# Preliminary Focal Species Mapping Order for the Montana Connectivity Project

Mapping order was obtained through the following steps: Threats and umbrella scores for each species were obtained from experts before and during the Connectivity Mapping meeting.  The threats and umbrella scores were added to get a total score for each species.  These total scores were then averaged across all experts.  Species were placed in order of their average total scores.   All species listed as falling under the umbrella of a higher scoring species were moved to the bottom of the list where they occur in order of their average total scores.  Harlequin duck was replaced with Trumpeter swan because they utillize similar habitats and more information is available for the latter species.  The final step was to move two species (wolverine and black bear) to the top of the list because current, range-wide linkage maps have been made for these species.  This order is preliminary as data availability may dictate that a species be replaced by a surrogate or mapped at a future time when more information is available.  The table below lists for each focal species:  mapping order, general habitat types used by a species, the types of connectivity needed for species persistence, threats faced, other species that may benefit by conserving connectivity for this species, and connectivity data/information that is known to be available for this species in Montana.

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Wolverine | 1 | High elevation forest | Long term (genetic), Range expansion/shift | Threats are valley bottom development (residential, transportation) and are imminent for some populations. | Canada Lynx, Fisher, Grizzly Bear, Mountain Lion, Black Bear, Elk, Mule Deer, Moose, Wolf, Bighorn Sheep, Hoary Marmot, Ptarmigan. | Range wide LCP linkage maps have been developed and updates are planned by Wildlife Conservation Society.  Range wide genetic connectivity maps by US Forest Service. Expert opinion data compiled for W. MT by American Wildlands (AWL). |
| Black Bear | 2 | Forest and woodlands | Within season, Seasonal, Long term | Threats are residential development and transportation infrastructure and are not severe or imminent. | Grizzly bear, Wolf, Mountain Lion | Linkage model available based on genetic similarity and LCP for W MT developed by US Forest Service.  Statewide model available soon.  Expert opinion data compiled for W. MT by AWL |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Greater Sage Grouse | 3 | Sage Steppe | Within season, seasonal | Threats are development (oil and gas, wind, and residential) and are imminent in most populations. | Sage thrasher, Sage sparrow, Brewer's Sparrow, Sharp-tailed grouse, Pygmy rabbit | Core habitat and lek areas mapped by MFWP. |
| Mountain Plover | 4 | Short grasslands | Seasonal | Threats are habitat loss and are severe and imminent. | Prairie Dog, longspurs (with mixed grass) | Habitat data available (Maxent or ReGAP models) from MTNHP. |
| Baird's Sparrow | 5 | Mixed Grasslands | Seasonal | Threats are agriculture, energy development and transportation infrastructure and are severe and imminent. | Sprague's Pipit, longspurs(with short grass) | Habitat data available (Maxent or ReGAP models). |
| Ferruginous Hawk | 6 | Shrub steppe | Seasonal | Threats are development (housing, energy, transportation, and agriculture) amd are severe for some populations in the state. | Swainson's hawk, Rough-legged hawk | Habitat data available (Maxent or ReGAP models). |
| Clark's Nutcracker | 7 | Conifer Forests | Seasonal | Threats are climate change and loss of whitebark pine amd are severe and imminent. | Grizzly Bear, Pinyon Jay, Brown Creeper | Habitat data available (Maxent or ReGAP models) |
| Long-billed Curlew | 8 | Short and Mixed Grasslands | Seasonal | Threats are agriculture, energy development and transportation infrastructure and are severe and imminent. | Grasshopper Sparrow, Bobolink | Habitat data available (Maxent or ReGAP models). Radiolocation data available for Phillips County |
| Piping Plover | 9 | Prairie lakes and rivers | Seasonal | Threats are stream flow maintainence and loss of gravel bars and are severe and imminent. | | Habitat data available (Maxent or ReGAP models) |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Northern Leopard Frog | 10 | Prairie wetlands | Within season, seasonal | Threats are small remaining populations in areas of near extirpation in western MT and in eastern MT grazing impacts to emergent vegetation and water quality.  Threats are imminent for some populations. | Great Plains Toad, Black Tern, Northern Pintail | Habitat data available (Maxent or ReGAP models) |
| Pronghorn | 11 | Sage Steppe and grasslands | Daily, Within season, Seasonal | Threats are energy development, residential development, transportation infrastructure, and fencing and are imminent for some populations. | Mule Deer, Elk, Pygmy Rabbit, Swift Fox, Sage Grouse, TBEB | Migration study in progress for northeastern Montana.  Seasonal ranges delineated statewide. Expert opinion data compiled for W. MT.  Some migration information compiled. |
| Hoary Bat | 12 | Woody wetlands and riparian | Daily, Within season, Seasonal | Threats are energy development (wind), and climate change and are not imminent but may have statewide impacts. Disease is also a concern. | | Habitat data available (Maxent or ReGAP models). |
| Trumpeter Swan | 13 | Wetlands | Seasonal | Threats include climate change and wind development and are imminent for some populations. | Common loon, American white pelican, Tundra swan, Northern pintail, Harlequin duck, Franklin's gull, Common tern, Black tern | Habitat data available (Maxent or ReGAP models). Nesting site locations available. |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Black Rosy Finch | 14 | Alpine tundra | Seasonal, Range expansion/shift | Threats are habitat loss due to climate change and are severe and imminent. | White-tailed Ptarmigan | Habitat data available (Maxent or ReGAP models) |
| Townsend's Bat | 15 | Caves and riparian areas | Daily, Within Season, Seasonal | Threats are habitat loss due to climate change and are not imminent but may have statewide impacts. Disease is also a concern. | Fringed Myotis, Spotted Bat, Pallid Bat | Habitat data available (Maxent or ReGAP models) |
| Cassin's Finch | 16 | Dry coniferous forests | Seasonal | Threats are logging and residential development and are not imminent but could be severe statewide. | | Habitat data available (Maxent or ReGAP models) |
| Rufous Hummingbird | 17 | Woody wetlands and riparian. Riparian migrators | Seasonal | Threats are loss of riparian habitat and area not imminent but could be severe statewide. | Black Swift, Lewis's woodpecker, veery and ovenbird | Habitat data available (Maxent or ReGAP models). |
| Wilson's Phalarope | 18 | Herbaceous wetlands | Seasonal | Threats are wetland loss due to climate change and dewatering. Threats are not imminent but could be severe statewide. | Long-billed Dowitcher | Habitat data available (Maxent or ReGAP models). |
| Beaver | 19 | Woody wetlands and riparian | Long term, Range expansion/shift | Threats are residential development and climate change. Threats are not imminent statewide and are not severe in eastern MT but may be severe in western MT. | Western toad; N. Leopard frog; Snapping turtle, Hoary bat, fringed myotis, terrestrial gartersnake, Northern River Otter, other riverine riparian | Habitat data available (Maxent or ReGAP models). |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Snapping Turtle | 20 | Small prairie rivers | Within season, seasonal | Threats are not severe or imminent due to altered hydrology from climate change or agricultural use. | | Habitat data available (Maxent or ReGAP models). |
| Idaho Giant Salamander | 21 | Moist coniferous forests and cold mountain streams | Range expansion/shift | Threats are canopy removal and alteration of hydrology and are not imminent for some populations. | | Habitat data available (Maxent or ReGAP models). |
| Spiny Softshell Turtle | 22 | Large prairie rivers | Seasonal | Threats are severe and imminent due to population isolation by dams, altered hydrology in small streams, and habitat loss to shoreline riprap. | | Telemetry data available |
| Pika | 23 | Talus slopes | Range expansion/shift | Threats area not imminent but may have statewide impacts due to climate change. | Hoary Marmot | Habitat data available (Maxent or ReGAP models). |
| Prairie Rattlesnake | 24 | Upland grasslands and herbaceous | Seasonal | Threats are human persecution near developed areas and transportation infrastructure.Threats area not imminent but could have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Plains Gartersnake | 25 | Upland grasslands and herbaceous | Seasonal | Threats are transportation infrastructure and are not severe or imminent . | | Habitat data available (Maxent or ReGAP models). |

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|---|---|---|---|---|---|---|
| Terrestrial Gartersnake | 26 | Forests and woodlands | Seasonal | Threats are transportation infrastructure and are not severe or imminent . | | Habitat data available (Maxent or ReGAP models). |
| Connectivity for the species below may be covered by mapping connectivity for one or more of the species above. | | | | | | |
| Grizzly Bear | 27 | Forests and grasslands | Daily, Within season, Seasonal, Long Term, Range shift/expansion | Threats are energy development, residential development, and transportation infrastructure.  Threats are imminent for some populations. | Black Bear, Wolf, Mountain Lion, Lynx, Wolverine, Elk, Moose, Marmot | Rangewide LCP linkage maps have been developed. Range wide expert opinion data is compiled .  Linkages based on empirical data developed for northern Montana.  Expert opinion linkage information compiled for W. MT. |
| Elk | 28 | Forests and grasslands | Seasonal | Threats are energy development, residential development and transportation infrastructure. Threats are not imminent but may have impacts statewide. | Mule Deer, Black Bear, Mountain Lion, Wolf, Grizzly Bear | Seasonal ranges are delineated. Expert opinion data is compiled for W. MT.  Some migration information is compiled and linkages are mapped for small portions of the state. |
| Pygmy Rabbit | 29 | Sagebrush | Long term, Range expansion/shift | Threats are habitat loss from energy development, residential development, and climate change. Threats are not imminent but may have statewide. | Sage grouse, Sage thrasher, Sage sparrow, Brewer's Sparrow, Sharp-tailed grouse | Habitat data available (Maxent or ReGAP models). |

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|---------|-------|---------------------------|--------------------|---------|----------------------|--------------------------------|
| Mule Deer | 30 | Upland grasslands and herbaceous | Seasonal | Threats are not imminent but may have statewide impacts due to energy development, residential development, and transportation infrastructure. | Elk, Pronghorn, Mountain Lion, Wolf, Swift Fox | Seasonal ranges are delineated. Expert opinion data is compiled for W. MT. Some migration information is compiled |
| Great Plains Toad | 31 | Great plains floodplains | Within season, seasonal | Threats are reduced breeding habitat due to sodbusting and altered disturbances (loss of flood regimes and bison wallows). Threats are imminent and severe. | | Habitat data available (Maxent or ReGAP models). |
| Swift Fox | 32 | Upland grasslands and herbaceous | Within season, Long term | Threats are loss of habitat from agriculture and transportation infrastructure. Threats are not imminent but may have statewide impacts. | Pronghorn, Mule Deer, Black-tailed Prairie Dog, TBEB | Habitat data available (Maxent or ReGAP models). |
| Canada Lynx | 33 | High elevation Forest | Long term, Range expansion/shift | Threats are logging and residential development and are not imminent but could have statewide impacts. | Fisher, Wolverine, Grizzly Bear, Black Bear, Wolf | Habitat models in progress. Expert opinion data is compiled for W. MT. General linkages delineated by USFS. |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Black-tailed Prairie Dog | 34 | Short Grasslands | Long term | Threats are agriculture and residential development. Threats are not imminent but could have statewide impacts. Disease is also a concern | Ferruginous Hawk, Mountain Plover, Swift Fox, White-tailed prairie dog | Habitat data available (Maxent or ReGAP models). |
| Bighorn Sheep | 35 | Grasslands | Daily, Within season, Seasonal, Long Term | Threats are residential development and transportation infrastructure and are not imminent but may have statewide impacts. | Mountain Lion | Habitat data available (Maxent or ReGAP models). Expert opinion data is compiled for W. MT. Some migration information is compiled. |
| White-tailed Prairie Dog | 36 | Grasslands, shrublands and steppe | Long term | Threats are transportation infrastructure and are imminent for some populations. Disease is also a concern. | Ferruginous Hawk, Mountain Plover, Swift Fox | Habitat data available (Maxent or ReGAP models). |
| Mountain Lion | 37 | Forest and woodlands | Seasonal, Long term | Threats are residential development and transportation infrastructure and are not imminent but may have statewide impacts. | Grizzly Bear, Black Bear, Wolverine, Swift Fox, Canada Lynx | Habitat data available (Maxent or ReGAP models). Dispersal study in progress. Expert opinion information is compiled for W. MT. |
| Fisher | 38 | Forest and woodlands | Range expansion/shift | Threats are not imminent but may have statewide impacts due to habitat loss from logging and residential development. | Wolverine, Canada Lynx, Grizzly Bear, Black Bear | Habitat data available (Maxent or ReGAP models). |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Gray Wolf | 39 | Savanna and shrub steppe,forest and woodland | Seasonal, Long term | Threats are energy development, residential development, and transportation infrastructure. Threats are not imminent but may have statewide impacts. | Grizzly Bear, Wolverine, Mountain Lion | Habitat data available (Maxent or ReGAP models). Connectivity model available but dated. |
| North American River Otter | 40 | Woody wetlands and riparian, herbaceous wetlands | Seasonal | Threats are residential development and are not severe or imminent. | | Habitat data available (Maxent or ReGAP models). |
| Western Toad | 41 | Western Montana pond breeders | Within season, seasonal | Threats are transportation infrastructure and are severe and imminent. Disease is also a concern. | | Habitat data available (Maxent or ReGAP models). |
| Hoary Marmot | 42 | Upland grasslands and herbaceous | Alpine tundra | Threats are climate change and are imminent for some populations in the state. | pika, ptarmigan, rosy finch | Habitat data available (Maxent or ReGAP models). |
| Moose | 43 | Forest and woodlands | Seasonal, Range expansion/shift | Threats are loss of riparian vegetation from residential development and climate change. Threats are not imminent but may have statewide impacts. | Beaver | Habitat data available (Maxent or ReGAP models). |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Fringed Myotis | 44 | Upland grasslands and herbaceous | Daily, Within season, Seasonal | Threats are not imminent but may have statewide impacts due to climate change. Disease is also a concern. | | Habitat data available (Maxent or ReGAP models). |
| Pallid Bat | 45 | Savanna and shrub steppe | Withing season, Seasonal | Threats are not imminent or severe due to disease. | | Habitat data available (Maxent or ReGAP models). |
| Spotted Bat | 46 | Savanna and shrub steppe | Daily, Within season, Seasonal | Threats are climate change and are not imminent or severe. | | Habitat data available (Maxent or ReGAP models). |
| Sprague's Pipit | 47 | Taller grasslands and herbaceous | Seasonal | Threats are agriculture, energy development and transportation infrastructure. Threats are severe and imminent. | Baird's Sparrow, Grasshopper Sparrow, Bobolink | Habitat data available (Maxent or ReGAP models). |
| Grasshopper Sparrow | 48 | Mixed and taller grassland and herbaceous | Seasonal | Threats are agriculture, energy development and transportation infrastructure. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Harlequin Duck | 49 | Mountain streams | Seasonal | Threats are changing stream ecology with climate change, grazing and residential development. Threats are imminent for some populations in the state. | | Habitat data available (Maxent or ReGAP models). |

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|---------|-------|--------------------------|-------------------|---------|---------------------|-------------------------------|
| Sharp-tailed Grouse | 50 | Shrub steppe | Seasonal | Threats are residential development and are not imminent but may have statewide impacts. | Greater Sage-Grouse | Habitat data available (Maxent or ReGAP models). |
| Brown Creeper | 51 | Moist conifer forest | Seasonal | Threats are logging and residential development and are not imminent but could have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Sage Thrasher | 52 | Sage steppe | Seasonal | Threats are agriculture, grazing, energy development and residential development. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| White-tailed Ptarmigan | 53 | | Seasonal, Range expansion/shift | Threats are climate change and habitat loss and are not imminent but could have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| McCown's Longspur | 54 | Short and Mixed Grasslands | Seasonal | Threats are agriculture, energy development and transportation infrastructure. Threats are imminent for some populations in the state. | | Habitat data available (Maxent or ReGAP models). |

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|---|---|---|---|---|---|---|
| Chestnut Collared Longspur | 55 | Short and Mixed Grasslands | Seasonal | Threats are agriculture, energy development and transportation infrastructure. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Lewis's Woodpecker | 56 | Riparian forest | Seasonal | Threats are logging and housing development and are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Black Tern | 57 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Franklin's Gull | 58 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Brewer's Sparrow | 59 | Sage steppe | Seasonal | Threats are agricure, grazing, energy development, residential development, and transportation infrastructure. Threats are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |

| Species | Order | General Occupancy Habitat | Connectivity Types | Threats | May be Umbrella for: | Habitat/Linkage Data Available |
|---|---|---|---|---|---|---|
| Black Swift | 60 | Woody wetlands and riparian - waterfalls | Seasonal | Threats are climate change and loss of waterfalls and are severe and imminent. | | Habitat data available (Maxent or ReGAP models). |
| Ovenbird | 61 | Deciduous forest | Seasonal | Threats are grazing, housing development and human disturbance. Threats are imminent for some populations in the state. | | Habitat data available (Maxent or ReGAP models). |
| Pinyon Jay | 62 | Conifer Forests | Seasonal | Threats are loss of habitat due to climate change and conifer encroachment. | | Habitat data available (Maxent or ReGAP models). |
| Long-billed Dowitcher | 63 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are not imminent but could have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Common Loon | 64 | Herbaceous wetlands | Seasonal | Threats are residential development, human disturbance, and climate change.  Threats are imminent for some populations. | | Habitat data available (Maxent or ReGAP models). |

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|---|---|---|---|---|---|---|
| Veery | 65 | Riparian forest | Seasonal | Threats are human disturbance and loss of riparian vegetation due to grazing, residential development and climate change.  Threats are not imminent but could have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Bobolink | 66 | Mixed Grasslands | Seasonal | Threats are imminent for some populations due to agriculture, energy development, and transportation infrastructure. | | Habitat data available (Maxent or ReGAP models). |
| Common Tern | 67 | Herbaceous wetlands | Seasonal | Threats are not imminent but could have statewide impacts due to agriculture (dewatering pressures),climate change and loss of wetlands. | | Habitat data available (Maxent or ReGAP models). |
| Northern Pintail | 68 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are not imminent but may have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |

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|---|---|---|---|---|---|---|
| American White Pelican | 69 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are not imminent but may have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Tundra Swan | 70 | Herbaceous wetlands | Seasonal | Threats are agriculture (dewatering pressures),climate change and loss of wetlands. Threats are not imminent but may have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Rough-legged Hawk | 71 | Shrub steppe | Seasonal | Threats are agriculture, grazing, energy development, residential development, and transportation infrastructure.  Threats are not imminent but may have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |
| Swainson's Hawk | 72 | Shrub steppe | Seasonal | Threats are agriculture, grazing, energy development, residential development, and transportation infrastructure.  Threats are not imminent but may have statewide impacts. | | Habitat data available (Maxent or ReGAP models). |