Species Habitat Model Report:

Hell Hollow Slender Salamander

Batrachoseps diabolicus

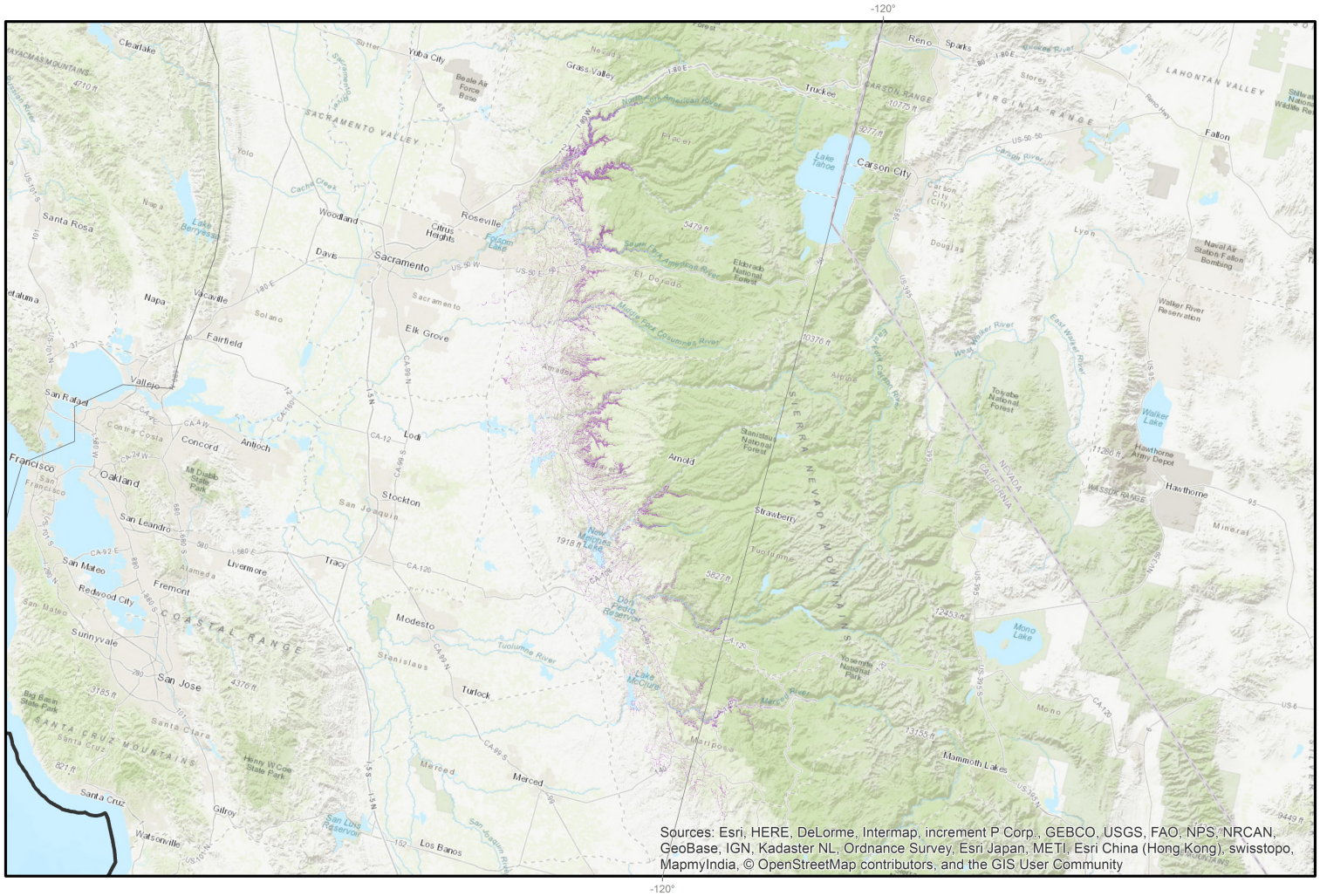
Gap Analysis Program Species Code: **aHHSSx**
Integrated Taxonomic Information System TSN: **573575**
NatureServe Global Element ID: **2.106376**

Model ID (extent, year, version): **CONUS_2001v1**
Model Editor: **Ken Boykin**
Model Reviewer: **Jeff Lonneker**

DOI Data Link: **https://doi.org/10.5066/F7TT4P78**

Date Report Generated: **October 27, 2017**

Map of Predicted Habitat



Legend
- Summer
- Winter
- Year-round

Hell Hollow Slender Salamander
Batrachoseps diabolicus
GAP Model ID: **aHHSSx_CONUS_2001v1**
ITIS TSN: **573575** NatureServe Global ID: **2.106376**

USGS science for a changing world

0 5 10 20 30 40 Miles

Coordinate System: Albers
Central Meridian: 96°0'0"W
1st Std Parallel: 29°30'0"N
2nd Std Parallel: 45°30'0"N
Latitude of Origin: 23°0'0"N

Habitat Modeling: Model Parameters

Season	Year Round
Region*	SW
Landcover Limitations	
Contiguous Patch	
Minimum Size (ha)	
Edge Type Usage	
Ecotone Width (m)	
Forest Interior Usage	
Distance From Edge (m)	
Secondary Map Units	
Distance From Primary Map Units (m)	
Hydrographic Limitations	
Flowing Water	
Distance Into (m)	
Distance From (m)	
Open/Standing Water	
Distance Into (m)	
Distance From (m)	
Wet Vegetation	
Distance Into (m)	
Distance From (m)	
Water Salinity	
Water Velocity	
Human Impact Avoidance	
Elevation Limit - Minimum (m)	
Elevation Limit - Maximum (m)	620
Hand Modeled	

*GP = Great Plains; NE = Northeast; NW = Northwest; SE = Southeast; SW = Southwest; UM = Upper Midwest

More information regarding modeling process: https://gapanalysis.usgs.gov/species/data/

Habitat Modeling: Map Units

Season	Year Round
Region*	SW
Map Unit	
1201 - Developed, Open Space	0
1202 - Developed, Low Intensity	0
1203 - Developed, Medium Intensity	0
1204 - Developed, High Intensity	0
1301 - Quarries, Mines, Gravel Pits and Oil Wells	0
1401 - Orchards Vineyards and Other High Structure Agriculture	0
1402 - Cultivated Cropland	0
1403 - Pasture/Hay	0
2102 - Open Water (Fresh)	0
2103 - Open Water (Brackish/Salt)	0
2104 - Open Water (Aquaculture)	0
3105 - Barren Land	0
3106 - Atlantic Coastal Plain Northern Sandy Beach	0
3107 - Atlantic Coastal Plain Southern Beach	0
3108 - Unconsolidated Shore (Lake/River/Pond)	0
3109 - Unconsolidated Shore (Beach/Dune)	0
3110 - Unconsolidated Shore	0
3111 - North American Warm Desert Active and Stabilized Dune	0
3112 - Northern Atlantic Coastal Plain Sandy Beach	0
3113 - Upper Texas Coast Beach	0
3114 - Louisiana Beach	0
3115 - Southeast Florida Beach	0
3116 - Great Lakes Dune	0
3117 - South Florida Shell Hash Beach	0
3118 - Florida Panhandle Beach Vegetation	0
3119 - Atlantic Coastal Plain Sea Island Beach	0
3120 - Southwest Florida Beach	0
3121 - Inter-Mountain Basins Active and Stabilized Dune	0
3122 - Mediterranean California Southern Coastal Dune	0
3123 - Mediterranean California Northern Coastal Dune	0

Season	Year Round
Region*	SW
Map Unit	
3124 - North Pacific Maritime Coastal Sand Dune and Strand	0
3125 - Texas Coastal Bend Beach	0
3201 - North American Warm Desert Bedrock Cliff and Outcrop	0
3202 - Rocky Mountain Cliff, Canyon and Massive Bedrock	0
3203 - Western Great Plains Cliff and Outcrop	0
3204 - Great Lakes Acidic Rocky Shore and Cliff	0
3205 - Central Interior Calcareous Cliff and Talus	0
3206 - Central Interior Acidic Cliff and Talus	0
3207 - North-Central Appalachian Circumneutral Cliff and Talus	0
3208 - North-Central Appalachian Acidic Cliff and Talus	0
3209 - North Pacific Montane Massive Bedrock, Cliff and Talus	0
3210 - Southern Piedmont Cliff	0
3211 - North Pacific Coastal Cliff and Bluff	0
3212 - Southern California Coast Ranges Cliff and Canyon	0
3213 - Central California Coast Ranges Cliff and Canyon	0
3214 - Klamath-Siskiyou Cliff and Outcrop	0
3215 - Sierra Nevada Cliff and Canyon	0
3216 - Inter-Mountain Basins Cliff and Canyon	0
3217 - Southwestern Great Plains Canyon	0
3218 - Colorado Plateau Mixed Bedrock Canyon and Tableland	0
3219 - Southern Interior Acid Cliff	0
3220 - Southern Appalachian Montane Cliff	0
3221 - Southern Interior Calcareous Cliff	0
3301 - Western Great Plains Badland	0
3302 - East Gulf Coastal Plain Dry Chalk Bluff	0
3303 - North American Warm Desert Badland	0
3304 - Inter-Mountain Basins Shale Badland	0
3305 - Mediterranean California Coastal Bluff	0
3306 - Columbia Plateau Ash and Tuff Badland	0
3401 - Temperate Pacific Intertidal Mudflat	0
3402 - Temperate Pacific Freshwater Mudflat	0
3403 - Inter-Mountain Basins Wash	0

Season	Year Round
Region*	SW
Map Unit	
3404 - North Pacific Serpentine Barren	0
3405 - North American Warm Desert Playa	0
3406 - Mediterranean California Serpentine Barrens	0
3407 - Inter-Mountain Basins Playa	0
3501 - North Pacific Alpine and Subalpine Bedrock and Scree	0
3502 - North American Alpine Ice Field	0
3503 - Rocky Mountain Alpine Bedrock and Scree	0
3504 - Mediterranean California Alpine Bedrock and Scree	0
3506 - Southern Appalachian Rocky Summit	0
3601 - Geysers and Hot Springs	0
3602 - Southern Appalachian Granitic Dome	0
3603 - Inter-Mountain Basins Volcanic Rock and Cinder Land	0
3604 - North Pacific Volcanic Rock and Cinder Land	0
3605 - North American Warm Desert Pavement	0
3606 - Southern Piedmont Granite Flatrock	0
3607 - North American Warm Desert Volcanic Rockland	0
4101 - Central and Southern Appalachian Northern Hardwood Forest	0
4102 - East Gulf Coastal Plain Limestone Forest	0
4103 - East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland - Hardwood Modifier	0
4104 - Northeastern Interior Dry Oak Forest-Hardwood Modifier	0
4105 - East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland - Juniper Modifier	0
4106 - Northeastern Interior Dry Oak Forest - Mixed Modifier	0
4107 - Ridge and Valley Calcareous Valley Bottom Glade and Woodland	0
4108 - East Gulf Coastal Plain Black Belt Calcareous Prairie and Woodland - Herbaceous Modifier	0
4109 - Southern and Central Appalachian Oak Forest - Xeric	0
4110 - North Pacific Oak Woodland	0
4111 - Rocky Mountain Aspen Forest and Woodland	0
4112 - Rocky Mountain Bigtooth Maple Ravine Woodland	0
4113 - Laurentian-Acadian Northern Hardwoods Forest	0
4114 - Northeastern Interior Dry-Mesic Oak Forest	0
4115 - Ozark-Ouachita Dry-Mesic Oak Forest	0
4116 - Southern Interior Low Plateau Dry-Mesic Oak Forest	0

Season	Year Round
Region*	SW
Map Unit	
4117 - East Gulf Coastal Plain Northern Dry Upland Hardwood Forest	0
4118 - Crosstimbers Oak Forest and Woodland	0
4119 - Southern Appalachian Northern Hardwood Forest	0
4120 - North-Central Interior Dry-Mesic Oak Forest and Woodland	0
4121 - North-Central Interior Dry Oak Forest and Woodland	0
4122 - Ouachita Montane Oak Forest	0
4123 - North-Central Interior Beech-Maple Forest	0
4124 - North-Central Interior Maple-Basswood Forest	0
4125 - Southern and Central Appalachian Oak Forest	0
4126 - Allegheny-Cumberland Dry Oak Forest and Woodland - Hardwood	0
4127 - Central and Southern Appalachian Montane Oak Forest	0
4128 - East Gulf Coastal Plain Northern Loess Bluff Forest	0
4129 - East Gulf Coastal Plain Southern Loess Bluff Forest	0
4130 - Southern Coastal Plain Dry Upland Hardwood Forest	0
4131 - Eastern Great Plains Tallgrass Aspen Parkland	0
4132 - South Florida Hardwood Hammock	0
4133 - Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	0
4134 - Southwest Florida Coastal Strand and Maritime Hammock	0
4135 - Southeast Florida Coastal Strand and Maritime Hammock	0
4136 - Central and South Texas Coastal Fringe Forest and Woodland	0
4137 - West Gulf Coastal Plain Chenier and Upper Texas Coastal Fringe Forest and Woodland	0
4138 - Northwestern Great Plains Aspen Forest and Parkland	0
4139 - Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest	0
4140 - East-Central Texas Plains Post Oak Savanna and Woodland	0
4141 - East-Central Texas Plains Riparian Forest	0
4142 - East-Central Texas Plains Floodplain Forest	0
4143 - Madrean Encinal	0
4144 - Mediterranean California Mixed Oak Woodland	1
4145 - South Florida Pine Rockland	0
4146 - Southern Coastal Plain Oak Dome and Hammock	0
4147 - Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	0
4148 - North Pacific Broadleaf Landslide Forest and Shrubland	0

Season	Year Round
Region*	SW
Map Unit	
4149 - Ozark-Ouachita Dry Oak Woodland	0
4150 - East Gulf Coastal Plain Maritime Forest	0
4151 - Lower Mississippi River Dune Woodland and Forest	0
4152 - Edwards Plateau Limestone Savanna and Woodland	0
4153 - Mississippi Delta Maritime Forest	0
4154 - Western Great Plains Wooded Draw and Ravine	0
4155 - Edwards Plateau Dry-Mesic Slope Forest and Woodland	0
4201 - Boreal Aspen-Birch Forest	0
4202 - Southern Piedmont Mesic Forest	0
4203 - Southern Crowley's Ridge Mesic Loess Slope Forest	0
4204 - West Gulf Coastal Plain Mesic Hardwood Forest	0
4205 - East Gulf Coastal Plain Northern Mesic Hardwood Forest	0
4206 - South-Central Interior / Upper Coastal Plain Flatwoods	0
4207 - Ozark-Ouachita Mesic Hardwood Forest	0
4208 - Edwards Plateau Mesic Canyon	0
4209 - East Gulf Coastal Plain Southern Mesic Slope Forest	0
4210 - Atlantic Coastal Plain Central Maritime Forest	0
4211 - Atlantic Coastal Plain Northern Maritime Forest	0
4212 - Atlantic Coastal Plain Southern Maritime Forest	0
4301 - East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest - Hardwood Modifier	0
4302 - Southern Piedmont Dry Oak-(Pine) Forest - Hardwood Modifier	0
4303 - East Gulf Coastal Plain Black Belt Calcareous Prairie and Woodland - Woodland Modifier	0
4304 - Northeastern Interior Dry Oak Forest - Virginia/Pitch Pine Modifier	0
4305 - Southern Piedmont Dry Oak-(Pine) Forest - Loblolly Pine Modifier	0
4306 - East Gulf Coastal Plain Northern Dry Upland Hardwood Forest - Offsite Pine Modifier	0
4307 - Allegheny-Cumberland Dry Oak Forest and Woodland - Pine Modifier	0
4308 - Southern Ridge and Valley Dry Calcareous Forest - Pine modifier	0
4309 - East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest - Mixed Modifier	0
4310 - Southern Piedmont Dry Oak-(Pine) Forest - Mixed Modifier	0
4311 - Southern Piedmont Dry Oak-Heath Forest - Mixed Modifier	0
4312 - Western Great Plains Dry Bur Oak Forest and Woodland	0
4313 - Northern Atlantic Coastal Plain Dry Hardwood Forest	0

Season	Year Round
Region*	SW
Map Unit	
4314 - Appalachian Shale Barrens	0
4315 - Madrean Pine-Oak Forest and Woodland	0
4316 - Madrean Upper Montane Conifer-Oak Forest and Woodland	0
4317 - Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland	1
4318 - Mediterranean California Red Fir Forest	0
4319 - North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	0
4320 - Mediterranean California Mixed Evergreen Forest	1
4321 - West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland	0
4322 - Southeastern Interior Longleaf Pine Woodland	0
4323 - Laurentian-Acadian Northern Pine-(Oak) Forest	0
4324 - Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	0
4325 - Central Interior Highlands Dry Acidic Glade and Barrens	0
4326 - Boreal White Spruce-Fir-Hardwood Forest	0
4327 - Laurentian-Acadian Pine-Hemlock-Hardwood Forest	0
4328 - Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland	0
4329 - Southern Piedmont Dry Oak-(Pine) Forest	0
4330 - Central Appalachian Oak and Pine Forest	0
4331 - Appalachian Hemlock-Hardwood Forest	0
4332 - West Gulf Coastal Plain Pine-Hardwood Forest	0
4333 - Acadian Low-Elevation Spruce-Fir-Hardwood Forest	0
4334 - Southern Ridge and Valley Dry Calcareous Forest	0
4335 - Central Appalachian Pine-Oak Rocky Woodland	0
4336 - West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland	0
4337 - Northern Crowley's Ridge Sand Forest	0
4338 - North Pacific Lowland Mixed Hardwood-Conifer Forest and Woodland	0
4401 - Southern and Central Appalachian Cove Forest	0
4402 - South-Central Interior Mesophytic Forest	0
4403 - Atlantic Coastal Plain Mesic Hardwood and Mixed Forest	0
4404 - Mediterranean California Mesic Serpentine Woodland and Chaparral	1
4501 - East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Offsite Hardwood Modifier	0
4502 - Florida Longleaf Pine Sandhill - Open Understory Modifier	0
4503 - Florida Longleaf Pine Sandhill - Scrub/Shrub Understory Modifier	0

Season	Year Round
Region*	SW
Map Unit	
4504 - Atlantic Coastal Plain Fall-Line Sandhills Longleaf Pine Woodland - Loblolly Modifier	0
4505 - Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Open Understory Modifier	0
4506 - Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Scrub/Shrub Understory Modifier	0
4507 - East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Loblolly Modifier	0
4508 - East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Open Understory Modifier	0
4509 - East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland - Scrub/Shrub Modifier	0
4510 - Northern Rocky Mountain Western Larch Savanna	0
4511 - Central and Southern California Mixed Evergreen Woodland	1
4512 - Colorado Plateau Pinyon-Juniper Woodland	0
4513 - Columbia Plateau Western Juniper Woodland and Savanna	0
4514 - Great Basin Pinyon-Juniper Woodland	0
4515 - Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	0
4516 - Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	0
4517 - Klamath-Siskiyou Upper Montane Serpentine Mixed Conifer Woodland	0
4518 - Madrean Pinyon-Juniper Woodland	0
4519 - Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	1
4520 - California Montane Jeffrey Pine-(Ponderosa Pine) Woodland	1
4521 - Mediterranean California Subalpine Woodland	0
4522 - North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	0
4523 - North Pacific Mountain Hemlock Forest	0
4524 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	0
4525 - Northern Rocky Mountain Subalpine Woodland and Parkland	0
4526 - Rocky Mountain Foothill Limber Pine-Juniper Woodland	0
4527 - Rocky Mountain Lodgepole Pine Forest	0
4528 - Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	0
4529 - Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	0
4530 - Southern Rocky Mountain Ponderosa Pine Woodland	0
4531 - Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	0
4532 - Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	0
4533 - Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland	0
4534 - Southern Rocky Mountain Pinyon-Juniper Woodland	0
4535 - Boreal Jack Pine-Black Spruce Forest	0

Season	Year Round
Region*	SW
Map Unit	
4536 - Atlantic Coastal Plain Upland Longleaf Pine Woodland	0
4537 - Southern Appalachian Montane Pine Forest and Woodland	0
4538 - Southern Appalachian Low Mountain Pine Forest	0
4539 - Northeastern Interior Pine Barrens	0
4540 - Northern Atlantic Coastal Plain Pitch Pine Barrens	0
4541 - East-Central Texas Plains Pine Forest and Woodland	0
4542 - Laurentian Jack Pine-Red Pine Forest	0
4543 - Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	0
4544 - Rocky Mountain Poor-Site Lodgepole Pine Forest	0
4545 - California Coastal Closed-Cone Conifer Forest and Woodland	0
4546 - Sierran-Intermontane Desert Western White Pine-White Fir Woodland	0
4547 - North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	0
4548 - Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna	0
4549 - Ozark-Ouachita Shortleaf Pine-Bluestem Woodland	0
4550 - East Cascades Oak-Ponderosa Pine Forest and Woodland	0
4551 - Acadian-Appalachian Montane Spruce-Fir Forest	0
4552 - North Pacific Wooded Volcanic Flowage	0
4553 - Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland - Offsite Hardwood Modifier	0
4601 - California Coastal Redwood Forest	0
4602 - East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	0
4603 - Mediterranean California Mesic Mixed Conifer Forest and Woodland	1
4604 - North Pacific Hypermaritime Sitka Spruce Forest	0
4605 - North Pacific Maritime Mesic Subalpine Parkland	0
4606 - North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	0
4607 - North Pacific Mesic Western Hemlock-Silver Fir Forest	0
4608 - Northern California Mesic Subalpine Woodland	0
4609 - Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	0
4610 - Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	0
4611 - Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	0
4612 - Central and Southern Appalachian Spruce-Fir Forest	0
4613 - North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest	0
5101 - Mediterranean California Alpine Fell-Field	0

Season	Year Round
Region*	SW
Map Unit	
5102 - North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow	0
5103 - Rocky Mountain Alpine Dwarf-Shrubland	0
5104 - Rocky Mountain Alpine Tundra/Fell-field/Dwarf-shrub	0
5105 - Acadian-Appalachian Alpine Tundra	0
5106 - North Pacific Avalanche Chute Shrubland	0
5107 - Acadian-Appalachian Subalpine Woodland and Heath-Krummholz	0
5108 - Northern Rocky Mountain Avalanche Chute Shrubland	0
5201 - Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub	0
5202 - Chihuahuan Mixed Salt Desert Scrub	0
5203 - Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub	0
5204 - Chihuahuan Succulent Desert Scrub	0
5205 - Inter-Mountain Basins Mixed Salt Desert Scrub	0
5206 - Mojave Mid-Elevation Mixed Desert Scrub	0
5207 - Sonora-Mojave Creosotebush-White Bursage Desert Scrub	0
5208 - Sonora-Mojave Mixed Salt Desert Scrub	0
5209 - Sonoran Mid-Elevation Desert Scrub	0
5210 - Southern California Coastal Scrub	0
5211 - Apacherian-Chihuahuan Mesquite Upland Scrub	0
5212 - Chihuahuan Mixed Desert and Thorn Scrub	0
5213 - Sonoran Paloverde-Mixed Cacti Desert Scrub	0
5214 - Florida Peninsula Inland Scrub	0
5215 - Tamaulipan Mixed Deciduous Thornscrub	0
5216 - Tamaulipan Mesquite Upland Scrub	0
5217 - Tamaulipan Calcareous Thornscrub	0
5218 - Northern California Coastal Scrub	0
5301 - Western Great Plains Sandhill Steppe	0
5302 - Northern Rocky Mountain Foothill Conifer Wooded Steppe	0
5303 - Apacherian-Chihuahuan Semi-Desert Grassland and Steppe	0
5304 - Chihuahuan Gypsophilous Grassland and Steppe	0
5305 - Columbia Plateau Steppe and Grassland	0
5306 - Columbia Plateau Low Sagebrush Steppe	0
5307 - Inter-Mountain Basins Big Sagebrush Steppe	0

Season	Year Round
Region*	SW
Map Unit	
5308 - Inter-Mountain Basins Montane Sagebrush Steppe	0
5309 - Inter-Mountain Basins Semi-Desert Shrub Steppe	0
5401 - California Maritime Chaparral	0
5402 - California Mesic Chaparral	1
5403 - California Montane Woodland and Chaparral	1
5404 - California Xeric Serpentine Chaparral	0
5405 - Madrean Oriental Chaparral	0
5406 - Great Basin Semi-Desert Chaparral	0
5407 - Mogollon Chaparral	0
5408 - Northern and Central California Dry-Mesic Chaparral	0
5409 - Sonora-Mojave Semi-Desert Chaparral	0
5410 - Southern California Dry-Mesic Chaparral	0
5411 - Coahuilan Chaparral	0
5501 - California Central Valley Mixed Oak Savanna	0
5502 - California Coastal Live Oak Woodland and Savanna	0
5503 - California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna	0
5504 - Southern California Oak Woodland and Savanna	0
5505 - Willamette Valley Upland Prairie and Savanna	0
5506 - North-Central Interior Oak Savanna	0
5507 - North-Central Oak Barrens	0
5508 - Southern Piedmont Glade and Barrens	0
5509 - Nashville Basin Limestone Glade	0
5510 - Cumberland Sandstone Glade and Barrens	0
5511 - Central Appalachian Alkaline Glade and Woodland	0
5512 - Central Interior Highlands Calcareous Glade and Barrens	0
5513 - West Gulf Coastal Plain Catahoula Barrens	0
5514 - West Gulf Coastal Plain Nepheline Syenite Glade	0
5515 - Laurentian Pine-Oak Barrens	0
5516 - Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral	0
5517 - Paleozoic Plateau Bluff and Talus	0
5601 - Colorado Plateau Pinyon-Juniper Shrubland	0
5602 - Atlantic Coastal Plain Xeric River Dune	0

Season	Year Round
Region*	SW
Map Unit	
5603 - Inter-Mountain Basins Juniper Savanna	0
5604 - Madrean Juniper Savanna	0
5605 - Southern Rocky Mountain Ponderosa Pine Savanna	0
5606 - Southern Rocky Mountain Juniper Woodland and Savanna	0
5607 - Great Lakes Alvar	0
5701 - Colorado Plateau Mixed Low Sagebrush Shrubland	0
5702 - Columbia Plateau Scabland Shrubland	0
5703 - Inter-Mountain Basins Mat Saltbush Shrubland	0
5704 - Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	0
5705 - Great Basin Xeric Mixed Sagebrush Shrubland	0
5706 - Inter-Mountain Basins Big Sagebrush Shrubland	0
5707 - Southern Colorado Plateau Sand Shrubland	0
5801 - Southern Appalachian Grass and Shrub Bald - Shrub Modifier	0
5802 - Southern Appalachian Grass and Shrub Bald - Herbaceous Modifier	0
5803 - Colorado Plateau Blackbrush-Mormon-tea Shrubland	0
5804 - North Pacific Montane Shrubland	0
5805 - Northwestern Great Plains Shrubland	0
5806 - Rocky Mountain Lower Montane-Foothill Shrubland	0
5807 - Northern Atlantic Coastal Plain Heathland and Grassland	0
5808 - Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	0
5809 - Rocky Mountain Gambel Oak-Mixed Montane Shrubland	0
5810 - Western Great Plains Mesquite Woodland and Shrubland	0
5811 - Edwards Plateau Limestone Shrubland	0
5812 - Northern Rocky Mountain Subalpine Deciduous Shrubland	0
7101 - Mediterranean California Alpine Dry Tundra	0
7102 - Rocky Mountain Alpine Fell-Field	0
7103 - Rocky Mountain Dry Tundra	0
7104 - North Pacific Alpine and Subalpine Dry Grassland	0
7201 - Mediterranean California Subalpine Meadow	0
7202 - North Pacific Montane Grassland	0
7203 - Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	0
7204 - Northern Rocky Mountain Subalpine-Upper Montane Grassland	0

Season	Year Round
Region*	SW
Map Unit	
7205 - Rocky Mountain Subalpine-Montane Mesic Meadow	0
7206 - Southern Rocky Mountain Montane-Subalpine Grassland	0
7301 - Eastern Highland Rim Prairie and Barrens - Dry Modifier	0
7302 - Central Mixedgrass Prairie	0
7303 - Chihuahuan Sandy Plains Semi-Desert Grassland	0
7304 - Columbia Basin Foothill and Canyon Dry Grassland	0
7305 - Inter-Mountain Basins Semi-Desert Grassland	0
7306 - Northwestern Great Plains Mixedgrass Prairie	0
7307 - Columbia Basin Palouse Prairie	0
7308 - Western Great Plains Foothill and Piedmont Grassland	0
7309 - Western Great Plains Sand Prairie	0
7310 - Western Great Plains Shortgrass Prairie	0
7311 - Western Great Plains Tallgrass Prairie	0
7312 - North-Central Interior Sand and Gravel Tallgrass Prairie	0
7313 - Arkansas Valley Prairie and Woodland	0
7314 - Northern Tallgrass Prairie	0
7315 - Central Tallgrass Prairie	0
7316 - Southern Blackland Tallgrass Prairie	0
7317 - Southeastern Great Plains Tallgrass Prairie	0
7318 - Florida Dry Prairie	0
7319 - West Gulf Coastal Plain Northern Calcareous Prairie	0
7320 - West Gulf Coastal Plain Southern Calcareous Prairie	0
7321 - East Gulf Coastal Plain Jackson Prairie and Woodland	0
7322 - Tamaulipan Savanna Grassland	0
7323 - Tamaulipan Clay Grassland	0
7324 - South Texas Sand Sheet Grassland	0
7326 - Chihuahuan Loamy Plains Desert Grassland	0
7401 - California Mesic Serpentine Grassland	0
7402 - Great Lakes Wet-Mesic Lakeplain Prairie	0
7501 - California Central Valley and Southern Coastal Grassland	0
7502 - California Northern Coastal Grassland	0
7503 - Atlantic Coastal Plain Southern Dune and Maritime Grassland	0

Season	Year Round
Region*	SW
Map Unit	
7504 - Southwest Florida Dune and Coastal Grassland	0
7505 - Texas-Louisiana Coastal Prairie	0
7506 - East Gulf Coastal Plain Dune and Coastal Grassland	0
7507 - Northern Atlantic Coastal Plain Dune and Swale	0
7508 - Central and Upper Texas Coast Dune and Coastal Grassland	0
7509 - South Texas Lomas	0
7510 - South Texas Dune and Coastal Grassland	0
7601 - Southern Appalachian Grass and Shrub Bald	0
7602 - Llano Uplift Acidic Forest, Woodland and Glade	0
7603 - North Pacific Hypermaritime Shrub and Herbaceous Headland	0
7604 - North Pacific Herbaceous Bald and Bluff	0
8101 - Recently Logged Areas	0
8102 - Disturbed/Successional - Shrub Regeneration	0
8103 - Disturbed/Successional - Grass/Forb Regeneration	0
8104 - Utility Swath - Herbaceous	0
8105 - Successional Shrub/Scrub (Other)	0
8106 - Harvested Forest - Northwestern Conifer Regeneration	0
8107 - Harvested Forest - Shrub Regeneration	0
8108 - Harvested Forest - Grass/Forb Regeneration	0
8201 - Deciduous Plantation	0
8202 - Evergreen Plantation or Managed Pine	0
8203 - Managed Tree Plantation	0
8301 - Recently Burned	0
8302 - Recently Burned Forest	0
8303 - Recently Burned Grassland	0
8304 - Recently Burned Shrubland	0
8401 - Introduced Upland Vegetation - Treed	0
8402 - Introduced Upland Vegetation - Shrub	0
8403 - Introduced Upland Vegetation - Forbland	0
8404 - Introduced Upland Vegetation - Annual Grassland	0
8405 - Introduced Upland Vegetation - Perennial Grassland	0
8406 - Introduced Riparian and Wetland Vegetation	0

Season	Year Round
Region*	SW
Map Unit	
8407 - Introduced Upland Vegetation - Perennial Grassland and Forbland	0
8408 - Modified/Managed Southern Tall Grassland	0
8501 - Disturbed, Non-specific	0
8502 - Recently Chained Pinyon-Juniper Areas	0
8503 - Ruderal Upland - Old Field	0
8504 - Ruderal Wetland	0
9101 - Acadian Salt Marsh and Estuary Systems	0
9102 - North Pacific Maritime Eelgrass Bed	0
9103 - Atlantic Coastal Plain Central Salt and Brackish Tidal Marsh	0
9104 - Atlantic Coastal Plain Indian River Lagoon Tidal Marsh	0
9105 - Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh	0
9106 - Mississippi Sound Salt and Brackish Tidal Marsh	0
9107 - Mediterranean California Eelgrass Bed	0
9108 - Temperate Pacific Tidal Salt and Brackish Marsh	0
9109 - Atlantic Coastal Plain Northern Tidal Salt Marsh	0
9110 - Florida Big Bend Salt-Brackish Tidal Marsh	0
9201 - Southern Coastal Plain Nonriverine Basin Swamp - Okefenokee Taxodium Modifier	0
9202 - Southern Coastal Plain Nonriverine Basin Swamp - Okefenokee Bay/Gum Modifier	0
9203 - Southern Coastal Plain Nonriverine Basin Swamp - Okefenokee Pine Modifier	0
9204 - Southern Coastal Plain Nonriverine Basin Swamp - Okefenokee Nupea Modifier	0
9205 - Southern Coastal Plain Nonriverine Basin Swamp - Okefenokee Clethra Modifier	0
9206 - Atlantic Coastal Plain Clay-Based Carolina Bay Herbaceous Wetland	0
9207 - Atlantic Coastal Plain Peatland Pocosin	0
9208 - Southern Coastal Plain Seepage Swamp and Baygall	0
9209 - West Gulf Coastal Plain Seepage Swamp and Baygall	0
9210 - East Gulf Coastal Plain Tidal Wooded Swamp	0
9211 - Atlantic Coastal Plain Streamhead Seepage Swamp - Pocosin - and Baygall	0
9212 - Central Interior and Appalachian Swamp Systems	0
9213 - Gulf and Atlantic Coastal Plain Swamp Systems	0
9214 - Laurentian-Acadian Swamp Systems	0
9215 - Atlantic Coastal Plain Large Natural Lakeshore	0
9216 - North Pacific Shrub Swamp	0

Season	Year Round
Region*	SW
Map Unit	
9218 - Atlantic Coastal Plain Southern Tidal Wooded Swamp	0
9219 - South Florida Everglades Sawgrass Marsh	0
9220 - Gulf and Atlantic Coastal Plain Tidal Marsh Systems	0
9221 - Great Lakes Coastal Marsh Systems	0
9222 - Central Interior and Appalachian Shrub-Herbaceous Wetland Systems	0
9223 - Floridian Highlands Freshwater Marsh	0
9224 - Laurentian-Acadian Shrub-Herbaceous Wetland Systems	0
9225 - Temperate Pacific Freshwater Aquatic Bed	0
9226 - North Pacific Intertidal Freshwater Wetland	0
9227 - North American Arid West Emergent Marsh	0
9228 - Temperate Pacific Freshwater Emergent Marsh	0
9229 - Great Lakes Freshwater Estuary and Delta	0
9230 - Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh	0
9231 - Central Florida Herbaceous Seep	0
9232 - Florida Big Bend Fresh-Oligohaline Tidal Marsh	0
9233 - Atlantic Coastal Plain Northern Fresh and Oligohaline Tidal Marsh	0
9234 - Northern Great Lakes Coastal Marsh	0
9235 - Atlantic Coastal Plain Northern Tidal Wooded Swamp	0
9236 - South Florida Mangrove Swamp	0
9237 - West Gulf Coastal Plain Near-Coast Large River Swamp	0
9238 - South Florida Bayhead Swamp	0
9239 - Southern Coastal Plain Nonriverine Basin Swamp	0
9240 - Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest	0
9241 - Southern Coastal Plain Herbaceous Seepage Bog	0
9242 - Laurentian-Acadian Freshwater Marsh	0
9243 - Atlantic Coastal Plain Central Fresh-Oligohaline Tidal Marsh	0
9301 - Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Taxodium/Nyssa Modifier	0
9302 - Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest - Oak Dominated Modifier	0
9303 - Atlantic Coastal Plain Clay-Based Carolina Bay Forested Wetland	0
9304 - Northern Rocky Mountain Conifer Swamp	0
9305 - South Florida Dwarf Cypress Savanna	0
9306 - North Pacific Hardwood-Conifer Swamp	0

Season	Year Round
Region*	SW
Map Unit	
9307 - Northern Pacific Mesic Subalpine Woodland	0
9308 - Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	0
9401 - Atlantic and Gulf Coastal Plain Interdunal Wetland	0
9402 - Great Lakes Wooded Dune and Swale	0
9403 - Inter-Mountain Basins Interdunal Swale Wetland	0
9501 - Boreal Acidic Peatland Systems	0
9502 - North Pacific Bog and Fen	0
9503 - Rocky Mountain Subalpine-Montane Fen	0
9504 - Mediterranean California Subalpine-Montane Fen	0
9505 - Mediterranean California Serpentine Fen	0
9506 - Southern and Central Appalachian Bog and Fen	0
9601 - Northern Atlantic Coastal Plain Pitch Pine Lowland	0
9602 - South Florida Wet Marl Prairie	0
9603 - East Gulf Coastal Plain Savanna and Wet Prairie	0
9604 - Texas Saline Coastal Prairie	0
9605 - Eastern Great Plains Wet Meadow, Prairie, and Marsh	0
9606 - Rocky Mountain Alpine-Montane Wet Meadow	0
9607 - Willamette Valley Wet Prairie	0
9608 - Temperate Pacific Montane Wet Meadow	0
9609 - Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe	0
9610 - Chihuahuan-Sonoran Desert Bottomland and Swale Grassland	0
9701 - Lower Mississippi River Bottomland Depressions - Forest Modifier	0
9702 - South Florida Cypress Dome	0
9703 - Southern Coastal Plain Nonriverine Cypress Dome	0
9704 - Northern Rocky Mountain Wooded Vernal Pool	0
9705 - Great Plains Prairie Pothole	0
9706 - Western Great Plains Depressional Wetland Systems	0
9707 - Western Great Plains Open Freshwater Depression Wetland	0
9708 - Columbia Plateau Vernal Pool	0
9709 - Northern California Claypan Vernal Pool	0
9710 - Western Great Plains Closed Depression Wetland	0
9711 - Western Great Plains Saline Depression Wetland	0

Season	Year Round
Region*	SW
Map Unit	
9712 - Central Florida Herbaceous Pondshore	0
9713 - East Gulf Coastal Plain Southern Depression Pondshore	0
9714 - Inter-Mountain Basins Alkaline Closed Depression	0
9715 - Southern Piedmont/Ridge and Valley Upland Depression Swamp	0
9716 - Atlantic Coastal Plain Depression Pondshore	0
9717 - Mississippi River Bottomland Depression	0
9718 - South Florida Freshwater Slough and Gator Hole	0
9801 - Atlantic Coastal Plain Blackwater Stream Floodplain Forest - Forest Modifier	0
9802 - Central Appalachian Floodplain - Forest Modifier	0
9803 - Central Appalachian Riparian - Forest Modifier	0
9804 - East Gulf Coastal Plain Large River Floodplain Forest - Forest Modifier	0
9805 - South-Central Interior Large Floodplain - Forest Modifier	0
9806 - Southern Piedmont Large Floodplain Forest - Forest Modifier	0
9807 - East Gulf Coastal Plain Large River Floodplain Forest - Herbaceous Modifier	0
9808 - South-Central Interior Large Floodplain - Herbaceous Modifier	0
9809 - California Central Valley Riparian Woodland and Shrubland	1
9810 - Inter-Mountain Basins Greasewood Flat	0
9811 - North Pacific Lowland Riparian Forest and Shrubland	0
9812 - North Pacific Montane Riparian Woodland and Shrubland	0
9813 - Rocky Mountain Montane Riparian Systems	0
9814 - Western Great Plains Floodplain Systems	0
9815 - Eastern Boreal Floodplain	0
9816 - Tamaulipan Floodplain	0
9817 - Eastern Great Plains Floodplain Systems	0
9818 - Central Interior and Appalachian Floodplain Systems	0
9819 - Central Interior and Appalachian Riparian Systems	0
9820 - Laurentian-Acadian Floodplain Systems	0
9821 - Tamaulipan Riparian Systems	0
9822 - North American Warm Desert Wash	0
9823 - Western Great Plains Floodplain	0
9824 - Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0
9825 - Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0

Season	Year Round
Region*	SW
Map Unit	
9826 - Northwestern Great Plains Floodplain	0
9827 - Mississippi River Riparian Forest	0
9828 - Cumberland Riverscour	0
9829 - Edwards Plateau Riparian	0
9830 - Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0
9831 - Columbia Basin Foothill Riparian Woodland and Shrubland	0
9832 - Rocky Mountain Subalpine-Montane Riparian Woodland	0
9833 - North American Warm Desert Lower Montane Riparian Woodland and Shrubland	0
9834 - North American Warm Desert Riparian Mesquite Bosque	0
9835 - North American Warm Desert Riparian Woodland and Shrubland	0
9836 - Mississippi River Low Floodplain (Bottomland) Forest	0
9837 - Rocky Mountain Subalpine-Montane Riparian Shrubland	0
9838 - Southern Coastal Plain Hydric Hammock	0
9839 - West Gulf Coastal Plain Small Stream and River Forest	0
9840 - West Gulf Coastal Plain Large River Floodplain Forest	0
9841 - Southern Piedmont Small Floodplain and Riparian Forest	0
9842 - Atlantic Coastal Plain Small Brownwater River Floodplain Forest	0
9843 - Atlantic Coastal Plain Small Blackwater River Floodplain Forest	0
9844 - Red River Large Floodplain Forest	0
9845 - Atlantic Coastal Plain Brownwater Stream Floodplain Forest	0
9846 - Mediterranean California Serpentine Foothill and Lower Montane Riparian Woodland and Seep	0
9847 - Northwestern Great Plains Riparian	0
9848 - Western Great Plains Riparian Woodland and Shrubland	0
9849 - Mediterranean California Foothill and Lower Montane Riparian Woodland	1
9850 - South-Central Interior Small Stream and Riparian	0
9851 - East Gulf Coastal Plain Small Stream and River Floodplain Forest	0
9852 - Southern Coastal Plain Blackwater River Floodplain Forest	0
9853 - Texas-Louisiana Coastal Prairie Slough	0
9854 - Mississippi River Floodplain and Riparian Forest	0
9855 - Inter-Mountain Basins Montane Riparian Systems	0
9856 - North American Warm Desert Riparian Systems	0
9857 - South-Central Interior Large Floodplain	0

Season	Year Round
Region*	SW
Map Unit	
9858 - Ozark-Ouachita Riparian	0
9901 - East Gulf Coastal Plain Jackson Plain Dry Flatwoods - Open Understory Modifier	0
9902 - East Gulf Coastal Plain Near-Coast Pine Flatwoods - Offsite Hardwood Modifier	0
9903 - East Gulf Coastal Plain Near-Coast Pine Flatwoods - Open Understory Modifier	0
9904 - East Gulf Coastal Plain Near-Coast Pine Flatwoods - Scrub/Shrub Understory Modifier	0
9905 - South Florida Pine Flatwoods	0
9906 - Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods	0
9907 - Atlantic Coastal Plain Southern Wet Pine Savanna and Flatwoods	0
9908 - West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods	0
9909 - Central Florida Pine Flatwoods	0
9910 - East Gulf Coastal Plain Near-Coast Pine Flatwoods	0
9911 - East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods	0
9912 - South-Central Interior / Upper Coastal Plain Wet Flatwoods	0
9913 - West Gulf Coastal Plain Pine-Hardwood Flatwoods	0
9914 - North-Central Interior Wet Flatwoods	0
9915 - Lower Mississippi River Flatwoods	0
9916 - West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods	0

*GP = Great Plains; NE = Northeast; NW = Northwest; SE = Southeast; SW = Southwest; UM = Upper Midwest

More information regarding modeling process: https://gapanalysis.usgs.gov/species/data/

Citations

Crother, B. I. (ed.) 2012. Standard Common and Current Scientific Names for North American Amphibians, Turtles, Reptiles, and Crocodilians, Seventh Edition. Herpetological Circular 39: 1-92.

Green, D.M., L.A. Weir, G.S. Casper, and M.J. Lannoo. 2013. North American Amphibians: Distribution and Diversity. University of California Press. Berkeley, California. 340 pp.

Jockusch, E. L., D. B. Wake, and K. P. Yanev. 1998. New species of slender salamanders, Batrachoseps (Amphibia: Plethodontidae), from the Sierra Nevada of California. Natural History Museum, Los Angeles County, Contributions in Science, Number 472, Los Angeles, California.

Lannoo, M. 2005. M. Lannoo (Ed.), Amphibian Declines. The Conservation Status of United States Species, University of California Press, Berkeley, CA (2005), p. 1094

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. Third Edition. Houghton Mifflin, Boston.

Model Parameter Definitions

Land Cover Map Units

Land Cover Data Source — National Gap Land Cover Ver 1.0 (2001) — The ecological systems mapped in the GAP National Land Cover Data were used as 'map units' to describe habitat types preferred by species. https://doi.org/10.5066/F7959GF5

Absent (0) — Not utilized by species.
Primary (1) — Utilized by species.
Secondary (2) — Utilized by species if in proximity to Primary map units (see Secondary Map Units below).

Land Cover Limitations

Contiguous Patch — Minimum size (ha) — This parameter is set using the most conservation values explicitly stated in the species literature. Any mapped habitat not meeting the minimum contiguous patch size is eliminated. If applied, this is the last step in habitat modeling.

Edge Type Usage — Ecotone Width (m) — We grouped map units into forested, non-forested, and shrubland/woodland land cover types to identify both Forest/Open ecotones and Woodland/Shrubland. Using this data set, we can define the width and nature of ecotones utilized by species.

Forest Interior Usage — Distance From Edge (m) — Used to limit species to forest interiors or to exclude them from such.

Secondary Map Units — Distance From Primary Map Units (m) — Secondary Map Units identified in the Map Units table (2) are included in a species habitat map if they are within proximity to Primary Map Units (1).

Hydrographic Limitations

Flowing Water — Distance Into/From (m) — Flowing water represents hydrographic features such as streams, rivers, springs, seeps, ditches with moving water, etc.

Open/Standing Water — Distance Into/From (m) — Standing water represents hydrographic features such as lakes, ponds, reservoirs, bays, inlets, estuaries, ocean, ditches with stagnant water, etc.

Wet Vegetation — Distance Into/From (m) — Wet vegetation represents hydrographic features such as swamps, marshes, Carolina bays, etc. This includes a collection of map units representing seasonally or tidally inundated woody and non-woody plants.

Water Salinity — Freshwater Only, Brackish/Salt Water Only, All Water — Water salinity is a major factor when considering habitat conditions for many species. However, the dynamic and complex nature of water systems makes the development of a highly refined and reliable data layer challenging. Therefore, we developed three general categories to include in species habitat models for species requiring water.

Water Velocity — Slow Only, Fast Only, All Types — For some aquatic species, this is an important aspect of their habitat, such as oxygenation levels, presence of invertebrate prey, and amount of sediment within the water column and on streambed substrates. Stream velocity (i.e., stream gradient) was derived from a combination of streams and slopes calculated from a digital elevation model (DEM), which created three categories for stream gradient.

Slow Only — For species that require slow moving or almost stagnant sections of streams or rivers. Typically these are areas where the underlying topography is flat (0 % gradient).
Fast Only — For species that require high velocity sections of streams or rivers. Typically these are areas where the underlying topography is steep. A threshold of > 5 % gradient was used.
All Types — For species that can utilize either fast or slow sections of streams or rivers.

Human Impact Avoidance — High, Medium, Low — Environments dominated by human disturbance such as roads, cities, and the constructed materials that support human habitation have profound effects on species. For most species, this data layer was used to exclude species from a portion of the landscape. However, some species respond favorably to human habitats, therefore this data layer was used in an inclusionary manner.

High — For species that are very intolerant of human disturbance. All portions of the landscape identified as being directly influenced by human disturbance are eliminated from the predicted distribution.
Medium — For species that are moderately intolerant of human disturbance. Only portions of the landscape identified as being highly or moderately influenced by human disturbance are eliminated from the predicted distribution.
Low — For species that are partially intolerant of human disturbance. Only portions of the landscape identified as being highly influenced by human disturbance are eliminated from the predicted distribution.

Elevation Limits — Min/Max (m) — Some species respond to environments directly related to altitudinal variation. Elevation (e.g., DEM) is easily implemented in spatial modeling by limiting the model to the minimum and maximum values explicitly stated in the literature. DEMs are utilized directly and are measured in meters above and below mean sea level.

Hand Modeled — Occasionally, habitat models had to be manipulated outside of the main scripting environmnent in order to acheive the desired results. If so, notes on additional processing are provided.