gradual revision, the organization of geological time divisions differs between authors. According to some the divisions archean (lightest gray) and proterozoic (purple) are eras, while others use these terms together with phanerozoic to identify eons, an additional level of the irregular geochronological hierarchy placed higher than all others. Note that the proterozoic is coterminous with the precambrian era, and that the phanerozoic is simply all time since then. The estimated time before the present of each level of the hierarchy is shown.

**Glossary of Geological Terms**

**Aggregate:** A grouping of crystals. Aggregates are defined by the ways crystals are clustered together.

**Alkaline:** Term pertaining to a highly basic, as opposed to acidic, substance. For example, hydroxide or carbonate of sodium or potassium.

**Argillaceous:** Composed mostly of clay.

**Carbonate:** Sediment, or rocks formed by sediment, derived from the precipitation of calcium, magnesium, or iron carbonates. For example, limestone or dolomite.

**Clast:** An individual grain or constituent of a rock.

**Clay:** A mixture of very fine grains of **micaceous** substances. Clay is plastic when wet and hardens when heated. It consists mainly of hydrous aluminum silicates.

**Conglomerate:** A coarse-grained sedimentary rock, with **clasts** larger than 2 mm.

**Eugeosyncline:** A “true” syncline, a term used to explain mountain building in terms of continental-edge sediment deposition and uplift.

**Felsic:** Term used to describe the amount of light-colored feldspar and silica minerals in an **igneous** rock. Complement of **mafic**.

**Gneiss:** Banded or layered metamorphic rock, similar in composition to **granite**.

**Granite:** Highly **felsic igneous plutonic** rock, typically light in color; rough **plutonic** equivalent of **rhyolite**. Granite is actually quite rare in the U.S.; often the term is applied to any quartz-bearing **plutonic** rock.

**Igneous:** Any rock solidified from molten or partly molten material.

**Loess:** Fine grained, gray-brown very fertile, primarily wind-blown loam.

**Mafic:** Term used to describe the amount of dark-colored iron and magnesium minerals in an **igneous** rock. Complement of **felsic**.

**Metamorphic:** Secondary rock that formed from an original rock, through heat or pressure.

**Micaceous:** Aggregate of compact, flat, parallel, flexible, and peelable sheets.

**Phyllosilicate:** Group of silicate minerals that have each set of tetrahedrons surrounded by three oxygen atoms, forming a sheet-like structure.

**Plutonic:** Applies to **igneous** rocks formed beneath the surface of the Earth; typically with large crystals due to the slowness of cooling. Antonym of **volcanic**.

**Pyroclastic:** Pyroclastic material is another name for a cloud of ash, lava fragments carried through the air, and vapor. Such a flow is usually hot, 800 deg F (400 deg C), and moves rapidly, 60 mph (100 km/hr), under its own power due to bouyancy provided by the vapors.

**Rhyolite:** Highly **felsic igneous** volcanic rock, typically light in color; rough volcanic equivalent of **granite**.

**Sandstone:** Sedimentary rock composed of sand-sized **clasts**.

**Shale:** A fine grained, thinly bedded sedimentary rock formed primarily from the compaction of clay.

**Tuff:** Porous **igneous** rock composed of compacted **volcanic** ash.

**Volcanic:** Applies to **igneous** rocks that cool on the surface of the Earth, including beneath water; typically with small crystals, due to the rapidity of cooling. Antonym of **plutonic**.

Oregon Formations	Rock Type (Major Lithology)
Qal, Qf, Qgf, Qgs, Qpl, Qt, QTg	Alluvium
Qd	Dune sand
Ql	Loess
Qs	Lake sediments
Qls	Landslide
Qg	Glacial drift
QTs, Tct, Tss, Js, Jss, JTRs, TRs	Shale and mudstone
TRPZs	Argillite and slate
Tts, QTst	Tuff
Ta, Tcss, Tms, Tmsc, Tsd, Ty	Siltstone
Tco, Tfe, Tm, Tmsm, Tmss, Tmst, Ts, Tsm, Tt, Tyq, Kc, Ks, KJds, Jop	Sandstone
Tn, KJm	Conglomerate
TRPZsn, PZs	Carbonate
Tfee, Tsfj, Jm, JTRsv, PZsv	Mixed eugeosynclinal rocks
cm, cs	Phyllite and schist
TRsv, TRPsv, TRPZm, Psv, mr	Interlayered meta-sediment
Qmp, Qma, Tat, Tlf, Trh, Tsf, Twt, Tvs	Felsic Pyroclastics
Qrd, QTvs, Tr, Tsv	Felsic volcanic flows
Qa, Qba, Tas, Tbaa, Tbas, Tca, Tfc, Tut, Tu, Tus, Jv	Calc-alkaline volcanic rocks
TRPv	Calc-alkaline meta-volcanics
QTMv, QTP, QTps, QTvm, Tp, Tps, Tvm	Mafic Pyroclastics
Qb, Qlb, Qyb, QTa, QTb, QTba, QTib, Tb, Tba, Tc, Tcg, Tci, Tcp, Tcs, Tcw, Tfeb, Tig, Tob, Tpb, Trb, Tsf, Tsr, Tstv, Ttv, Tub, Tvm, KJdv, Jub	Mafic volcanic flows
TRv	Greenstone
Tia	Alkalic bodies
KJg, KJi, JTRgd	Calc-alkaline intrusive rock
Thi, Ti, Tib, Tmv, Tvi, Tim, KJgu, Jc, TRPZg	Mafic intrusive rocks
Ju, TRPZu	Ultramafic rocks
bc, mc	Mafic gneiss

Table 51. Formations and major lithology group

Geologic Time	Map Symbols	ASCII* text
Cenozoic	Cz	CZ
Quaternary	Q	Q
Holocene	Q, Qr	Q, Qr
Pleistocene	Q, Qp	Q, QP
Tertiary	T	T
Pliocene	P, Tp	PL, Tp
Miocene	M, Tm	MI, Tm
Oligocene	Ø, To	OL, To
Eocene	E, Te	E, Te
Paleocene	Ep, pE	E, Te
Mesozoic	Mz	MZ
Cretaceous	K	K
Jurassic	J	J
Triassic	Tr	TR
Paleozoic	Pz	PZ
Permian	P	P
Carboniferous	C	PNM
Pennsylvanian	P	PN
Mississippian	M	M
Devonian	D	D
Silurian	S	S
Ordovician	O	O
Cambrian	C	C
Precambrian	pC	pC
Proterozoic	P	PR
Proterozoic Z	Z	Z
Proterozoic Y	Y	Y
Proterozoic X	X	X
Archean	W	W

Table 52. Geological time symbols

\* American Standard Code for Information Interchange. The standard system used in digital communication to assign identifying numeric codes to symbols and device control signals.

Era / Eon	Period	Epoch	Beginning, Years Before Present	Derivation		
Cenozoic			65 million	The Paleo, Meso, and Cenozoic are time divisions based on the characterization of animals. Birds, insects, mammals, and angiosperms (anthophyta) predominate in the Cenozoic.		
	Quaternary			1.8 million	The several geologic <i>eras</i> were originally named Primary, Secondary, Tertiary, and Quaternary. The first is no longer used; Tertiary and Quaternary have been retained, but used as <i>periods</i> .	
		Holocene			10 thousand	The "recent." Time since the last ice age.
		Pleistocene			1.8 million	The "most recent." Cycles of glacial advance and retreat, sea level rises and falls, landform connections appear and disappear.
	Tertiary			65 million		
		Pliocene			5 million	The "very recent." General climatic cooling; hominids appear in geologic record.
		Miocene			23 million	The "moderately recent." Grazing animals fill a new niche created by grasses proliferating in the Oligocene.
		Oligocene			34 million	The "slightly recent." A period of global cooling begins, although climate is generally warm; rapid mammalian diversification.
		Eocene			55 million	The "dawn of the present." Grasses first appear, as do most mammalian orders.
		Paleocene			65 million	The "early dawn of the present." Evolution is influenced by the disappearance of dinosaurs, and the possibly catastrophic events that caused it. Early primates appear.
Mesozoic			250 million	The "Age of Dinosaurs." Ends with mass extinctions.		
	Cretaceous			141 million	Flowering plants and first placental mammals appear, angiosperm forests spread globally. Derived from Latin word for chalk ( <i>creta</i> ), and first applied to extensive deposits forming white cliffs along the English Channel.	
	Jurassic			202 million	First appearance of mammals and giant dinosaurs. Named for the Jura Mountains between France and Switzerland.	
	Triassic			250 million	Conifers (gymnosperms) predominate, dinosaurs first appear. Taken from the word <i>trias</i> in recognition of the threefold character of these rocks in Europe.	
Paleozoic			544 million	Complex life prior to dinosaurs; ends with a global episode of mass extinctions.		
	Permian			290 million	All land masses joined in Pangea; 96% of all species disappear coincident with the collision of a large object with the earth. Named after the province of Perm, U.S.S.R., where these rocks were first studied.	
	Pennsylvanian			323 million	Together, the Pennsylvanian and Mississippian are called the Carboniferous due to the presence of coal deposits found in these locales.	
	Mississippian			363 million	Conifers first appear.	
	Devonian			409 million	Amphibians, bony fish, and terrestrial plants appear. Named for Devonshire, England, where these rocks were first studied.	
	Silurian			439 million	First terrestrial invertebrates appear. Named after Celtic tribes, the Silures and (below) the Ordovices living in Wales during the Roman conquest.	
	Ordovician			510 million	Invertebrates predominate, but vertebrates appear.	
	Cambrian			544 million	Complex, multicellular life first appears; all basic body plans appear. Taken from the Roman name for Wales (Cambria).	
Proterozoic / Precambrian			2.5 billion	The time at which complex, unicellular life, including nucleated, sexually reproducing protozoa begin to appear in the geologic record. The capacity of oceanic iron to sequester microbially produced oxygen is exhausted, atmospheric oxygen rises.		
Archaean			3.8 billion	The age of the earliest strong evidence of life - cyanobacteria. All basic metabolic pathways develop.		
Hadean			4.5 billion	The estimated time when the planet first formed. Not a <i>geological</i> time division in that no stratigraphic examples remain. Sun is 17% dimmer, days are 18 hrs. long.		

Table 53. Geological time scale

# Terrestrial Vertebrate Species List

Common Name	Scientific Name	Origin	G-rank	S-rank	Common Name	Scientific Name	Origin	G-rank	S-rank
<b>Amphibians</b>					<b>Birds (continued)</b>				
Northwestern Salamander	<i>Ambystoma gracile</i>	N	G5	S5	Anna's Hummingbird	<i>Calypte anna</i>	N	G5	S4?
Long-Toed Salamander	<i>Ambystoma macrodactylum</i>	N	G5	S5	Rufous Hummingbird	<i>Selasphorus rufus</i>	N	G5	S4
Clouded Salamander	<i>Aneides ferreus</i>	N	G4	S4	Belted Kingfisher	<i>Ceryle alcyon</i>	N	G5	S4
Oregon Slender Salamander	<i>Batrachoseps wrighti</i>	N	G3	S3	Lewis' Woodpecker	<i>Melanerpes lewis</i>	E	G5	S4
Ensatina	<i>Ensatina eschscholtzii</i>	N	G5	S5	Acorn Woodpecker	<i>Melanerpes formicivorus</i>	N	G5	S3?
Dunn's Salamander	<i>Plethodon dunni</i>	N	G4	S4	Red-Breasted Sapsucker	<i>Sphyrapicus ruber</i>	N	G5	S4
Western Red-Backed Salamander	<i>Plethodon vehiculum</i>	N	G5	S5	Downy Woodpecker	<i>Picoides pubescens</i>	N	G5	S4
Roughskin Newt	<i>Taricha granulosa</i>	N	G5	S5	Hairy Woodpecker	<i>Picoides villosus</i>	N	G5	S4
Pacific Giant Salamander	<i>Dicamptodon tenebrosus</i>	N	G5	S4	Black-Backed Woodpecker	<i>Picoides arcticus</i>	N	G5	S3
Southern Torrent Salamander	<i>Rhyacotriton variegatus</i>	N	G3	S3	Northern Flicker	<i>Colaptes auratus</i>	N	G5	S5
Cascade Torrent Salamander	<i>Rhyacotriton cascadae</i>	N	G3	S3	Pileated Woodpecker	<i>Dryocopus pileatus</i>	N	G5	S4?
Tailed Frog	<i>Ascaphus truei</i>	N	G4	S3	Olive-Sided Flycatcher	<i>Contopus cooperi</i>	N	G5	S4
Western Toad	<i>Bufo boreas</i>	N	G4	S4	Western Wood-Pewee	<i>Contopus sordidulus</i>	N	G5	S4
Pacific Treefrog	<i>Pseudacris regilla</i>	N	G5	S5	Willow Flycatcher	<i>Empidonax traillii</i>	N	G5	S4
Red-Legged Frog	<i>Rana aurora</i>	N	G4T4	S3S4	Hammond's Flycatcher	<i>Empidonax hammondii</i>	N	G5	S4
Foothill Yellow-Legged Frog	<i>Rana boylei</i>	N	G3	S3?	Dusky Flycatcher	<i>Empidonax oberholseri</i>	N	G5	S4
Cascades Frog	<i>Rana cascadae</i>	N	G4	S3	Pacific-Slope Flycatcher	<i>Empidonax difficilis</i>	N	G5	S4
Bullfrog	<i>Rana catesbeiana</i>	I	G5	SE	Western Kingbird	<i>Tyrannus verticalis</i>	N	G5	S5
Oregon Spotted Frog	<i>Rana pretiosa</i>	N	G2G3	S2	Horned Lark	<i>Eremophila alpestris</i>	N	G5	S5
<b>Birds</b>					Purple Martin	<i>Progne subis</i>	N	G5	S3B
Pied-Billed Grebe	<i>Podilymbus podiceps</i>	N	G5	S5	Tree Swallow	<i>Tachycineta bicolor</i>	N	G5	S5
Western Grebe	<i>Aechmophorus occidentalis</i>	N	G5	S4?	Violet-Green Swallow	<i>Tachycineta thalassina</i>	N	G5	S5
American Bittern	<i>Botaurus lentiginosus</i>	N	G4	S4	Northern Rough-Winged Swallow	<i>Stelgidopteryx serripennis</i>	N	G5	S4
Great Blue Heron	<i>Ardea herodias</i>	N	G5	S4	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	N	G5	S5
Green Heron	<i>Butorides virescens</i>	N	G5	S4	Barn Swallow	<i>Hirundo rustica</i>	N	G5	S5
Black-Crowned Night-Heron	<i>Nycticorax nycticorax</i>	E	G5	S4	Gray Jay	<i>Perisoreus canadensis</i>	N	G5	S4
Canada Goose	<i>Branta canadensis</i>	N	G5	S5	Steller's Jay	<i>Cyanocitta stelleri</i>	N	G5	S5
Wood Duck	<i>Aix sponsa</i>	N	G5	S4	Western Scrub-Jay	<i>Aphelocoma californica</i>	N	G5	S5
Green-Winged Teal	<i>Anas crecca</i>	N	G5	S5	Clark's Nutcracker	<i>Nucifraga columbiana</i>	N	G5	S4
Mallard	<i>Anas platyrhynchos</i>	N	G5	S5	American Crow	<i>Corvus brachyrhynchos</i>	N	G5	S5
Northern Pintail	<i>Anas acuta</i>	N	G5	S5	Common Raven	<i>Corvus corax</i>	N	G5	S4
Blue-Winged Teal	<i>Anas discors</i>	N	G5	S4	Black-Capped Chickadee	<i>Poecile atricapillus</i>	N	G5	S5
Cinnamon Teal	<i>Anas cyanoptera</i>	N	G5	S5	Mountain Chickadee	<i>Poecile gambeli</i>	N	G5	S4
Northern Shoveler	<i>Anas clypeata</i>	N	G5	S5	Chestnut-Backed Chickadee	<i>Poecile rufescens</i>	N	G5	S5
Ring-Necked Duck	<i>Aythya collaris</i>	N	G5	S3	Bushtit	<i>Psaltriparus minimus</i>	N	G5	S5
Harlequin Duck	<i>Histrionicus histrionicus</i>	N	G4	S2B;S3N	Red-Breasted Nuthatch	<i>Sitta canadensis</i>	N	G5	S5
Barrow's Goldeneye	<i>Bucephala islandica</i>	N	G5	S3B;S3N	White-Breasted Nuthatch	<i>Sitta carolinensis</i>	N	G5	S4
Bufflehead	<i>Bucephala albeola</i>	N	G5	S2B;S5N	Brown Creeper	<i>Certhia americana</i>	N	G5	S4
Hooded Merganser	<i>Lophodytes cucullatus</i>	N	G5	S4	Rock Wren	<i>Salpinctes obsoletus</i>	N	G5	S5
Common Merganser	<i>Mergus merganser</i>	N	G5	S4	Bewick's Wren	<i>Thryomanes bewickii</i>	N	G5	S4
Ruddy Duck	<i>Oxyura jamaicensis</i>	N	G5	S4	House Wren	<i>Troglodytes aedon</i>	N	G5	S4
Turkey Vulture	<i>Cathartes aura</i>	N	G5	S5	Winter Wren	<i>Troglodytes troglodytes</i>	N	G5	S4
California Condor	<i>Gymnogyps californianus</i>	E	G1	SX	Marsh Wren	<i>Cistothorus palustris</i>	N	G5	S5
Osprey	<i>Pandion haliaetus</i>	N	G5	S4	American Dipper	<i>Cinclus mexicanus</i>	N	G5	S4
White-Tailed Kite	<i>Elanus caeruleus</i>	N	G5	S1B;S3N	Golden-Crowned Kinglet	<i>Regulus satrapa</i>	N	G5	S4
Bald Eagle	<i>Haliaeetus leucocephalus</i>	N	G4	S3B;S4N	Western Bluebird	<i>Sialia mexicana</i>	N	G5	S4B;S4N
Northern Harrier	<i>Circus cyaneus</i>	N	G5	S5	Townsend's Solitaire	<i>Myadestes townsendi</i>	N	G5	S4
Sharp-Shinned Hawk	<i>Accipiter striatus</i>	N	G5	S4	Swainson's Thrush	<i>Catharus ustulatus</i>	N	G5	S5
Cooper's Hawk	<i>Accipiter cooperii</i>	N	G5	S4	Hermit Thrush	<i>Catharus guttatus</i>	N	G5	S4
Northern Goshawk	<i>Accipiter gentilis</i>	N	G5	S3	American Robin	<i>Turdus migratorius</i>	N	G5	S5
Red-Shouldered Hawk	<i>Buteo lineatus</i>	N	G5	S3N	Varied Thrush	<i>Ixoreus naevius</i>	N	G5	S4
Red-Tailed Hawk	<i>Buteo jamaicensis</i>	N	G5	S5	Wrentit	<i>Chamaea fasciata</i>	N	G5	S5
Golden Eagle	<i>Aquila chrysaetos</i>	N	G5	S4	Cedar Waxwing	<i>Bombycilla cedrorum</i>	N	G5	S5
American Kestrel	<i>Falco sparverius</i>	N	G5	S5	European Starling	<i>Sternus vulgaris</i>	I	G5	SE
Peregrine Falcon	<i>Falco peregrinus anatum</i>	N	G4T3	S1B	Cassin's Vireo	<i>Vireo solitarius</i>	N	G5	S4?
Ring-Necked Pheasant	<i>Phasianus colchicus</i>	I	G5	SE	Hutton's Vireo	<i>Vireo huttoni</i>	N	G5	S4
Blue Grouse	<i>Dendragapus obscurus</i>	N	G5	S4	Warbling Vireo	<i>Vireo gilvus</i>	N	G5	S5
Ruffed Grouse	<i>Bonasa umbellus</i>	N	G5	S4?	Red-Eyed Vireo	<i>Vireo olivaceus</i>	N	G5	S4
Wild Turkey	<i>Meleagris gallopavo</i>	I	G5	SE	Orange-Crowned Warbler	<i>Vermivora celata</i>	N	G5	S5
California Quail	<i>Callipepla californica</i>	I	G5	S4SE	Nashville Warbler	<i>Vermivora ruficapilla</i>	N	G5	S4?
Mountain Quail	<i>Oreortyx pictus</i>	N	G5	S4?	Yellow Warbler	<i>Dendroica petechia</i>	N	G5	S4
Virginia Rail	<i>Rallus limicola</i>	N	G5	S4	Yellow-Rumped Warbler	<i>Dendroica coronata</i>	N	G5	S5
Sora	<i>Porzana carolina</i>	N	G5	S4	Black-Throated Gray Warbler	<i>Dendroica nigrescens</i>	N	G5	S5
American Coot	<i>Fulica americana</i>	N	G5	S5	Townsend's Warbler	<i>Dendroica townsendi</i>	N	G5	S4
Killdeer	<i>Charadrius vociferus</i>	N	G5	S5	Hermit Warbler	<i>Dendroica occidentalis</i>	N	G5	S4
Spotted Sandpiper	<i>Actitis macularia</i>	N	G5	S4	Macgillivray's Warbler	<i>Oporornis tolmiei</i>	N	G5	S4
Common Snipe	<i>Gallinago gallinago</i>	N	G5	S4	Common Yellowthroat	<i>Geothlypis trichas</i>	N	G5	S5
Wilson's Phalarope	<i>Phalaropus tricolor</i>	N	G5	S4	Wilson's Warbler	<i>Wilsonia pusilla</i>	N	G5	S5
Black Tern	<i>Chlidonias niger</i>	N	G5	S3B	Yellow-Breasted Chat	<i>Icteria virens</i>	N	G5	S4?
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	N	G3G4	S2	Western Tanager	<i>Piranga ludoviciana</i>	N	G5	S4
Rock Dove	<i>Columba livia</i>	I	G5	SE	Black-Headed Grosbeak	<i>Pheucticus melanocephalus</i>	N	G5	S5
Band-Tailed Pigeon	<i>Columba fasciata</i>	N	G5	S4	Lazuli Bunting	<i>Passerina amoena</i>	N	G5	S4
Mourning Dove	<i>Zenaidura macroura</i>	N	G5	S5	Spotted Towhee	<i>Pipilo maculatus</i>	N	G5	S5
Yellow-Billed Cuckoo	<i>Coccyzus americanus</i>	E	G5	S1	Chipping Sparrow	<i>Spizella passerina</i>	N	G5	S4
Barn Owl	<i>Tyto alba</i>	N	G5	S4?	Vesper Sparrow	<i>Poocetes gramineus</i>	N	G5	S4B
Western Screech-Owl	<i>Otus kennicottii</i>	N	G5	S4?	Lark Sparrow	<i>Chondestes grammacus</i>	N	G5	S4
Great Horned Owl	<i>Bubo virginianus</i>	N	G5	S5	Savannah Sparrow	<i>Passerculus sandwichensis</i>	N	G5	S5
Northern Pygmy-Owl	<i>Glaucidium gnoma</i>	N	G5	S4?	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	N	G5	S2?B
Spotted Owl	<i>Strix occidentalis caurina</i>	N	G3T3	S3	Fox Sparrow	<i>Passerella iliaca</i>	N	G5	S4
Barred Owl	<i>Strix varia</i>	N	G5	SU	Song Sparrow	<i>Melospiza melodia</i>	N	G5	S5
Great Gray Owl	<i>Strix nebulosa</i>	N	G5	S4	Lincoln's Sparrow	<i>Melospiza lincolni</i>	N	G5	S4
Long-Eared Owl	<i>Asio otus</i>	N	G5	S4?	White-Crowned Sparrow	<i>Zonotrichia leucophrys</i>	N	G5	S5
Short-Eared Owl	<i>Asio flammeus</i>	N	G5	S4?	Dark-Eyed Junco	<i>Junco hyemalis</i>	N	G5	S5
Northern Saw-Whet Owl	<i>Aegolius acadicus</i>	N	G5	S4?	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	N	G5	S5
Common Nighthawk	<i>Chordeiles minor</i>	N	G5	S5	Western Meadowlark	<i>Sturnella neglecta</i>	N	G5	S4
Black Swift	<i>Cypseloides niger</i>	N	G4	S1B;S3?N	Yellow-Headed Blackbird	<i>Xanthocephalus</i>	N	G5	S5
Vaux's Swift	<i>Chaetura vauxi</i>	N	G5	S5	Brewer's Blackbird	<i>xanthocephalus</i>	N	G5	S5
					Brown-Headed Cowbird	<i>Euphagus cyanocephalus</i>	N	G5	S5

# APPENDICES

Common Name	Scientific Name	Origin	G-rank	S-rank	Common Name	Scientific Name	Origin	G-rank	S-rank
<b>Birds (continued)</b>					<b>Mammals (continued)</b>				
Bullock's Oriole	<i>Icterus galbula</i>	N	G5	SA	Lynx	<i>Lynx canadensis</i>	N	G5	S1
Purple Finch	<i>Carpodacus purpureus</i>	N	G5	S4	Bobcat	<i>Lynx rufus</i>	N	G5	S4
House Finch	<i>Carpodacus mexicanus</i>	N	G5	S5	Elk	<i>Cervus elaphus</i>	N	G5	S5
Red Crossbill	<i>Loxia curvirostra</i>	N	G5	S4	Black-Tailed Deer	<i>Odocoileus hemionus</i>	N	G5	S5
Pine Siskin	<i>Carduelis pinus</i>	N	G5	S5	<b>Reptiles</b>				
Lesser Goldfinch	<i>Carduelis psaltria</i>	N	G5	S4	Painted Turtle	<i>Chrysemys picta</i>	N	G5	S2
American Goldfinch	<i>Carduelis tristis</i>	N	G5	S4	Western Pond Turtle	<i>Clemmys marmorata</i>	N	G3	S3
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	N	G5	S5	Northern Alligator Lizard	<i>Elgaria coerulea</i>	N	G5	S5
House Sparrow	<i>Passer domesticus</i>	I	G5	SE	Southern Alligator Lizard	<i>Elgaria multicarinata</i>	N	G5	S5
<b>Mammals</b>					Western Fence Lizard	<i>Sceloporus occidentalis</i>	N	G5	S5
Virginia Opossum	<i>Didelphis virginiana</i>	I	G5	SE	Western Skink	<i>Eumeces skiltonianus</i>	N	G5	S5
Vagrant Shrew	<i>Sorex vagrans</i>	N	G5	S4	Rubber Boa	<i>Charina bottae</i>	N	G5	S4
Pacific Shrew	<i>Sorex pacificus</i>	N	G3G4	S3S4	Racer	<i>Coluber constrictor</i>	N	G5	S4?
Water Shrew	<i>Sorex palustris</i>	N	G5	S4	Sharptail Snake	<i>Contia tenuis</i>	N	G5	S3
Pacific Water Shrew	<i>Sorex bendirii</i>	N	G4	S4	Ringneck Snake	<i>Diadophis punctatus</i>	N	G5	S4?
Trowbridge's Shrew	<i>Sorex trowbridgii</i>	N	G5	S4	Gopher Snake	<i>Pituophis catenifer</i>	N	G5	S5
Baird's Shrew	<i>Sorex bairdi</i>	N	G4	SU	Western Terrestrial Garter Snake	<i>Thamnophis elegans</i>	N	G5	S5
Fog Shrew	<i>Sorex sonomae</i>	N	G5	SU	Northwestern Garter Snake	<i>Thamnophis ordinoides</i>	N	G5	S5
Shrew-Mole	<i>Neurotrichus gibbsii</i>	N	G5	S4	Common Garter Snake	<i>Thamnophis sirtalis</i>	N	G5	S5
Townsend's Mole	<i>Scapanus townsendii</i>	N	G5	S4	Western Rattlesnake	<i>Crotalus viridis</i>	N	G5	S4
Coast Mole	<i>Scapanus orarius</i>	N	G5	S5?	<hr/>				
Little Brown Myotis	<i>Myotis lucifugus</i>	N	G5	S4	<b>Origin Definitions</b>				
Yuma Myotis	<i>Myotis yumanensis</i>	N	G5	S3	Species are classified as native, introduced, or extirpated (in the Basin). See pp. 46, 47 for a more complete explanation.				
Long-Eared Myotis	<i>Myotis evotis</i>	N	G5	S3	N = Native				
Fringed Myotis	<i>Myotis thysanodes</i>	N	G5	S3	I = Introduced				
Long-Legged Myotis	<i>Myotis volans</i>	N	G5	S3	E = Extirpated				
California Myotis	<i>Myotis californicus</i>	N	G5	S4	<b>Conservation Status Rank Definitions (G-rank and S-rank)</b>				
Silver-Haired Bat	<i>Lasionycteris noctivagans</i>	N	G5	S4?	The Nature Conservancy and the Oregon Natural Heritage Program use global (G-rank) and state (S-rank) designations, respectively, to characterize species according to their conservation needs. The primary criterion for ranking species is the number of known distinct occurrences. Also, the total number of individuals at each occurrence is important. Other considerations may include trends in numbers of individuals, the condition of the individuals, the number of protected occurrences, or the status of habitat. For a more complete discussion including overall range, population trends, threats, inherent fragility, and protection status, see: L. L. Master, 1991, Assessing threats and setting priorities for conservation, <i>Conservation Biology</i> 5:559-63. The global and state ranks are defined in parallel, except that the state ranks define the status within Oregon. In addition there are several ranks that are only relevant at the state level. Also see Figure 65, p.47.				
Big Brown Bat	<i>Eptesicus fuscus</i>	N	G5	S4	GX = Presumed Extinct                      SX = Apparently Extirpated				
Hoary Bat	<i>Lasiurus cinereus</i>	N	G5	S4?	Believed to be extinct throughout its range globally or within the state. Not located despite intensive searches and virtually no likelihood that it will be rediscovered (if globally extinct).				
Townsend's Big-Eared Bat	<i>Corynorhinus townsendii</i>	N	G4T3T	S3	GH = Possibly Extinct                      SH = Historically Known but not Verified Recently				
Pallid Bat	<i>Antrozous pallidus</i>	N	4	S3	Known only from historical occurrences. Still some hope of rediscovery.				
Brazilian Free-Tailed Bat	<i>Tadarida brasiliensis</i>	N	G5	S2	G1 = Critically Imperiled                      S1 = Extremely Rare				
Pika	<i>Ochotona princeps</i>	N	G5	S4?	Critically imperiled globally, or extremely rare in state, because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (< 1,000).				
Brush Rabbit	<i>Sylvilagus bachmani</i>	N	G5	S5	G2 = Imperiled                                      S2 = Very Rare				
Eastern Cottontail	<i>Sylvilagus floridanus</i>	I	G5	SE	Imperiled globally, or very rare in state, because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000).				
Snowshoe Hare	<i>Lepus americanus</i>	N	G5	S4	G3 = Vulnerable                                      S3 = Rare to Uncommon				
Black-Tailed Jackrabbit	<i>Lepus californicus</i>	N	G5	S4	Vulnerable globally, or rare in state, either because very rare and local throughout its range, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.				
Mountain Beaver	<i>Aplodontia rufa</i>	N	G5	S4	G4 = Apparently Secure                      S4 = Common				
Townsend's Chipmunk	<i>Tamias townsendii</i>	N	G5	S4	Uncommon but not rare globally, or common in state, and usually widespread. Possibly cause for long-term concern. Typically more than 100 occurrences or more than 10,000 individuals.				
California Ground Squirrel	<i>Spermophilus beecheyi</i>	N	G5	S5	G5 = Secure    S5 = Very Common				
Golden-Mantled Ground Squirrel	<i>Spermophilus lateralis</i>	N	G5	S4	Common, typically widespread and abundant. No conservation concern.				
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	I	G5	SE	G#G# = Range Rank                                      #S# = Range Rank				
Western Gray Squirrel	<i>Sciurus griseus</i>	N	G5	S4?	A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a taxon.				
Eastern Fox Squirrel	<i>Sciurus niger</i>	I	G5	SE	GU = Unrankable                                      SU = Status Uncertain				
Douglas' Squirrel	<i>Tamiasciurus douglasii</i>	N	G5	S5	Currently unrankable due to lack of available information about status or trends.				
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	N	G5	S4	G? = Unranked    S? = Unranked				
Western Pocket Gopher	<i>Thomomys mazama</i>	N	G5	S?	Rank not yet assessed.				
Camas Pocket Gopher	<i>Thomomys bulbivorus</i>	N	G4G5	S4	? = Inexact numeric rank				
American Beaver	<i>Castor canadensis</i>	N	G4	S5	Following a numerical rank, denotes some uncertainty in the rank.				
Deer Mouse	<i>Peromyscus maniculatus</i>	N	G5	S5	T = Intraspecific Taxon (trinomial)				
Dusky-Footed Woodrat	<i>Neotoma fuscipes</i>	N	G5	S4	The status of intraspecific taxa (subspecies or varieties) are indicated by a T-rank following the species' global rank. Rules for assigning T ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.				
Bushy-Tailed Woodrat	<i>Neotoma cinerea</i>	N	G5	S5	SE = Established exotic				
Western Red-Backed Vole	<i>Clethrionomys californicus</i>	N	G5	S4	May be native elsewhere in North America.				
White-Footed Vole	<i>Phenacomys albipes</i>	N	G5	S3	SA = Accidental				
Red Tree Vole	<i>Phenacomys longicaudus</i>	N	G3G4	S4	Normal range is not in state.				
California Vole	<i>Microtus californicus</i>	N	G4	S4	S_B = Breeding				
Townsend's Vole	<i>Microtus townsendii</i>	N	G5	S4	Rank for the breeding populations of the species, usually for migratory birds.				
Long-Tailed Vole	<i>Microtus longicaudus</i>	N	G5	S5	S_N = Non-breeding				
Creeping Vole	<i>Microtus oregoni</i>	N	G5	S4	Rank for the non-breeding populations of the species, usually for migratory birds.				
Gray-Tailed Vole	<i>Microtus canicaudus</i>	N	G5	S4					
Water Vole	<i>Microtus richardsoni</i>	N	G4	S4					
Muskkrat	<i>Ondatra zibethicus</i>	N	G5	S5					
Black Rat	<i>Rattus rattus</i>	I	G5	SE					
Norway Rat	<i>Rattus norvegicus</i>	I	G5	SE					
House Mouse	<i>Mus musculus</i>	I	G5	SE					
Pacific Jumping Mouse	<i>Zapus trinotatus</i>	N	G5	S4					
Common Porcupine	<i>Erethizon dorsatum</i>	N	G5	S5					
Nutria	<i>Myocastor coypus</i>	I	G5	SE					
Coyote	<i>Canis latrans</i>	N	G5	S5					
Gray Wolf	<i>Canis lupus</i>	E	G5	SX					
Red Fox	<i>Vulpes vulpes</i>	I	G4	S4?					
Gray Fox	<i>Urocyon cinereoargenteus</i>	N	G5	S4					
Black Bear	<i>Ursus americanus</i>	N	G5	S4					
Grizzly Bear	<i>Ursus arctos</i>	E	G5	SX					
Raccoon	<i>Procyon lotor</i>	N	G	S5					
American Marten	<i>Martes americana</i>	N	G5	S3					
Fisher	<i>Martes pennanti</i>	N	G5	S2					
Ermine	<i>Mustela erminea</i>	N	G5	S5					
Long-Tailed Weasel	<i>Mustela frenata</i>	N	G5	S5					
Mink	<i>Mustela vison</i>	N	G5	S5					
Wolverine	<i>Gulo gulo</i>	N	G5	S2					
Western Spotted Skunk	<i>Spilogale gracilis</i>	N	G4	S4					
Striped Skunk	<i>Mephitis mephitis</i>	N	G5	S5					
Northern River Otter	<i>Lutra canadensis</i>	N	G5	S4?					
Mountain Lion	<i>Felis concolor</i>	N	G5	S4?					
Feral House Cat	<i>Felis catus</i>	I	G5	SE					

Species are listed in taxonomic order as determined by the Association for Biodiversity Information based on their review of the literature published by specialists in different taxonomic groups. The sources for the taxonomy and additional information can be found at [http://www.abi.org/datasets\\_zoo/overview.htm](http://www.abi.org/datasets_zoo/overview.htm) and <http://www.natureserve.org/classani.htm>.

The following is a classification of “presettlement” vegetation for the Willamette Basin. Vegetation types are defined and a description is provided of the species in each plant community. This table was prepared by the Oregon Natural Heritage Program and The Nature Conservancy of Oregon (July 17, 2000). More detailed descriptions of these plant communities (including understory species composition) may be obtained from ONHP/TNC.

Major Structural Classification	Abbreviation	Plant Species in Association
HERBACEOUS UPLANDS	EF	Fern openings or hillsides in forest, woodland or savanna. No trees.
CLOSED FOREST: UPLAND	FD	Lodgepole pine forest.
	FED	Low to mid-elevation mix of (1) xeric Douglas fir-chinquapin-madrone on S to W slopes, and ridgetops, and (2) more mesic Douglas fir-red cedar-hemlock forest on N slopes and bottoms.
	FEDBu	FED, but burned, often with scattered trees surviving fire.
	FF	Douglas fir forest, often with bigleaf maple, red alder, ash, grand fir. No other conifers or oak.
	FFBu	FF, but burned, often with scattered trees surviving fire. May include alder or willow.
	FFHA	As in FFHC, with silver or noble fir. No spruce.
	FFHC	Mesic mixed conifer forest. May include Douglas fir, western hemlock, red cedar, grand fir. No ash, black oak, silver or noble fir or pine.
	FFHCBu	FFHC, but burned, often with scattered trees surviving fire. May have grass, and blackberries or raspberries.
	FFHCSt	FFHC, but storm-damaged (broken limbs, bent trees, windfall etc.).
	FFHE	Mid-elevation, xeric mixed conifer forest. Overstory of Douglas fir, white fir, hemlock, red cedar, white pine, sugar pine, madrone, bigleaf maple, dogwood, red alder, grand fir. No oak.
	FFHEBu	FFHE, but burned, often with scattered trees surviving fire.
	FFHP	As in FFHC, with white pine.
	FFHPP	Mixed conifer forest with ponderosa pine. May include Douglas fir, red cedar, western hemlock.
	FFHPPBu	FFHPP, but burned, often with scattered trees surviving fire.
	FFM*	Mixed conifer forests, Douglas fir present, mature age class.
	FFO	Douglas fir-white oak often with bigleaf maple. No black oak or incense cedar.
	FFOBu	FFO, but burned, often with scattered trees surviving fire.
	FFP	Douglas fir-ponderosa pine forest. No oak or hemlock.
	FFPBu	FFP, but burned, often with scattered trees surviving fire.
	FFSA*	Subalpine fir forest, no Douglas fir.
	FFSH*	Pacific fir and mountain hemlock forest.
	FFSHBu*	FFSH, but burned, often with scattered trees surviving fire.
	FFSRW	Shasta red fir and white fir forest, no Douglas fir.
	FFSt	Storm-damaged Douglas fir forest.
	FFY	Douglas fir forest, young, burned within last 20 years.
	FO	White oak forest.
	FOB	White oak-black oak forest, often with madrone, ponderosa pine. No firs.
	FOFP	White oak-Douglas fir-ponderosa pine. No black oak or madrone.
	FOFPBu	FOFP, but burned, often with scattered trees surviving fire.
	Fopen*	Mixed conifer forest, large openings.
	FP*	Ponderosa pine forest, no Douglas fir.
	FPW	Ponderosa pine forest in Willamette Valley.
FSCC*	Conifer forest, canopy not completely closed.	
FSCH*	Mixed hardwood forest, canopy not completely closed.	
FSCM*	Mixed coniferous and hardwood forest, canopy not completely closed.	
FSH	Sitka spruce-Douglas fir-western hemlock-red cedar forest, patches of red alder, bigleaf maple.	
FSt	Storm-damaged forest, species unspecified.	
CLOSED FOREST: RIPARIAN & WETLAND	FA	Ash “swamp” or “swale,” sometimes with alder, bigleaf maple. Understory may include briars.
	FALW	Ash-alder-willow swamp, may have bigleaf maple. Sometimes vine maple, ninebark, hardhack, cattail, grass, briars. Usually extensive beaver dams.
	FAW	Ash-willow swamp, sometimes with ninebark, briars.
	FFA	Ash-mixed deciduous riparian forest, with bigleaf maple, black cottonwood, red or white alder, white oak, dogwood, willow. Douglas or grand fir, ponderosa pine, red cedar.
	FFABu	FFA, but burned, often with scattered trees surviving fire.
	FFCL	Red alder-mixed conifer riparian forest; combinations of red cedar, grand fir, Douglas fir, western hemlock, bigleaf maple, black cottonwood, ash. No oaks.
	FFCLBu	FFCL, but burned, often with scattered trees surviving fire.
	FL	Red alder swamp, usually with salmonberry, sometimes willow.
	FOA	White oak-ash riparian forest; may have ponderosa pine, Douglas fir, cottonwood, bigleaf maple, alder, willow.
	FT	Black cottonwood riparian forest, often with willow, rose, briars, nettles, crabapple. No conifers.

Major Structural Classification	Abbreviation	Plant Species in Association
SHRUBLAND	HA	Manzanita shrubland.
	HBBu	Brush fields or thickets established after forest fires, few or no trees remaining.
	HR	Rose or briar thickets.
	HS	Spiraea or hardhack brush or “swamp.” May contain rose.
	HSS	Shrub swamp, composition unknown.
	HU	Brush, composition unknown.
	HV	Vine maple swamp.
	HW	Willow swamp or swale. May include young riparian stands on gravel or sand bars.
	HZ	Hazel brush or thicket.
WOODLAND	OFHC	Mesic mixed-conifer woodland, with various combinations of Douglas fir, red cedar, western hemlock, some bigleaf maple, white oak, ash, red alder.
	OFHCBu	OFHC, but burned, often with scattered trees surviving fire.
	OFOBZ	Douglas fir-white oak-black oak woodland. Brushy understory of hazel, oak sprouts, bracken and other shrubs. No madrone or pine.
	OFOFZ	Douglas fir-white oak-ponderosa pine. No hemlock or cedar.
	OFOZ	Douglas fir-white oak, often with bigleaf maple. No black oak or pine.
	OFZ	Douglas fir woodland, often with bigleaf maple, alder, or dogwood. No other conifers or oaks.
	OFZBu	OFZ, but burned, often with scattered trees surviving fire.
	OOZ	White oak woodland. Brushy understory of hazel, oak sprouts, bracken and other shrubs. No fir, no black oak.
	PRAIRIE	P
PM		Mounded prairie.
PU		Upland and xeric prairie. May have scattering of trees.
PV		Vernal pool.
PW		Seasonally wet prairie. May have scattered ash trees or willow.
SAVANNA	SA	Ash savanna.
	SF	Douglas fir savanna.
	SFP	Douglas fir-ponderosa pine savanna.
	SO	White oak savanna.
	SOA	White oak-ash savanna.
	SOB	White oak-black oak savanna, usually with madrone, often with ponderosa pine. No Douglas fir.
	SOBF	White oak-black oak-Douglas fir savanna.
	SOBFP	White oak-black oak-Douglas fir-ponderosa pine savanna.
	SOBP	White oak-black oak-ponderosa pine savanna.
	SOF	White oak-Douglas fir savanna. Mostly herbaceous understory.
	SOFP	White oak-Douglas fir-ponderosa pine savanna.
	SOP	White oak-ponderosa pine savanna.
	SP	Ponderosa pine (or species of pine unspecified) savanna.
	UNVEGETATED	UF*
UG		Gravel bar.
UR		Rock outcrops, talus, exposed bedrock, scree slopes, rocky scablands, recent landslides.
US		Sand bar, “sandy barrens.”
WATER, EMERGENT WETLANDS (EXCEPT WET PRAIRIE), OR AQUATIC BED	W	Water bodies 1 or more chains across, including rivers, sloughs, ponds, beaver ponds, lakes.
	WK	Skunk cabbage marsh.
	WMU	Marsh, composition unknown. Includes “wet meadow.”
	WP	Pond lily aquatic bed, sometimes with skunk cabbage.
	WR*	Willamette River and other higher order streams.
	WS	Seasonally-flooded lake, pond or slough 1 or more chains wide.
	WSU	Swamp, composition unknown.
	WU	Wetland, composition unknown.
	WW	Wapato marsh, sometimes with “rushes” or pond lily.

**NOTES:**

One chain equals 66 feet or 20.1 meters

Vegetation types marked with an asterisk (\*) are not in the classification provided by ONHP/TNC. They were developed for the PESVEG scenario, and, except for type WR, are derived from the 1936 HJ Andrews maps. See discussion on page 92.

Table 54 on the opposite page shows the cross-reference system we used to facilitate comparison between the Presettlement Vegetation ca. 1851 (pp. 38-39), the Pre-EuroAmerican scenario maps (pp. 92-93) and the current and future scenarios (pp. 78-81, 86-91). The table shows how classes from the historical vegetation map (pp 164-65) were translated into the standard LU/LC classification used for ca. 1990 and the future scenarios.

The major difference between the historical and contemporary maps is the method used to collect the spatial information. The Pre-EuroAmerican scenario (pp. 92-93) was generated from two main sources, both of which originated with on-the-ground field work. In the Willamette Valley and adjacent foothills, descriptions from the General Lands Office (GLO) surveys (circa 1851-1895) were used to create a digital map at a scale of 1:24000 (p. 39). In the forested uplands, the source was a U. S. Forest Service map from the 1930s, at a scale of 1:250000. The data generated from both sources are fairly coarse in geographic scale, but highly focused on the plant community species composition and forest stand structure. In contrast, the mapping and classification of the current vegetation, which was used to generate the future scenarios, is based on analysis of raster imagery from the Landsat satellite. The satellite imagery provides information at a much finer spatial scale (the entire landscape is represented by pixels that are 30 meters on a side), but it gives only limited information on what is actually on the ground (see pp. 78-81). Our challenge was to cross-reference the ground-based, vegetation community-level descriptions from the historical data with broad land cover classes from the satellite imagery.

Some of the cross-referencing between these two systems was straightforward. For example, there were no cities, roads, nor agricultural developments prior to EuroAmerican settlement, so these classes (# 1-21, 49, 66-85 and 91-95 on the facing page) have no equivalent in the historical maps. Other classes, such as water or gravel bars in rivers, are the same today as they were 150 years ago. The natural vegetated lands were more difficult to cross-reference because of the inherent differences between the original data sources.

In the GLO map, areas with trees were classified based on the distance between tree crowns. Thus the classification on the previous pages (pp. 162-163) divides the treed landscape into forest, woodland, or savanna. Areas with undergrowth but no trees were defined as “shrubland.” For the existing conditions map (LULC ca. 1990, pp. 78-81), the satellite imagery was able to discriminate between closed and partially closed forest canopies. However, the fine-scale difference between woodland and shrubland was not discernable. Consequently, the contemporary land cover class “natural shrub” (#87) is cross-referenced to both woodland and shrubland on the Pre-EuroAmerican (PESVEG) scenario map.

Likewise, the satellite imagery was useful for separating the forest into conifer-and hardwood-dominated stands, but was not able to separate these same forests into species-level communities. Therefore, many of the fine-scale differences in plant community type discernable to 19th-century surveyors are collapsed into the broader classes captured by the satellite. For example, the contemporary land cover class “Forest Closed Hardwood” (#53 at right) is cross-referenced to nine different historic vegetation types; all nine have closed hardwood forests, but the species composition of those forests could be quite different. In coniferous forests, unless the surveyors made note of tree diameters (or other reference to stand age), we assumed that the closed canopy conifer forests were greater than 200 years old.

The woodlands, shrublands, and prairies of the historic maps were compared to the current natural shrub and natural grassland classes. The oak and conifer savannas once prominent in the Willamette Valley are not represented in the ca. 1990 land cover condition, both because they are difficult to detect from satellite imagery, and because of the relative lack of these plant communities in the present-day Willamette Basin. However, the Conservation 2050 alternative envisions an increase in savanna.

The early ground-based surveyors also made note of areas that had burned as the result of wildfire. We used our knowledge of plant community succession to relate these areas to a contemporary class. We assumed that burned forests were not completely vaporized, but rather reduced from a completely closed canopy to a semi-closed condition. Burned woodlands and shrublands, in contrast, were more likely to resemble natural grasslands than forests.

Wetlands in the Willamette Basin vary widely, from small marshes to seasonally wet prairie. The GLO surveyors described many types of wetlands, including wet brushy swamps with species such as vine maple or willows predominating. The satellite image analysis was able to generate only one “wetland” category, “flooded/marsh.” As a result, the pre-EuroAmerican scenario classes of vernal pools and all emergent wetlands were placed into this one category (#89 at right). Wet prairie was maintained as a separate class in the Pre-EuroAmerican scenario (PESVEG) only because it covered a substantial area historically. Like oak savanna, “wet shrub” (#101 at right) could not be captured using the satellite data. Consequently this land cover type appears only in the historical maps and the Conservation 2050 alternative.

In order to compare the historical landscape to the present and future scenarios, we developed this cross-reference system, knowing that we were not just comparing landscapes, but also the data collection techniques used to describe those landscapes. For many of the direct comparisons that appear in this atlas, we collapsed the individual classes into broad vegetation types to reduce the problems caused by the different data types.

Class Number (map cell value)	Class Name 1990 & 2050 Land Use/Land Cover	Class Name Presettlement Vegetation ca. 1851	Classes present in each map				
			PESVEG v.3	LULC 1990	Plan Trend 2050	Devel. 2050	Cons. 2050
1	Residential 0 - 4 DU/ac			x	x	x	x
2	Residential 4 - 9 DU/ac			x	x	x	x
3	Residential 9 - 16 DU/ac			x	x	x	x
4	Residential > 16 DU/ac			x	x	x	x
6	Commercial			x	x	x	x
7	Commercial/Industrial			x	x	x	x
8	Industrial			x	x	x	x
10	Residential & commercial				x	x	x
11	Urban non-vegetated unknown			x	x	x	x
16	Rural structures			x	x	x	x
18	Railroad			x	x	x	x
19	Primary roads			x	x	x	x
20	Secondary roads			x	x	x	x
21	Light duty roads			x	x	x	x
24	Rural non-vegetated unknown			x	x	x	x
29	Main channel non-vegetated	US,UG	x	x	x	x	x
32	Stream orders 5 - 7	WR	x	x	x	x	x
33	Permanent lentic water	W	x	x	x	x	x
39	Topographic shadow			x	x	x	x
40	Snow	UF	x	x	x	x	x
42	Barren	UR	x	x	x	x	x
49	Urban tree overstory			x	x	x	x
51	Upland forest open	Fopen	x	x	x	x	x
52	Upland forest semi- closed mixed	FFCLBu,FFOBu, FOFPBu,FSCM	x	x	x	x	x
53	Forest closed hardwood	FA,FALW,FAW,FFA,FL,FO,FOA, FOB,FT	x	x	x	x	x
54	Forest closed mixed	FFCL,FFO,FOFP,FSst	x	x	x	x	x
55	Upland forest semi- closed conifer	FEDBu,FFBu,FFHCbu,FFHEBu, FFHPPBu,FFPBu,FSCC,FFSHBu	x	x	x	x	x
56	Conifers 0 - 20 yrs.	FFY	x	x	x	x	x
57	Forest closed conifer 21 - 40 yrs.			x	x	x	x
58	Forest closed conifer 41 - 60 yrs.			x	x	x	x
59	Forest closed conifer 61 - 80 yrs.			x	x	x	x
60	Forest closed conifer 81 - 200 yrs.	FFM	x	x	x	x	x
61	Forest closed conifer older than 200 yrs.	FD,FED,FF,FFHA,FFHC,FFHCSt, FFHE,FFHP,FFHPP,FFP, FFSA,FFSH,FFSRW,FFSt,FP, FPW,FSH	x	x	x	x	x
62	Upland forest semi- closed hardwood	FFABu,FSCH	x	x	x	x	x
66	Hybrid poplar			x	x	x	x
67	Grass seed rotation			x	x	x	x
68	Irrigated annual rotation			x	x	x	x
70	Prairie, seasonally wet	PW	x				
71	Grains			x	x	x	x
72	Nursery			x	x	x	x
73	Berries & vineyards			x	x	x	x
74	Double cropping			x	x	x	x
75	Hops			x	x	x	x
76	Mint			x	x	x	x
77	Radish seed			x	x	x	x
78	Sugar beet seed			x	x	x	x
79	Row crop			x	x	x	x
80	Grass			x	x	x	x
81	Burned grass			x	x	x	x
82	Field crop			x	x	x	x
83	Hayfield			x	x	x	x
84	Late field crops			x	x	x	x
85	Pasture			x	x	x	x
86	Natural grassland	OFHCbu,OFZBu,P,PM, PU	x	x	x	x	x
87	Natural shrub	EF,HA,HBBu,HR,HU,HZ,OFHC, OFOBZ,OFOPZ,OFOZ,OFZ,OOZ, SF, SFP, SP	x	x	x	x	x
88	Bare/fallow			x	x	x	x
89	Flooded/marsh	WK,WMU,WP,WS,WSU,WU,WW, PV	x	x	x	x	x
90	Irrigated perennial			x	x	x	x
91	Turfgrass			x	x	x	x
92	Orchard			x	x	x	x
93	Christmas trees			x	x	x	x
95	Conifer woodlot			x	x	x	x
98	Oak savanna	SA*,SOBFP,SOBF,SO,SOA,SOB,SOF,SOBP, SOFP, SOP	x				x
101	Wet shrub	HS,HSS, HV, HW	x				x
102	Unknown						x

Table 54. Classification cross-reference table.

\* Wildlife modeling considered SA as class #87, Natural shrub.