APPENDIX 1. BIOLOGICAL TARGETS

Appendix 1a. Ecological system targets: reclassification of potential targets into new target types

This table shows the reclassification or "lumping" of the potential ecological system targets into new groupings for purposes of simplification. SW ReGAP was the data source for the potential list, with the exception of Ponderosa (open) and Ponderosa (woodland), which the County provided.

Potential targets	Acres in SW ReGAP	Data source	Reclassify as
Inter Mountain Basins Mixed Salt Desert Scrub	3,449	SWReGAP	Salt Desert Scrub
Inter Mountain Basins Montane Sagebrush Steppe	1	SWReGAP	Mountain Mahogany
Inter Mountain Basins Semi-Desert Shrub Steppe	2	SWReGAP	Salt Desert Scrub
Inter Mountain Basins Wash	251	SWReGAP	Riparian Woodlands and Shrublands
Invasive Perennial Grassland	1,752	SWReGAP	Wetlands
Open Water	16	SWReGAP	Aquatic Systems
Ponderosa (open)		County	Ponderosa Pine Woodlands
Ponderosa (woodland)		County	Ponderosa Pine Woodlands
Rocky Mountain Alpine-Montane Wet Meadow	5	SWReGAP	Wetlands
Rocky Mountain Cliff and Canyon	1	SWReGAP	Cliff and Outcrops
Rocky Mountain Lower Montane-Foothill Shrubland	10,408	SWReGAP	Mountain Mahogany
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	2	SWReGAP	Ponderosa Pine Woodlands
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	60	SWReGAP	Ponderosa Pine Woodlands
Rocky Mountain Ponderosa Pine Woodland	186	SWReGAP	Ponderosa Pine Woodlands
Rocky Mountain Subalpine-Montane Riparian Shrubland	2	SWReGAP	Riparian Woodlands and Shrublands
Southern Rocky Mountain Montane-Subalpine Grassland	266	SWReGAP	Foothills Grasslands
Western Great Plains Cliff and Outcrop	70	SWReGAP	Cliff and Outcrops
Western Great Plains Floodplain Herbaceous Wetland	262	SWReGAP	Wetlands
Western Great Plains Foothill and Piedmont Grassland	8,052	SWReGAP	Foothills Grasslands
Western Great Plains Riparian Woodland and Shrubland	45	SWReGAP	Riparian Woodlands and Shrublands
Western Great Plains Shortgrass Prairie	41,309	SWReGAP	Shortgrass Prairie

Appendix 1b. Ecological system targets: final list

Aquatic targets and notes

- Creeks and streams - Includes streams, where they are on the surface. Includes perennial and intermittent streams. There are no true perennial streams on Meadow Springs; only perennial sections.
- Seeps and springs
- Wetlands - Wetlands are home to most of Soapstone's 17 rare plants, including but not limited to the federally-threatened Colorado butterfly plant. Plants are being seen here which haven't been seen since 1898. The area between CO and WY is "a botanists dream." Things occur here said only found to occur in alpine and subalpine areas (City). These are also the areas containing the prehistoric ceramics (CSU).

Terrestrial targets, acreages, and notes

System targets	Acres (approx.)*	% Project Area	Notes
Cliff and Outcrops	102	0.2%	
Foothills Grasslands	8,252	13.5%	Mix between mixed-grass prairie and Piedmont Grasslands. Most imperiled/least protected major terrestrial ecological system on the planet. Declining faster than any of the other systems in the project area.
Mountain Mahogany	9,530	15.5%	Red Mountain and Soapstone contain one of the least developed and most intact occurrences of this system along the Front Range. Important for towhees, jays, and some other bird species. Not as widespread as the grasslands. Follows the foothills of the Ft. Range primarily.
Ponderosa Pine Woodlands	543	0.9%	Also includes an aspen grove.
Riparian Woodlands and Shrublands	290	0.5%	Major species within this system include cottonwoods and willows.
Salt Desert Scrub	3,419	5.6%	Dominant plant is *atriplex* - saltbush. High quality forage for cattle. Blends in with the shortgrass. Birds change with structure - will see different birds, such as lark bunting and Cassin's sparrow. 2-3x the cultural site density of any other ecological system type (sites are more visible).
Shortgrass Prairie	39,196	69.9%	North to south gradient in Colorado. The northern part is a little wetter than the southern part, thus the species diversity is higher. Can flux from shortgrass to mixed grass depending on the amount of rain. V. productive for cattle. Huge ecosystem, but we've lost more than any other ecosystem in the state – in Colorado, we have lost 48% of the shortgrass prairie. Many species of birds are associated with shortgrass prairie. The birds don't need much, but what they do need, they really need.
Total acreage	**61,332**		

* Acreages do not exclude developed areas except where they have been mapped in SWReGAP land cover data, and may include or overlap with some areas also mapped as aquatic systems.

Appendix 1c. Plant community targets

This table shows all plant communities considered for identification as targets, and identifies whether or not the Technical Team included them as targets or not.

Potential target list	Include as Target?	Rarity	Comments
Foothills Ponderosa Pine Savannas (*Pinus ponderosa / Leucopoa kingii* Woodland)	Yes	G3	High quality occurrence. This plant community is primarily found in older growth Ponderosa Pine forests that are maintained by infrequent fires (once/40 years) that maintains a lower density forest and allows for the *Leucopoa kingii* grass to thrive. Soils are mature and often have a good depth of organic material.
Western Slope Grasslands (*Krascheninnikovia lanata / Pascopyrum smithii - Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation)	Yes	G4	Common, but this is a high quality area. This plant community occurs in wide basins or gently-sloping areas. The Krascheninnikovia lanata (winter fat) is an excellent forage plant for cattle and sheep and considered an indicator of a healthy range site.
Beaked Sedge Montane Wet Meadows (*Carex utriculata* Herbaceous Vegetation)	No	G5	Covered by wetlands. Common.
Choke cherry/plum thickets	No	n/a	Mostly mixed with riparian, but can go up into the hills. Low risk for a placement of a well. Would be covered by riparian setbacks.
Clustered Sedge Wetland (*Carex praegracilis* Herbaceous Vegetation)	No	G3G4	Covered by wetlands. Common.
Foothills Shrubland (*Cercocarpus montanus / Hesperostipa neomexicana* Shrubland)	No	G2G3	
Mixed Foothill Shrublands (*Cercocarpus montanus / Hesperostipa comata* Shrubland)	No	G2	Rare
Mixed Mountain Shrublands (*Cercocarpus montanus / Muhlenbergia montana* Shrubland)	No	GU	
Montane Grasslands (*Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation)	No	G5	Covered by foothills shrubland. Common.
Mountain Mahogany/Griffith's Wheatgrass Shrubland (*Cercocarpus montanus / Elymus lanceolatus* ssp. *lanceolatus* Shrubland)	No	GU	Per CNHP, we can consider this plant community to be the same as the Foothills Shrubland ecological system and use SW ReGAP data. The County data isn't a plant community; it's a system.
Narrowleaf Cottonwood/Common	No	G2Q	Covered by riparian woodland and shrubland. Does not need to be pulled out specifically.

Potential target list	Include as Target?	Rarity	Comments
Chokecherry (*Populus angustifolia / Prunus virginiana* Woodland)			
Pinyon Pine site	No	n/a	2 trees.
Shortgrass Prairie (*Atriplex canescens / Bouteloua gracilis* Shrubland)	No	G3	Probably almost one to one with Salt Desert Scrub ecological system
Shortgrass Prairie (*Bouteloua gracilis - Buchloe dactyloides* Herbaceous Vegetation)	No	G4	Covered by shortgrass prairie ecological system. Common.
Spring Wetland (*Catabrosa aquatica - Mimulus* ssp. Spring Wetland)	No	GU	Covered by seeps and springs. Common.
Western Slope Wet Meadows (*Juncus balticus* Herbaceous Vegetation)	No	G5	Covered by wetlands. Common
Wet Meadow (*Carex simulata* Herbaceous Vegetation)	No	G4	Covered by wetlands. Common
Wet Meadows (*Carex nebrascensis* Herbaceous Vegetation)	No	G4	Covered by wetlands. Common

Appendix 1d. Species targets

This table includes all available data layers that the Technical Team found for species and identifies the factors involved in whether to include the species as a target. For state priorities, O&G Rules = targets identified as Limited Surface Occupancy and/or Sensitive Wildlife Habitat under the Colorado Oil and Gas Rules; SWAP = State Wildlife Action Plan priority (Colorado Division of Wildlife, 2006). For City and County priorities, RMOS = Red Mountain Open Space target (Larimer County, 2007) and SS= Soapstone Prairie Natural Area target (City of Fort Collins, 2007). Ecoregional plan target = a target in the Central Shortgrass Prairie Ecoregional Assessment (Neely, et al., 2006).

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
Amph.	Northern leopard frog	Yes		Tier 1		yes		G5/S3	
Bird - raptor	Bald eagle nests	Yes							Not mapped in planning area at present, but within habitat
Bird - raptor	Bald eagle winter roosts	Yes	yes	?	?	?	?	?	Not mapped in planning area at present, but within habitat.
Bird - raptor	Ferruginous hawk nests	Yes	yes nests	Tier 1	?	yes	yes	G4/S3	High priority for many planning efforts.
Bird - raptor	Golden eagle nests	Yes	yes	Tier 1	?	yes			There are a few in the planning area. Sensitive to disturbance (RMBO).
Bird - raptor	Prairie falcon nests	Yes		Tier 1					
Bird - raptor	Swainson's hawk nests	Yes		Tier 1				G5/S5	
Bird - raptor	Western burrowing owl nests	Yes		Tier 1				G4/S4B	The protection of the larger prairie dog towns may not necessarily protect the owls. They seem to favor small, isolated prairie dog towns that we can identify and map.
Bird - raptor	Owls and other nesting raptor nests	Yes			yes nests				Short-horned owl, great-horned owl, etc.
Bird - other	Mountain plover nests and staging area	Yes		Tier 1	?		yes	G2/S2	Specific to pdogs because they prefer almost bare ground, can also be found in recently burned areas or heavily grazed areas.
Bird - other	Chestnut-collared	Yes		Tier 2	?		yes	G5/S1	Area is esp. important, some of the only places in

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
	longspur breeding areas								N.America that they nest (RMBO)
Bird - other	Lark bunting core areas	Yes		Tier 1				G5	80% population decline over the last 40 years, the steepest of many grassland obligates (RMBO).
Bird - other	McCown's longspur core areas	Yes		Tier 1	?		yes	G4/S2B	Very important area (RMBO). Population is declining (CNHP).
Fish	Iowa darter	Yes		Tier 2		yes		G5/S3	Added to targets. Only a couple known locations. Similar situation to the Northern leopard frog.
Fungus	*Smithiomyces crocodilinus*	Yes						1 known in world	Only one location known. Depends on Mountain Mahogany ecological system.
Insect	Colorado blue	Yes		Tier 2			yes	G3G4T2T3	Fairly small range in the world. Just a couple known locations on site. Note, however, that it probably does not need special management; may not be location specific.
Insect	Aquatic insects	Yes							
Mammal	Black-footed ferret (captive population)	Yes		Tier 1				G1/S1	Ferret Center is surrounded by Meadow Springs and is one of the only areas in CO where FWS is managing for ferrets (FWS)
Mammal	Black-tailed prairie dog	Yes		Tier 1		yes	yes	G4/S3	Proxy for burrowing owls, and high priority in and of themselves.
Mammal	Swift fox dens	Yes		Tier 1		yes	yes		
Mammal	Elk production area	Yes	yes		?				
Mammal	Elk winter concentration area	Yes	yes		?				
Mammal	Mule deer critical winter range	Yes	yes		?				
Mammal	Mule deer	Yes	yes		?				

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
	severe winter range								
Mammal	Pronghorn winter concentration area	Yes	yes		?	yes			
Plants	Rare plants	Yes						Various, see below	
Plant	*Agrimonia striata*	Yes						G5 Under consideration for tracking. waiting on State Status from CNHP	Located at the aspen grove. There are only about 19 current occurrences of this plant in CO. It is listed as a G5 S2 in Wyoming. There is a very small population at SSN, less than 5 plants. Waiting for CNHP to determine status.
Plant	Colorado butterfly plant (*Oenothera coloradensis ssp. Coloradensis*)	Yes				yes	yes	G3T2S1	Federally threatened species. This is the only known population in Larimer County.
Plant	Hops (*Humulus lupulus* subsp. *neomexicanus*)	Yes						G5 Infrequent	This species is listed as a G5 S3 in Wyoming and should be considered for tracking in CO. A majority of the herbaria collections for this plant are historic. A rare butterfly depends on this plant for survival.
Plant	Large Indian breadroot (*Pediomelum esculentum*)	Yes						G5 Under consideration for tracking, waiting on State Status from CNHP	Soapstone has the only Larimer County occurrence for this plant. According to CU, CSU and RM Herbaria there are only 6 current occurrences in the State.
Plant	Pale blue-eyed grass	Yes				yes	yes	G2G3 S2	Grows in same habitat as CO butterfly plant. Very

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
	(*Sisyrinchum pallidum*)								small population (118 plants in 2009)
Plant	Prairie goldenrod (*Oligoneuron album*)	Yes						G5 S2S3	The Soapstone Prairie occurrence is the only one in Larimer County. This plant has not been documented in Larimer County since 1898. This population also occurs in the same wet meadow as the Colorado butterfly plant.
Plant	Purple spikerush (*Eleocharis atropurpurea*)	Yes						G4G5 Under consideration for tracking, waiting on State Status from CNHP	The Soapstone Prairie occurrence is the only one in Larimer County. Also it is the second known occurrence for this species in the State of Colorado according to CU, CSU and RM Herbaria.
Plant	Rare canyon ferns	Yes						n/a	Red Mountain has populations of extremely rare ferns growing in only a few canyons.
Plant	Slender wildparsley (*Musineon tenuifolium*)	Yes						G4 S2	This occurrence is at both Red Mountain and at Soapstone Prairie. There is only 1 other current occurrences of this species in Larimer County according to CU, CSU and RM Herbaria.
Bird - raptor	American peregrine falcon nests	No		Tier 1					
Bird - raptor	Bald Eagle winter range	No	yes nests	Tier 1	?				See target for winter roosts
Bird - raptor	Northern harrier	No		Tier 2				G5	
Bird - other	Brewer's sparrow	No		Tier 1				G5/S5	Common
Bird - other	Broad-tailed hummingbird	No		Tier 2				G5/S5	Common

			State priorities		City/County priorities				
Type	Targets	Chosen target?	O&G rules	SWAP	RMOS target	SS target	Ecoregional plan target	Rarity rank (if known)	Comments
Bird - other	Cassin's sparrow	No		Tier 1			yes	G5/S4B	Fairly numerous. No special mgmt needed. Tied to Salt Desert Scrub, of which there are relatively few acres in the project area.
Bird - other	Chestnut-collared longspur (general)	No		Tier 2	?		yes	G5/S1	Habitat broad; narrowed by selecting breeding areas as a target
Bird - other	Geese foraging area	No							Covered by wetlands.
Bird - other	Geese production area	No							Covered by wetlands.
Bird - other	Geese winter concentration area	No							Covered by wetlands.
Bird - other	Geese winter range	No							Covered by wetlands.
Bird - other	Great blue heron foraging area	No							Covered by wetlands.
Bird - other	Grasshopper sparrow	No							
Bird - other	Greater prairie chicken historic range	No		Tier 1					Historic.
Bird - other	Lark bunting (general)	No		Tier 1				G5	Habitat broad; narrowed by selecting core areas as a target
Bird - other	Lazuli bunting	No		Tier 2					
Bird - other	Lewis's woodpecker	No		Tier 1	?			G4	RMBO has never recorded sightings in the area, and if they are present they are most likely to be in an area too difficult to access for drilling (RMBO).
Bird - other	Loggerhead shrike	No		Tier 1				G4	
Bird - other	Long-billed curlew	No		Tier 1			yes	G5/S2	No special management needed. No confirmed nests, though big group on Soapstone last spring.
Bird -	McCown's	No		Tier 1	?		yes	G4/S2B	Habitat broad; narrowed

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
other	longspur (general)								by selecting core areas as a target
Bird - other	Plains sharp-tailed grouse	No		Tier 1				G4T4/S1	Project area is historically within the range. But no current known range.
Bird - other	Red crossbill	No		Tier 2				G5/S5	
Bird - other	Vesper sparrow	No		Tier 2				G5/S5	
Bird - other	Virginia's warbler	No		Tier 2				G5/S4	
Insect	Hops azure	No		Tier 1				G2G3/S2	Lumped with hops plant.
Mammal	Aberts squirrel overall range	No							Hard to find in this area. Covered by ponderosa pine.
Mammal	Black bear overall range	No			yes				Widespread.
Mammal	Black-footed ferret (future released population)	No		Tier 1				G1/S1	Covered by prairie dogs (FWS).
Mammal	Elk summer range	No			?				
Mammal	Elk winter range	No			?				
Mammal	Fringed myotis roosting habitat	No		Tier 1				G4G5/S3	Done a bit of mist-netting. Project area is in the range, but no known roosting sites.
Mammal	Mountain lion human conflict area	No			?				
Mammal	Mountain lion overall range	No			?				
Mammal	Mule deer concentration area	No			?				
Mammal	Mule deer winter range	No			?				
Mammal	Olive-backed pocket mouse	No		Tier 1			yes	G5S3	Only in high quality Piedmont grasslands.
Mammal	Pronghorn winter range	No			?	yes			Included pronghorn winter concentration area as the target
Mammal	Pronghorn	No			?	yes			Included pronghorn winter

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
	concentration area								concentration area as the target
Mammal	Pronghorn severe winter range	No			?	yes			Included pronghorn winter concentration area as the target
Mammal	Townsend's big-eared bat roosting habitat	No		Tier 1				G4T4/S2	None found in mist-netting in the project area.
Mammal	White-tailed deer concentration area	No			?				
Mammal	White-tailed deer winter range	No			?				
Mammal	White-tailed jackrabbit	No		Tier 1				G4/S4B	Common.
Plant	*Carex crawei*	No						G5 S1	Lumped into wetlands. The Soapstone Prairie occurrence is the only one in Larimer County according to CU, CSU and RM Herbaria. This plant occurs in the wet meadow with Colorado butterfly plant and in Spottlewood Creek.
Plant	*Cirsium flodmanii*	No						G5 Waiting on State status from CNHP	Lumped into wetlands. In Wyoming this species is a G5 S3. There are only 3 current occurrences of this plant in Larimer County according to CU, CSU and RM Herbaria.
Plant	Fuzzy-tongue penstemon (*Penstemon eriantherus*)	No						G4SU	Lumped into another target. The Soapstone Prairie occurrence is the only current record in LC. According to CU, CSU and RM herbaria there are only 2 current occurrences across the entire state of Colorado.
Plant	Jeweled	No						G3?S3?	Lumped into creeks and

			State priorities		City/County priorities				
Type	**Targets**	**Chosen target?**	**O&G rules**	**SWAP**	**RMOS target**	**SS target**	**Ecoregional plan target**	**Rarity rank (if known)**	**Comments**
	blazingstar (*Mentzelia speciosa*)								streams. There are only 5 current occurrences of this species in Larimer County, not including Soapstone Prairie according to CU, CSU and RM Herbaria. Populations at Soapstone Prairie are few and spread out.
Plant	Rocky Mountain blazingstar (*Liatris ligulistylis*)	No				yes		G5?S1S2	Lumped. According to CU, CSU and RM Herbaria there are only 14 current occurrences across the State and only 2 in LC not including the Soapstone Prairie population.
Plant	Rocky Mountain phacelia (*Phacelia denticulata*)	No						G3? S3?	Lumped into mountain mahogany. According to CU, CSU and RM Herbaria there are only 17 current occurrences of this plant across the State. 5 of those are in Larimer County and include Soapstone.
Plant	Slender sedge (*Carex lasiocarpa*)	No						G5S1	Lumped into wetlands. According to CU, CSU and RM Herbaria there are only 16 occurrences of this plant in the State and only 5 in Larimer County.
Plant	Wyoming kittentails (*Besseya wyomingensis*)	No						G5S1	Lumped into mountain mahogany. According to CU, CSU and RM Herbaria there are only 8 current occurrences of this species in the State and Larimer County.
Reptile	Common garter snake	No		Tier 1				G5/S5	

APPENDIX 2. EXISTING DISTURBANCES - AVAILABLE DATA AND INPUTS TO THE PREFERRED SURFACE OCCUPANCY LAYER

		GIS Data availability*				
Infrastructure and other impacts to biological values	**PSO?**	**Red Mountain**	**Soapstone**	**Meadow Springs**	**Other source**	**Comments**
Activities outside project area	Yes	Yes	Yes	Yes	digitized by TNC	includes power plant, homesites, tanks, and lots
Buildings	Yes	None	Yes	Yes	digitized by TNC	
Cell or radio tower	Yes	Yes	Yes	None		
Corrals	Yes	Yes	None	Yes		Three sets of corrals exist on Soapstone
Historic buildings	Yes	Yes	None	None		Several buildings exist
Irrigated areas	Yes	Yes	None	Yes		
Parking lots	Yes	(see trailheads)	Yes	(see buildings)		Parking lots may be associated with trailheads or buildings when not explicitly mapped
Quarry	Yes	Yes	None	None		One small quarry exists on soapstone
Roads (w/ classes)	Yes	Yes	Yes	Yes		
Sheep barns	Yes	None	Yes	None		
Sludge headquarters facilities/building	Yes	None	None	Yes		
Stock water piping	Yes	Not avail	Yes	Yes		
Stock/water tanks	Yes	Yes	Yes	Yes		
Trailheads	Yes	Yes	(see parking lots)	None		Parking lots may be associated with parking lots when not explicitly mapped
Transmission lines (above ground)	Yes	Not avail	Yes	Yes		used where available. Minor impacts
Transmission lines (buried)	Yes	Not avail	Yes	Yes		used where available. Minor impacts
Buried gaslines	No	Not avail	Not avail	Not avail		data not available; gas lines on Meadow Springs may be available but not included in the report
Diversions	No	Yes	Yes	Yes	CDSS**	impacts not uniform or consistently mappable
Fencelines	No	Not avail	Yes	Yes		not considered impactful in

		GIS Data availability*				
Infrastructure and other impacts to biological values	**PSO?**	**Red Mountain**	**Soapstone**	**Meadow Springs**	**Other source**	**Comments**
						this landscape in a comparable way to other infrastructure
Gate	No	Not avail	Yes	Yes		not considered impactful in this landscape in a comparable way to other infrastructure
Invasives (large patches)	No	Yes	Not avail	Not avail		point data, and not comprehensive
Pasture (same as fences?)	No	None	Yes	Yes		not considered impactful in this landscape in a comparable way to other infrastructure
Reservoirs	No	Yes	Yes	Yes	CDSS**	impacts not uniform or consistently mappable
Trails	No	Yes	Yes	Yes		not considered impactful in this landscape in a comparable way to other infrastructure
Valve	No	Not avail	Yes			associated with piping
Windmills	No	None	Yes	Yes		often considered roosting habitat. No longer impactful because no longer in use.

* None = infrastructure or impact not present in the area. Not available = infrastructure or impact may be present, but mapped data is not available.

** Colorado's Decision Support Systems (CDSS) is a water management system developed by the Colorado Water Conservation Board (CWCB) and the Colorado Division of Water Resources (DWR) for each of Colorado's major water basins.

APPENDIX 3. SURFACE OCCUPANCY RECOMMENDATIONS AND TIMING LIMITATIONS, INCLUDING JUSTIFICATION

This appendix provides summary and target-specific tables related to the creation of the surface occupancy recommendations and timing limitations for biological values. The Nature Conservancy's Project Management and Science Team assembled this information and facilitated agreement amongst Core Team members and relevant Technical Team representatives to make the final recommendations to the SLB. Various Core and Technical Team members participated in recommendation-making depending on their expertise. For example, Rocky Mountain Bird Observatory was involved in recommendations for grassland bird species, while the U.S. Fish & Wildlife Service drove the recommendations for the captive population of the black-footed ferret.

Appendix 3a. SUMMARY TABLE: Surface occupancy recommendations and timing limitations

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Aquatic Systems	**Creeks and streams**	300 ft. (100 m.) from the high water mark of perennial and ephemeral streams and rivers	100-200m (300-600 ft.) from the high water mark of perennial and ephemeral streams and rivers	none	none	The O&G rules restrict surface water impacts in Public Water Systems (Rule 317B and Appendix VI). No such systems are in our project area.[1]
Aquatic Systems	**Seeps and springs**	0-300 ft. (0-100 m.)	300-600 ft. (100-200 m.)	none	none	Small footprint on the landscape, but important. Chose same buffer distance as rivers and streams and wetlands.
Aquatic Systems	**Wetlands**	0-300 ft. (0-100 m.) from the legal edge	300-600 ft. (100-200 m.) from the legal edge. Surface occupancy within this area is contingent on survey findings.	none	none	
Terrestrial Systems	**Mountain Mahogany**	All but 300 ft. (100 m.) from the edge of primary roads.	0-300 ft. (0-100 m.) from primary roads traversing the MM.	none	none	
Terrestrial Systems	**All others**	none	none	none	none	
Plant	**Plant**	0-300 ft. (0-	none	none	none	

[1] Also, for GIS, we used the centerline unless the edges were already mapped. In the field, measure the distance from the high water mark of the hydrologic feature.

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
communities	**communities**	100 m.)				
Amph.	**Northern leopard frog**	0-300 ft. (0-100 m.) from the legal edge of wetlands	300-600 ft. (100-200 m.) from the legal edge of wetlands	none	none	Same as wetlands buffer.
Bird - raptor	**Bald eagle nests**	1/4 mile from active nests and historic nests	none	Legal: 1/2 mile from 11/15-7/31 - no human disturbance or construction activity.		Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations. Not mapped for planning area at present.
Bird - raptor	**Bald eagle winter roosts**	1/4 mile from winter roosts	none	Legal: Winter roosts: Within 1/2 mile from 11/15-3/15, no human disturbance except periodic visits such as maintenance and monitoring from 10:00 a.m.-2:00 p.m.[2]	none	Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations. Not mapped for this planning area at present.
Bird - raptor	**Ferruginous hawk nests**	none	1/2 mile from active and alternate nests	1/2 mile from active or alternate nests from 2/1-7/15 - no human disturbance or	none	Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the

[2] Also, active winter night roosts: From 12/1-2/28, no human disturbance or construction within 1/4 mile where there is no direct line of sight to the roost, and within 1/2 mile where there is a direct line of sight.

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
				construction activity		legal timing limitations.
Bird - raptor	**Golden eagle nests**	1/4 mile from active and alternate nests	none	Legal: 1/2 mile from active nests from 12/15-7/15 - no human disturbance or construction activity	none	Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations.
Bird - raptor	**Prairie falcon nests**	1/2 mile from active nests	none	1/2 mile from active nests from 3/15-7/15: No human disturbance	none	Restricted Surface Occupancy Area under Colorado's Oil and Gas Rules.
Bird - raptor	**Swainson's hawk nests**	none	1/4 mile from active nests	1/4 mile from active nests from 4/1-7/15 - No human disturbance	none	
Bird - raptor	**Western burrowing owl nests**	none	1/4 mile from nests that have been active within the last 5 years	300 ft. from active nests from 3/1-8/15 -- No construction activity	none	Used CPW guidelines for timing limitations.
Bird - raptor	**Owls and other nesting raptors**	none	1/4 mile from active nests	???	none	None are mapped in the planning area at present.
Bird - other	**Chestnut-collared longspur breeding areas**	Breeding area plus a 300 ft. (100 m) buffer	none	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	
Bird - other	**Lark bunting core areas**	none	Core area plus a 450 ft. (150 m) buffer	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Bird - other	**McCown's longspur core areas**	none	Core area plus a 450 ft. (150 m.) buffer	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	
Bird - other	**Mountain plover staging area**	Staging area plus a 600 ft. (200 m) buffer	none	none	none	
Bird - other	**Mountain plover nests**	none	1/4 mile from nests	From 4/1-5/15, 1/4 mile buffer around occupied nests - no construction activity .	Set work schedules and shift changes to avoid periods 30 minutes before and after sunrise and sunset in June and July; Limit speed within 1/2 mile of nesting areas to 25 mph from March 15 and July 31.	In GIS, mapped as repeated observation locations. Nests will be within these areas.
Fish	**Iowa darter**	600 ft. (200 m.) from the high water mark of creeks and streams	none	none	none	
Fungus	***Smithiomyces crocodilinus***	600 ft. (200 m.)	none	none	none	Treat it like a rare plant.
Insect	**Colorado blue (butterfly)**	300 ft. (100 m.) from mapped occurrences	none	none	none	
Insect	**Aquatic insects**	0-300 ft. (0-100 m) buffer of all creeks and streams.	300-600 ft. (100-200 m) buffer of priority streams only.	none	600 ft. (200 m.) from the high water mark of creeks, rivers, and wetlands -- in spring and	

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
					summer (4/15-10/1)- shine lights down toward the ground or ideally turn them off at night, to specific streams.	
Mammal	**Black-footed ferret (captive population)**	0-1/2 mile buffer around the perimeter of the ferret center	1/2-1 mile to the south, east, and west.	???	none	
Mammal	**Black-tailed prairie dog**	none	none	3/1-6/15 - No construction activity within and over colonies	none	
Mammal	**Swift fox den sites**	none	none	1/4 mile from active den sites from 3/15-6/15: No construction activity while young are den-dependent	none	
Mammal	**Elk production area**	none	none	Legal: 5/15-6/30 - no construction activity	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal seasonal timing limitations.
Mammal	**Elk winter concentration area**	none	none	Legal: From 12/1-4/15, no post-development well-site visits from 3p.m.-10a.m.	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations.
Mammal	**Mule deer critical winter**	none	none	Legal: From 12/1-4/15, no	none	Sensitive Wildlife Habitat under the

		Surface occupancy		Timing limitations (seasonal)		
Target Type	**Target**	**No Surface Occupancy**	**Limited Surface Occupancy**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
	range			post-development well-site visits from 3p.m.-10a.m.		COGCC rules. Used CPW guidelines as the legal timing limitations.
Mammal	**Mule deer severe winter range**	none	none	Legal: From 12/1-4/15, no post-development well-site visits from 3p.m.-10 a.m.	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations. Assumed that Severe Winter Range and Critical Winter Range would use the same stips (stips available only for the latter)
Mammal	**Pronghorn winter concentration area**	none	none	Legal: 1/1-3/31: No human disturbance or construction activity within winter concentration areas west of I-25	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations.
Plants	**Rare Plants**	Occurrence plus a 300 ft. (100 m) buffer	300-600 ft. (100-200 m) buffer.	none	none	Legal avoidance through SLB policy -- Procedures for Rare Plant Environmental Review for Development Projects and Land Use Changes

Appendix 3b. Sources considered

This table provides the sources considered and cited in this appendix.

Short name used in the tables	Document Title	Reference
Sources reviewed for *all* targets		
COGCC Rules	Colorado Oil and Gas Conservation Commission Rules	(Colorado Oil and Gas Conservation Commission, 2008)
CDOW BMPs[3]	Colorado Division of Wildlife (CDOW) Actions to Minimize Adverse Impacts to Wildlife Resources	(Colorado Division of Wildlife, 2012)
CRCC BMPs[4]	Colorado Renewables & Conservation Collaborative (CRCC) BMPs	(Colorado Renewables and Conservation Collaborative, 2011)
Lowry Range O&G Lease[5]	Lowry Range Oil and Gas Lease, OG 1960.12	(Colorado State Land Board, 2012)
Sources reviewed for *select* targets		
BLM - Mountain plover biological report	Mountain Plover Biological Report to the Bureau of Land Management (BLM)	(Author unknown, 2007)
BLM Atlantic Rim	BLM Atlantic Rim Natural Gas Development Project - Record of Decision and Environmental Impact Statement	(U.S. Bureau of Land Management Wyoming, 2007)
BLM Desolation Flats	BLM Desolation Flats Natural Gas Field Development - Record of Decision	(U.S. Bureau of Land Management Wyoming, 2004)
BLM Draft Recs for Plants	BLM Draft Recommendations for Avoiding Adverse Effects on Threatened, Endangered, Proposed, Candidate & BLM Sensitive Plants on BLM lease lands in Colorado	(U.S. Bureau of Land Management Colorado, 2008)
BLM Jonah	BLM Jonah Infill Drilling Project, WY - Final EIS	(U.S. Bureau of Land Management Wyoming, 2006)
BLM Powder River Basin	BLM Powder River Basin O&G Project - Record of Decision and Resource Management Plan	(U.S. Bureau of Land Management Wyoming, 2003)
BLM Roan Plateau	BLM Roan Plateau Draft Resource Management Plan	(U.S. Bureau of Land Management Colorado, 2004)
CDOW – Burrowing Owls	CDOW Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls	(Colorado Division of Wildlife, 2008)
CDOW Raptor	CDOW Raptor Guidelines	(Colorado Division of

[3] CDOW is now Colorado Parks & Wildlife

[4] These BMPs pertain to wind energy development. They were developed collaboratively by a group of wind energy developers and science-based conservation groups.

[5] State Land Board's oil and gas leasing plan for the Lowry Range

Short name used in the tables	Document Title	Reference
Guidelines		Wildlife, 2008)
City of Fort Collins Land Use Code	City of Fort Collins Land Use Code	(City of Fort Collins)
Crested Butte water body setbacks (draft)	Crested Butte water body setbacks	(Reaman, 2012)
ELI's guide to wetland buffers	Environmental Law Institute's Planner's Guide to Wetland Buffers for Local Governments	(Environmental Law Institute, 2008)
EPA wetlands and watersheds	U.S. Environmental Protection Agency wetlands and watersheds: Adapting watershed tools to protect wetlands	(Center for Watershed Protection)
Expert opinion – C. Pague	Expert opinion – Chris Pague	(Pague, 2012)
Expert opinion – F. Knopf	Expert opinion - Fritz Knopf	(Knopf, 2012)
Expert opinion – P. Marinari	Expert opinion – Paul Marinari	(Marinari, 2012)
Expert opinion – R. Rondeau	Expert opinion – Renee Rondeau	(Rondeau, 2012)
Expert opinion – RMBO	Expert opinion – Rocky Mountain Bird Observatory	(VerCauteren, Panjabi, & Youngberg, 2012)
Federal Lands Analysis Natural Gas Assessment	Federal Lands Analysis Natural Gas Assessment	(Advanced Resources International, Inc., 2001)
Inglefinger (2001)	The Effects of Natural gas Development on Sagebrush Steppe Passerines in Sublette County, Wyoming	(Ingelfinger, 2001)
Larimer County Land Use Code	Larimer County Land Use code	(Larimer County)
Linnen (2008)	Effects of Oil and Gas Development on Grassland Birds	(Linnen, 2008)
NM Wind BMPs[6]	New Mexico Wind & Wildlife Collaborative BMPs	(New Mexico Wind & Wildlife Collaborative, 2012)
Rare Plant BMPs	Recommended BMPs for Rare Plants of Concern	(Elliott, et al., 2009)
RMBO BMPs for Shortgrass Prairie Birds	RMBO Best Management Practices for Shortgrass Prairie Birds	(Gillihan & Hutchings)
Shane (2000)	(Lark bunting book chapter)	(Shane, 2000)
SLB Procedures for Rare Plant Review	SLB Procedures for Rare Plant Environmental Review for Development Projects and Land Use Changes	(Colorado State Land Board, 2012)
USFS Species Assessments	U.S. Forest Service Species Assessments	(U.S. Forest Service)
USFWS Bald Eagle	USFWS National Bald Eagle Management	(U.S. Fish & Wildlife Service,

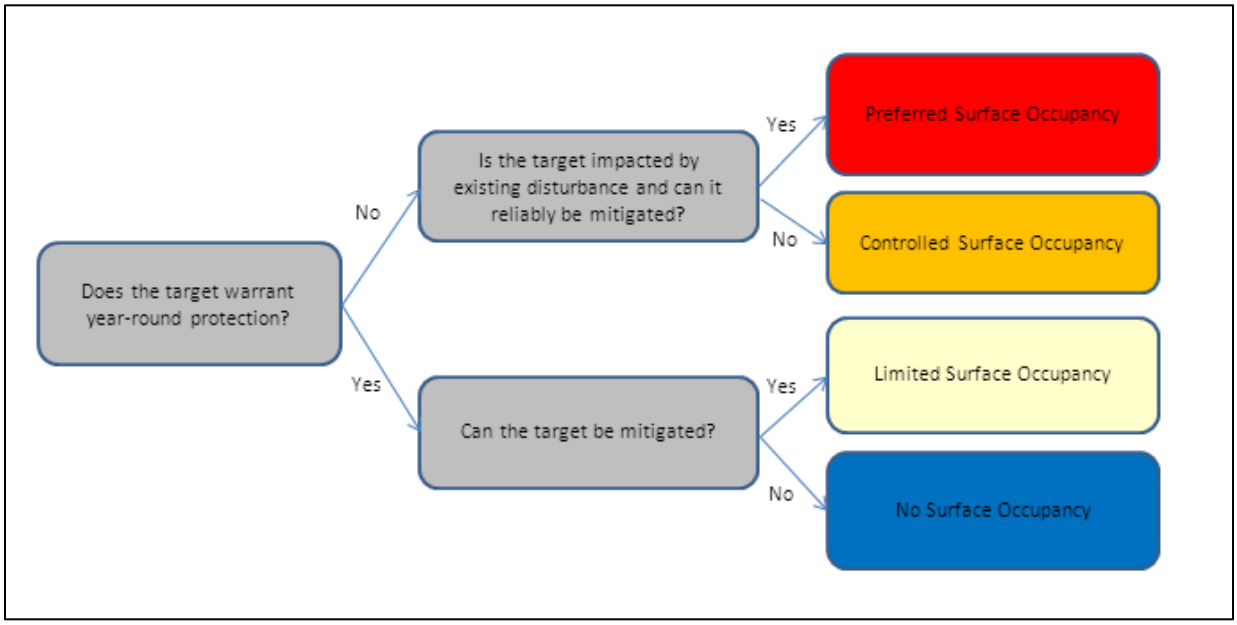
[6] These BMPs built on the Colorado Renewables & Conservation Collaborative BMPs

Short name used in the tables	Document Title	Reference
Guidelines	Guidelines	2007)
USGS Effects of Management Practices on Grassland Birds	Effects of Management Practices on Grassland Birds	(U.S. Geological Survey, 2002)
WYG&F Recs	Wyoming Game & Fish Recommendations for Development of Oil and Gas Resources within Crucial and Important Wildlife Habitats	(Wyoming Game and Fish Department, 2010)

Appendix 3c. Inputs to categorizing targets into Surface Occupancy Areas

As Part II-B explains, the Technical Team mapped the biological values into surface occupancy categories using the decision tree shown below (Figure 1).

Figure 1. Decision tree for assigning surface occupancy to biological targets



For each target, the table below provides the answers to the questions, "Is year-round avoidance warranted?" and if so, "Can the target be mitigated?" Rationale for the latter question is provided below; for the former question, see Appendix 3d.

Target type	**Target**	**Is year-round avoidance warranted?**	**Can the target be mitigated?**	**Rationale for "Can the target be mitigated?"** (Pague, 2012) (Rondeau, 2012)
AQUATIC SYSTEMS				
System	Aquatic systems	Yes	No	
System	Wetlands	Yes	No	While it is possible to create new wetlands elsewhere, restoration to achieve no net loss includes the soils, microbiota, etc. is not feasible within a reasonable timeframe (5-20 years).
System	Seeps and Springs	Yes	No	
TERRESTRIAL SYSTEMS				
System	Cliff and Outcrops	Yes*	No*	
System	Foothills Grasslands	No		
System	Mountain Mahogany [aka Foothills	Yes	No	Mountain mahogany is slow to recolonize disturbed areas, probably due to a symbiotic fungus relationship in its roots. The foothills

Target type	Target	Is year-round avoidance warranted?	Can the target be mitigated?	Rationale for "Can the target be mitigated?" (Pague, 2012) (Rondeau, 2012)
	(Montane) Shrublands]			shrublands that were disturbed by the spring Creek flood in 1995 are still visibly scarred and mountain mahogany is just starting to come back.
System	Ponderosa Pine Woodlands	No		
System	Riparian Woodlands and Shrublands	No		
System	Salt Desert Scrub	No		
System	Shortgrass Prairie	No		
PLANT COMMUNITIES				
Plant comms	Foothills Ponderosa Pine Savannas	Yes	Yes	Moderate-- could protect, manage, and restore/enhance habitat reasonably nearby
Plant comms	Western Slope Grasslands	Yes	Yes	Moderate -- could protect, manage, and restore/enhance habitat reasonably nearby
SPECIES				
Amph.	Northern leopard frog	Yes	Yes	Moderate -- could protect, manage, and restore/enhance habitat reasonably nearby
Bird - raptor	Bald eagle nests	Yes	No	Creation of a new nest site is subject to too many variables.
Bird - raptor	Bald eagle winter roosts	Yes	No	Creation of a new nest site is subject to too many variables.
Bird - raptor	Ferruginous hawk nesting sites	Yes	Yes	Some tree nests could be "replaced" by creating conditions elsewhere
Bird - raptor	Golden eagle nesting sites	Yes	No	Creation of a new nest site is subject to too many variables.
Bird - raptor	Prairie falcon nest sites	Yes	No	Creation of a new nest site is subject to too many variables.
Bird - raptor	Swainson's hawk nest sites	Yes	Yes	Some tree nests could be "replaced" by creating conditions elsewhere
Bird - raptor	Western burrowing owl	No		
Bird - raptor	Owls and other nesting raptors	Yes	Yes	Some tree nests could be "replaced" by creating conditions elsewhere
Bird - other	Mountain plover nests	Yes	Yes	Creation or expansion of prairie dog complexes with suitable protection and management could effectively mitigate for this species.
Bird - other	Mountain plover staging area	Yes	No	Creation or expansion of prairie dog complexes with suitable protection and management could effectively mitigate for this species.
Bird - other	Chestnut-collared longspur breeding areas	Yes	Yes	Protection and habitat management in other locations is possible
Bird - other	Lark bunting core areas	Yes	Yes	Protection and habitat management in other locations is possible

Target type	Target	Is year-round avoidance warranted?	Can the target be mitigated?	Rationale for "Can the target be mitigated?" (Pague, 2012) (Rondeau, 2012)
Bird - other	McCown's longspur core areas	Yes	Yes	Protection and habitat management in other locations is possible
Fish	Iowa darter	Yes	No	It is possible to enlarge stream habitats but cost prohibitive
Fungus	*Smithiomyces crocodilinus*	Yes	No	Irreplaceable
Insect	Colorado blue	Yes	No	
Insect	Aquatic insects	Yes	Yes	Most species will readily inhabit restored wetlands; however, restoration of most aquatic systems other than ponds and marshes is very difficult.
Mammal	Black-footed ferret (captive population)	Yes	No	Impacts to this facility (Black-footed Ferret Conservation Center) cannot be mitigated in general
Mammal	Black-tailed prairie dog	No		
Mammal	Swift fox den sites	No		
Mammal	Elk production area	No		
Mammal	Elk winter concentration area	No		
Mammal	Mule deer critical winter range	No		
Mammal	Mule deer severe winter range	No	Yes	Protection and habitat management in other portions of the same area or other locations is possible
Mammal	Pronghorn winter concentration area	No		
Plants	Rare Plants	Yes	No	

* The Technical Team identified cliff and outcrops as warranting year-round avoidance and not possible to mitigate, thereby warranting categorization as NSO. However, the system was not mapped as NSO based on the assumption that operators would not be able to develop it. In retrospect, it may have been better to map the cliffs and outcrops as NSO from the outset.

Appendix 3d. Target-specific tables: Surface occupancy recommendations and timing limitations and including justification

The tables following this page provide the following information for each target: Sources considered, inconsistencies amongst the sources, and final recommendations to the State Land Board.

AQUATIC SYSTEMS: CREEKS & STREAMS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 300 ft (100 m.) from the high water mark of perennial and ephemeral creeks and streams = true avoidance. 100-200m (300-600 ft.) = avoid, but negotiation may be possible.	300 ft (100 m.) from the high water mark of perennial and ephemeral streams and rivers	100-200m (300-600 ft.) from the high water mark of perennial and ephemeral streams and rivers	none	none	The O&G rules restrict surface water impacts in Public Water Systems (Rule 317B and Appendix VI). No such systems are in our project area. For GIS, we used the centerline unless the edges were already mapped. In the field, measure the distance from the high water mark of the hydrologic feature.
Inconsistences between sources	150 ft. (50 m.) for all rivers and streams to 0.3 miles (~1,600 ft.) for largers ones. Distance from center line vs. high water mark.					
Legal: COGCC Rules						The O&G rules restrict surface water impacts in Public Water Systems (Rule 317B and Appendix VI). No such systems are in our project area.
CDOW BMPs	300 ft.: Minimize activities and operations within 300 ft. of the ordinary high water mark of any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river" (p.4)				Various (p.4-5)	
CRCC BMPs						

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Lowry Range O&G Lease	0.3 miles (~1,600 ft.) from the centerline of Box Elder Creek and Coal Creek (Tier 1) (p.2). 0.3-0.5 mile buffer on either side of Box Elder Creek (Tier 2). 200-foot buffer on both sides of all tributary drainages (p.2)					
City of Fort Collins Land Use Code	Varies from 100-300 feet depending on the stream.					Requirements are not specific to O&G
Crested Butte water body setbacks (draft)	Inner buffer of 150 feet (unless installing a new well on an existing well pad or putting something like a pipeline across a creek). There's also no way out of that restriction for gas companies, who previously had an option of a "technical infeasibility waiver" that could be considered on a case-by-case basis.					The new setback is somewhere between the 300-foot setback recommended by High Country Citizens' Alliance and the 100 feet asked for by Gunnison Energy Corporation. A second, 500-foot outer buffer could allow some development activity, depending on circumstances at the site.
Larimer County land use code	The minimum required setback from any stream, creek or river identified on a U.S.G.S. quadrangle map is 100 feet from the centerline of the water course unless a greater setback is required (p.LUC4-75)					Requirements are not specific to O&G

AQUATIC SYSTEMS: SEEPS & SPRINGS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 0-300 ft. (0-100 m.) = true avoidance. 300-600 ft. (100-200 m.) = avoid, but negotiation may be possible	0-300 ft. (0-100 m.)	300-600 ft. (100-200 m.)	none	none	Really small footprint on the landscape, but important. Chose same buffer distance as rivers and streams and wetlands.
Inconsistences between sources	100-300 ft.					
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
City of Fort Collins Land Use Code						
Expert Opinion - C.Pague	300 ft. (100 m.) buffer					Really small footprint on the landscape, but important. Chose same buffer distance as rivers and streams and wetlands.

AQUATIC SYSTEMS: WETLANDS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 0-300 ft. (0-100 m.) from the legal edge = true avoidance. 300-600 ft. (100-200 m.) avoid, but negotiation may be possible.	0-300 ft. (0-100 m.) from the legal edge	300-600 ft. (100-200 m.) from the legal edge. Surface occupancy within this area is contingent on survey findings.	none	none	
Inconsistences between sources	Distance ranges from 50 ft-300 ft. Distance from legal edge vs. ordinary high water mark.					
Legal: COGCC Rules						
CDOW BMPs	300 ft.: Minimize activities and operations within 300 ft. of the ordinary high water mark of any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river" (p.4)					
CRCC BMPs						
Lowry Range O&G Lease						
City of Fort Collins Land Use Code	50 ft. for wetlands <1/3 acre; 100 ft. for wetlands >1/3 acre that without significant use by waterfowl or shorebirds, and 300 ft. for wetlands >1/3 acre with significant use by waterfowl and shorebirds.					Setback requirements are not O&G specific
Crested Butte water body setbacks (draft)	Inner buffer of 150 feet (unless installing a new well on an existing well pad or putting something like a pipeline across a creek). There's also no way out of that restriction for gas companies, who previously had an option of a "technical infeasibility waiver" that could be considered on a case-by-case basis.					The new setback is somewhere between the 300-foot setback recommended by High Country Citizens' Alliance and the 100 feet asked for by Gunnison Energy Corporation. A second, 500-foot outer buffer could allow some development activity, depending on circumstances at the site.

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
ELI's guide to wetland buffers	Buffer sizes for wildlife protection may range from 33 to more than 5,000 feet, depending on the species.					
EPA wetlands and watersheds	200-300 ft. buffer around wetlands to protect wildlife habitat and corridors for rare, threatned and endangered species (p.23)					
Expert opinion - C.Pague	300 ft. from the edge					
Larimer County Land Use Code	50 ft. for wetlands 1 acre or less; 100 ft for wetlands >1 acre. 100 ft. for wetlands of any size as delineated on the Larimer Cty Parnership Land Use System Wetland Classification and Protection Program Maps. (LUC8-15 and 8-16)					

TERRESTRIAL SYSTEMS: MOUNTAIN MAHOGANY

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Avoid large patches	All but 300 ft (100 m.) from the edge of primary roads.	0-300 ft. (0-100 m.) from primary roads traversing the MM.	none	none	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert opinion - R.Rondeau	Large mountain mahogany patches.*	All but 300 ft (100 m.) from the edge of primary roads.	0-300 ft. (0-100 m.) from primary roads traversing the MM.			

PLANT COMMUNITIES

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 0-300 ft. (0-100 m.) = true avoidance.	0-300 ft. (0-100 m.)	none	none	none	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert opinion-R.Rondeau	0-300 ft. (0-100 meters)					Smaller buffer than rare plants because the size of plant communities is generally much greater than that of rare plants (thus, less of a buffer is needed)

AMPHIBIAN: NORTHERN LEOPARD FROG

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 0-300 ft. (0-100 m.) from the legal edge of wetlands = true avoidance. 300-600 ft (100-200 m.) = avoid, but negotiation may be possible.	0-300 ft. (0-100 m.) from the legal edge of wetlands	300-600 ft (100-200 m.) from the legal edge of wetlands	none	none	Same as wetlands buffer.
Inconsistences between sources	Distance ranges from 300-600 ft. (100-200 m.)					
Legal: COGCC Rules						
CDOW BMPs					Various, see Aquatic Species/Amphibians (p.47-48)	
CRCC BMPs						
Lowry Range O&G Lease						
USFS Species Assessments	450-600 ft. (150-200m) habitat buffer from breeding ponds is desired (p. 38)				Noise and blinding by bright lights can increase mortality; these effects should be considered (p.39)	
NM Wind BMPs					Wind farms: Prevent leaving trenches open overnight. When trenches cannot be backfilled immediately, construct escape ramps every 90m or less; Minimize the number and length of access roads; use existing roads when feasible.	
Expert opinion - C.Pague	300 ft. (100 m.) from wetlands (same as wetlands)			None.		

BIRD: CHESTNUT-COLLARED LONGSPUR BREEDING AREAS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Breeding area plus a 300 ft (100 m) buffer	Breeding area plus a 300 ft (100 m) buffer	none	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	
Inconsistences between sources	300 ft. (100m) vs. 450 ft. (150 m.)					
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert opinion - C.Pague	450 ft. (150 meters). In terms of the buffer distance, Chris had recommended 450 ft (150 m) buffer originally, but Linnen recommends 100 m. so we'll go with the published paper.					Matches lark bunting and McCown's
Expert opinion - RMBO	At least 300 ft. (100m) (Linnen 2008) and (Canadian Environmental Assessment Agency, 2008). Maintain plots of 2-4 ha (USFS J. Sedgewick, 2004)				From 1 April through 30 June, reduce noise levels to 49 dBA or less within breeding habitat of songbirds to minimize the effects of continuous noise on species that rely on aural cues for successful breeding (Inglefinger 2001).	RMBO recommended 150 m. buffer for lark bunting and McCown's longspur. Waste Ponds. Cover or net all ponds that contain oily wastes to exclude their use as a water source by songbirds (Esmoil 1991, Esmoil and Anderson 1995).
USGS Effects of Management Practices on Grassland Birds						CCLs more abundant along two-track roads than paved roads with drainage ditches; Provide open, grazed native prairie. (p.6)
RMBO BMPs for Shortgrass Prairie Birds	Avoid known nesting sites as they return year after year (p.32)					

BIRD: LARK BUNTING CORE AREAS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Core area plus a 450 ft. (150 m) buffer	none	Core area plus a 450 ft. (150 m) buffer	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert opinion - RMBO	150 m. (492 ft, or 0.09 miles) from mapped polygons				1 April through 30 June, reduce noise levels to 49 dBA or less within breeding habitat of songbirds to minimize the effects of continuous noise on species that rely on aural cues for successful breeding (Inglefinger 2001).	Waste Ponds. Cover or net all ponds that contain oily wastes to exclude their use as a water source by songbirds (Esmoil 1991, Esmoil and Anderson 1995).
RMBO BMPs for Shortgrass Prairie Birds						
USGS Effects of Management Practices on Grassland Birds						Requires large (>10km) grassland areas (p.6, Shane 2000); Avoid studying LBs during the breeding season (p.6)

BIRD: McCOWN'S LONGSPUR CORE AREAS
Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Core area plus a 450 ft. (150 m.) buffer	none	Core area plus a 450 ft. (150 m.) buffer	none	From 4/1-6/30, ensure that noise levels within breeding areas are 49 dBA or less	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert opinion - RMBO	450 ft. (150 m.) avoidance from mapped polygons				From 1 April through 30 June, reduce noise levels to 49 dBA or less within breeding habitat of songbirds to minimize the effects of continuous noise on species that rely on aural cues for successful breeding (Inglefinger 2001).	Waste Ponds. Cover or net all ponds that contain oily wastes to exclude their use as a water source by songbirds (Esmoil 1991, Esmoil and Anderson 1995).
RMBO BMPs for Shortgrass Prairie Birds	Protect area around known nest sites (p.30)					
USFS Species Assessments	and gas exploration, wind-power development, and water well drilling should be restricted during the				adequate size (.5 to 1.5ha per territory) to support multiple McCown's longspur territories; Provide areas of short,	
USGS Effects of Management Practices on Grassland Birds	Provide areas of adequate size to support multiple territories (.5-1.5ha per territory) (p.8)					

BIRD: MOUNTAIN PLOVER STAGING AREA

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Staging area plus a 600 ft. (200 m.) buffer	Staging area plus a 600 ft (200 m) buffer	none	none	none	
Inconsistences between sources	1/2 mile avoid ancillary facilities throughout habitat, vs. not. Avoid habitat broadly, vs. avoid staging area only.					
Legal: COGCC Rules						
CDOW BMPs						Survey (p.34)
CRCC BMPs	Avoid prairie dog colonies, agricultural fields, and grassland sites with known occurrences.... Unoccupied sites with suitable nesting habitat that are located in or near known breeding areas...should be avoided... (p.2). Route roads outside occupied breeding sites (p.2)			Avoid construction during the breeding season (p.2)		Mountain Plover BMP. Surveys, offsets (p.2)
Lowry Range O&G Lease	Use SLB wildlife stips and consult with CPW (p.7)					
BLM Desolation Flats				No surface disturbance within suitable habitat from 4/10-7/10		oilandgasbmps.org
BLM Powder River Basin					Set work schedules and shift changes to avoid periods 30 minutes before and after sunrise and sunset in June and July; Limit speed within 1/2 mile of nesting areas to 25 mph from March 15 and July 31; Avoid creating hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas	oilandgasbmps.org
Expert opinion - C.Pague	Avoid mountain plover staging area by 600' (200 m.)					

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Expert opinion - RMBO	Avoid mountain plover staging area. Linnen (2008) states that chestnut-collard longspurs exhibit significant avoidance of areas within 100m of oil development. RMBO observes "the birds select this site every year."					Home range - they move an average of 300m/day (BNA No. 211).
NM Wind BMPs	Avoid wind development in prairie dog colonies, agricultural fields, and grassland sites with known occurrence of breeding mountain plover or post-breeding flocks.					

BIRD: MOUNTAIN PLOVER NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted? If yes, NSO or LSO.**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Technical Team Recommendation	Yes. 1/4 mile from nests	none	1/4 mile from nests	From 4/1-5/15, 1/4 mile buffer around occupied nests - no construction activity .	Set work schedules and shift changes to avoid periods 30 minutes before and after sunrise and sunset in June and July; Limit speed within 1/2 mile of nesting areas to 25 mph from March 15 and July 31.	In GIS, mapped as repeated observation locations. Nests will be within these areas.
Inconsistences between sources	No avoidance needed vs. yes avoidance is warranted. 1/2 mile avoid ancillary facilities throughout habitat, vs. no such buffer.	RMBO preferred NSO but was willing to support LSO.		300 ft. vs. 1/4 mile from nests. Active nests vs. occupied nests. Start 4/1 vs. 4/10. End 5/15 vs. 7/10 vs. 7/31.		
Legal: COGCC Rules						
CDOW BMPs				300 ft: NSO from active nests until young are hatched and independent of nest (p.34)		Survey (p.34)
CRCC BMPs	Avoid prairie dog colonies, agricultural fields, and grassland sites with known occurrences.... Unoccupied sites with suitable nesting habitat that are located in or near known breeding areas...should be avoided... (p.2). Route roads outside occupied breeding sites (p.2)			Avoid construction during the breeding season (p.2)		Mountain Plover BMP. Surveys, offsets (p.2)
Lowry Range O&G Lease	Use SLB wildlife stips and consult with CPW (p.7)					
BLM Atlantic Rim				From 4/10-7/10, No surface-disturbing activities.	From 6/1-7/10, Seasonally reduce traffic in occupied habitat areas	Mark wells within 1/2 mile of occupied habitat areas with perch inhibitor. Oilandgasbmps.org

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted? If yes, NSO or LSO.**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
BLM Desolation Flats				No surface disturbance within suitable habitat from April 10 to July 10		Oilandgasbmps.org
BLM mountain plover biological report	There should be No Surface Occupancy of ancillary facilities (e.g., compressor stations, processing plants, etc.) within 0.5 miles of known mountain plover nesting areas." [note: this provision addresses ancillary facilities – not all facilities]					
BLM Powder River Basin	No ancillary facilities within 1/2 mile of known nesting areas. Avoid creating hunting perches or nest sites for avian predators within 1/2 mile of identified nesting areas.			From 3/15-7/31 - 1/4 mile buffer around mountain plover nesting locations	Set work schedules and shift changes to avoid periods 30 minutes before and after sunrise and sunset in June and July; Limit speed within 1/2 mile of nesting areas to 25 mph from March 15 and July 31.	Oilandgasbmps.org
Expert opinion - C.Pague	1/4 mile from nests. It can be argued whether avoidance is needed for plover nests generally, Can be argued either way, but the scale is tipped toward yes avoidance is warranted for the Mountains to Plains project area. The idea is to steer development away from active nesting sites. If development occurs anyway, the mitigation should be high.	none	1/4 mile from nests	Use CPW	Traffic restrictions needed, as chicks will be running all over.	RMBO, Renee Rondeau, and Chris Pague recommend 5 years for surveys. As Renee observes, "This five year window will account for episodic plague events. In certain areas where I have repeatedly worked and where prairie dogs have been plagued out, I often see pd's come back in within five years of the plague event."

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted? If yes, NSO or LSO.**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Expert opinion - F.Knopf	Not needed - O&G is problematic locally for plovers during the construction phase where there is a lot of human activity on the ground. Once into the operational phase, plovers are not bothered by it at all. Once a field is "developed" and into the operational phase, plovers are quite oblivious. In fact, for extreme site development like the Jonah field, the predator community moves out and where plovers nest they are highly successful.					Potential impacts can be addressed through seasonal timing limitations and traffic restrictions (e.g., O&G companies must know what the birds look like and drive 10 mph through mountain plover areas).
Expert opinion - RMBO	1/4 mile from nests	1/4 mile from nests*		From 4/10-7/10, 1/4 mile buffer around occupied nests, (Wyoming BLM BMP, 2005).		Home range - they move an average of 300m/day (BNA No. 211). Sound, specifically alarm calls, from pdogs are critical for detecting predators and the potential noise from an oil or gas pump will hamper communications both intra and inter species.
NM Wind BMPs	Avoid wind development in prairie dog colonies, agricultural fields, and grassland sites with known occurrence of breeding mountain plover or post-breeding flocks.			Avoid wind turbine construction during the breeding season; will prevent nest destruction and chick mortality by vehicles accessing the site.		There is a collision risk when wind turbine rotors extend downward close to the height of the plover's aerial displays (60ft aboveground)
RMBO BMPs for Shortgrass Prairie Birds				Restrict oil & gas exploration and other development during the nesting season (April-June) (p.12)		

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted? If yes, NSO or LSO.**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
USFS Species Assessments				Nesting area closures between 4/10 and 7/10 to protect known plover nesting sites are desired (U.S. Forest Service 1994a, 1994b) (p.31).		
USGS Effects of Management Practices on Grassland Birds				Restrict oil & gas activities during peak breeding season (April-July) (p.6)		Avoid traditional nesting areas (p.5); maintain large areas of short grass (p.6)

– Per Chris Pague: "Mountain Plovers are tolerant of some disturbance and have tremendous mobility (overall). While they return to nesting sites or nearly so, they are also, as a species, vagrants relative to locating new nesting sites as evidenced by the adoption of new pdog towns in other areas." It is important to distinguish between mitigation of individuals vs populations or even the species. We are using the interpretation that if, in spite of all the "costs" a development occurs in the RSO, there are some reasonable actions that can be taken to create additional habitat that is expected to be occupied by plovers in a meaningful time – either onsite or off. The occupation of new habitat has been repeatedly observed in the field by numerous observer

-- Alternative view from RMBO: "LSO is insufficient to ensure the species will persist in the area as constructing a well pad on its breeding territory while the species is away does little to alleviate the fact that it's only suitable habitat has been seriously compromised.

RMBO urged the selection of NSO instead of LSO: "While Mountain Plovers are a somewhat adaptable species that are attracted to areas with extensive bare ground (sometimes to their detriment), our 6 years of data from the Mountain to Plains landscape suggest the species has very high site fidelity and very specific habitat requirements, occupying only large prairie dog towns. It has undergone a precipitous decline since 2007 and has not yet shown any rebound since the 2008 plague event. Plover populations here were at their lowest levels in 2012. We have not observed plovers nesting in any new locations over this time. There has only been a contraction of occupied habitat. Assuming the species will simply move over if an oil well is cited on its territory is a risky assumption that is not supported by available scientific literature, and jeopardizes an already shrinking population in this region. LSO is also insufficient to ensure the species will persist in the area as constructing a well pad on its breeding territory while the species is away does little to alleviate the fact that it's only suitable habitat has been seriously compromised." RMBO also states, "Given grassland birds are among the highest of wildlife conservation priorities nationally and in Colorado, it would seem prudent that [we] would aim to offer the fullest of protections to species such as Mountain Plover and Burrowing Owl that are showing steeply negative population trends in Colorado for reasons that are not fully understood. Likewise, our understanding of what constitutes suitable and optimal habitat for these species is admittedly incomplete, thus caution and conservatism is warranted in allowing changes to their habitat if preserving their populations is the goal."

RAPTOR: BALD EAGLE NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Legal: 1/4 mile from active nest sites. Additional recommended: 1/4 mile from historic nests	1/4 mile from active nests and historic nests	none	Legal: 1/2 mile from 11/15-7/31 - no human disturbance or construction activity.		Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations. Not mapped for planning area at present.
Inconsistences between sources	1/8 vs. 1/4 vs. 1/2 mile from nests. Active and/or historic nests.			Distance of 1/2 mile vs. 1 mile. Start at 10/15, 11/15, or 2/15. End at 6/15, 7/1, or 8/15. Limit construction vs. no human disturbance vs. no human encroachment.		
Legal: COGCC Rules	1/4 mile from active nest sites (Restricted Surface Occupancy Area).			Nests and winter night roost sites		Sensitive Wildlife Habitat (also includes winter roost sites)
CDOW BMPs	1/4 mile no surface occupancy beyond that which historically occurred in the area from any active or historic nest site (p.41)			1/2 mile from 11/15-7/31, no human disturbance or construction activity (p.41) [more info available for winter night roosts, winter roosts, and winter concentration areas]		Surveys (p.41)
CRCC BMPs	1/2 mile from active nests: Above-ground structure buffer (p.4)			1/2 mile from 10/15-7/31: Limit construction around raptor nests and roost sites (p.4)		Raptor BMP. Surveys, offsets, other (whole doc).
Lowry Range O&G Lease						

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
BLM Desolation Flats				No surface disturbance within 1 mile of active nest areas from 2/1-7/1		oilandgasbmps.org
BLM Jonah	No surface occupancy within 1/2 mile from active nest sites			No surface disturbance within 1 mile of active nest from 2/1-8/15		oilandgasbmps.org
BLM Powder River Basin	No surface occupancy within 1/2 mile from active nest sites					oilandgasbmps.org
BLM Roan Plateau	No surface disturbance within 1/4 mile from bald eagle nest sites					oilandgasbmps.org
CDOW Raptor Restrictions	1/4 mile (NSO (beyond that which historically occurred in the area) from active nests (p.2)			1/2 mile from 10/15-7/31: Seasonal restriction to human encroachment (p.2)		Seasonal restriction more extensive than National Bald Eagle Management Guidelines (USFWS 2007) due to generally open habitat used by CO's nesting bald eagles (p.2)
Expert opinion - C.Pague	Active nests: 1/4 mile from active and historic nests.			Active nests: 1/2 mile from 2/15 - 8/15 - no human encroachment.		Active nests determined multi-year.
Federal Lands Analysis Natural Gas Assessment	No surface occupancy within 1/4 mile from bald eagle nest sites			No surface occupancy within 1/2 mile of the nest site between Dec 15 and June 15;		oilandgasbmps.org
USFWS Bald Eagle Guidelines	330 ft. (0.0625 mile) if the activity will not be visible from the nest. 660 ft (1/8 mile) if it will be visible from the nest (p.12).			Use seasonal restrictions (i.e., during the breeding season)for activities that have temporary impacts (p.11)	No blasting or other loud noises within 1/2 mile of active nests, unless tolerance has been demonstrated (p.14).	

RAPTOR: BALD EAGLE WINTER ROOSTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 1/4 mile from winter roosts	1/4 mile from winter roosts	none	Legal: Winter roosts: Within 1/2 mile from 11/15-3/15, no human disturbance except periodic visits such as maintenance and monitoring from 10:00 a.m.-2:00 p.m. Active winter night roosts: From 12/1-2/28, no human disturbance or construction within 1/4 mile where there is no direct line of sight to the roost, and within 1/2 mile where there is a direct line of sight.	none	Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations. Not mapped for this planning area at present.
Inconsistences between sources				No surface occupancy vs. no surface disturbance vs. limit construction. 1 mile vs 1/2 mile buffer. Start date 11/1 vs. 11/15. End date 4/1, 4/15, or 4/30.		
Legal: COGCC Rules				Nest sites and winter night roost sites		Sensitive Wildlife Habitat (also includes winter roost sites)
CDOW BMPs				Winter roosts: Within 1/2 mile and between 11/15-3/15, no human disturbance except periodic visits such as maintenance and monitoring from 10:00 a.m.-2:00 p.m. SEE NOTES	Surveys (p.32)	Timing limitations, cont. Active winter night roosts: No surface occupancy or construction within 0.25 miles , where there is no direct line of sight to the roost, from 12/1-2/28 and within 0.5 mile where there is a direct line of sight.

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
CRCC BMPs				1/2 mile from 10/15-7/31: Limit construction around raptor nests and roost sites (p.4)	Surveys, offsets, other (whole doc).	Raptor BMP
Lowry Range O&G Lease						
BLM Jonah				No surface disturbance within 1 mile of winter use areas from 11/15-4/30		oilandgasbmps.org
BLM Powder River Basin				No surface disturbance within 1 mile of winter use areas from 11/1-4/1		oilandgasbmps.org
CDOW Raptor Restrictions				Active winter night roosts: No surface occupancy or construction within 0.25 miles , where there is no direct line of sight to the roost, from 12/1-2/28 and within 0.5 mile where there is a direct line of sight.	CDOW also recommends protecting hunting perches from human encroachment (p.2)	Seasonal restriction more extensive than National Bald Eagle Management Guidelines (USFWS 2007) due to generally open habitat used by CO's nesting bald eagles (p.2).
Expert opinion - C.Pague	1/4 mile			Winter roosts: 1/4 mile no human encroachment from 11/1-3/31		Active nests determined multi-year.
Federal Lands Analysis Natural Gas Assessment				No surface occupancy within 1/2 mile of the winter roost site 11/16-4/15		oilandgasbmps.org
USFWS Bald Eagle Guidelines					No blasting or other loud noises within 1/2 mile of active nests, unless tolerance has been demonstrated (p.14).	

RAPTOR: FERRUGINOUS HAWK NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Legal: 1/2 mile from active nests. Additional recommended: 1/2 mile from alternate nests	none	1/2 mile from active and alternate nests	1/2 mile from active or alternate nests from 2/1-7/15 - no human disturbance or construction activity	none	Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations.
Inconsistences between sources	Active vs. active and alternate nests. Distance ranging from 1/5 mile - 1/2 mile from nests.			Active vs. active and alternate nests. Limit construction vs. no construction activity vs. no human encroachment. End date of 7/15 vs. 7/31 vs. 8/15		
Legal: COGCC Rules	1/2 mile from active nests (Restricted Surface Occupancy Area)					
CDOW BMPs	1/2 mile: No surface occupancy beyond that which historically occurred in the area for active and alternate nests (p.41-42)			1/2 mile from 2/1-7/15: No human encroachment or construction activity from active or alternate nests (p.41-42)		Surveys (p.32)
CRCC BMPs	1/2 mile from active nests: No above-ground structures buffer (p.4)			1/2 mile from 2/1-7/15: Limit construction (p.4)		Raptor BMP. Surveys, Offsets, Other
Lowry Range O&G Lease						
BLM Atlantic Rim	No surface disturbance or surface structures requiring a repeated human presence within 1,200 feet (~1/4 mile) of nests					oilandgasbmps.org
BLM Jonah	No surface occupancy within 1000 feet (~1/5 mile) from active nest sites			No surface disturbance within 1 mile of active nest from 2/1-7/31		oilandgasbmps.org
CDOW Raptor Restrictions	1/2 mile: NSO (beyond that which historically occurred in the area) from active nests.			1/2 mile from 2/1-7/15: Restriction to human encroachment to active nests	None	

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Expert opinion - C.Pague	1/4 mile from active nests					Ferruginous hawks use nests repeatedly. However, they will use another tree (difficult to recreate cliff dwellings)
Federal Lands Analysis Natural Gas Assessment				No surface occupancy within 1 mile of the nest site between 2/1-8/15		oilandgasbmps.org
NM Wind BMPs	1/2 mile buffer from active raptor nests					
RMBO BMPs for Shortgrass Prairie Birds	Limit brief disturbances to >1/2 mile, prolonged disturbances to >1mile, long-term disturbances to >1.5 miles (p.10)				preserve trees that already contain nests, as they return year after year; leave unused utility poles as perches (p.10)	
USFS Species Assessments	Trespassing" signs or wildlife alert signs at least 1,500 ft (~1/3 mile) from active nests (Ensign 1983) (p.43). Table on p.44 shows recommended maximum duration of disturbance by breeding stage, distance from nest, and disturbance type.				Post "No Artificial nests can mitigate loss of natural nest sites due to resource development (Tigner et al 1996); Artificial nests should be located >1mi from public roads and >1.5mi from any occupied building; natural nest sites can also be maintained (p.42).	

RAPTOR: GOLDEN EAGLE NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Legal: 1/4 mile from active nests. Additional recommended: 1/4 mile from alternate nests	1/4 mile from active and alternate nests	none	Legal: 1/2 mile from active nests from 12/15-7/15 - no human disturbance or construction activity	none	Restricted Surface Occupancy Area and Sensitive Wildlife Habitat under Colorado's Oil and Gas Rules. Used CPW guidelines as the legal timing limitations.
Inconsistences between sources	Active vs. active and alternate nests. Distance of 1/4 vs. 1/2 mile.			Limit construction vs. no human encroachment or construction activity		
Legal: COGCC Rules	**1/4 mile from active nest sites (Restricted Surface Occupancy Area).**			**Nest sites**		**Restricted Surface Occupancy and Sensitive Wildlife Habitat**
CDOW BMPs	1/4 mile: NSO (beyond that which historically occurred in the area) from active nests (p.42)			1/2 mile from 12/15-7/15: No human encroachment or construction activity from active nests (p.42)		Surveys (p.41)
CRCC BMPs	1/2 mile from active nests: Above-ground structure buffer (p.4)			1/2 mile from 12/15-7/15: Limit construction (p.4)		
Lowry Range O&G Lease						
CDOW Raptor Restrictions	1/4 mile from active nests: NSO (beyond that which historically occurred in the area) for active nests (p.2)			1/2 mile from active nests from 12/15-7/15: Seasonal restriction to human encroachment within 1/2 mile of active nests from 12/15-7/15 (p.2)		
Expert Opinion - C.Pague	1/4 mile from active and alternate nests					

RAPTOR: PRAIRIE FALCON NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Legal: 1/2 mile from active nests	1/2 mile from active nests	none	1/2 mile from active nests from 3/15-7/15: No human disturbance	none	Restricted Surface Occupancy Area under Colorado's Oil and Gas Rules.
Inconsistences between sources				Limit construction vs. restriction to human encroachment		
Legal: COGCC Rules	1/2 mile from active nests (Restricted Surface Occupancy Area)					Restricted Surface Occupancy
CDOW BMPs						Surveys (p.41)
CRCC BMPs	1/2 mile from active nests: Above-ground structure buffer (p.4)			1/2 mile from 3/15-7/15: Limit construction (p.4)		
Lowry Range O&G Lease						
CDOW Raptor Restrictions	1/2 mile: NSO (beyond that which historically occurred in the area) from active nests (p.3)			1/2 mile from 3/15-7/15: Seasonal restriction to human encroachment from active nests (p.3)		
NM Wind BMPs	1/2 mile buffer from active raptor nests					

RAPTOR: SWAINSON'S HAWK NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 1/4 mile from active nests	none	1/4 mile from active nests	1/4 mile from active nests from 4/1-7/15 - No human disturbance	none	
Inconsistences between sources				Limit construction vs. no human encroachment		
Legal: COGCC Rules						
CDOW BMPs					Surveys (p.41)	
CRCC BMPs	1/4 mile from active nests: Above-ground structure buffer (p.4)			1/4 mile from 4/1-7/15: Limit construction (p.4)		
Lowry Range O&G Lease						
CDOW Raptor Restrictions	1/4 mile: NSO (beyond that which historically occurred) within 1/4 mile radius of active nests (p.3)			1/4 mile from 4/1-7/15: Seasonal restriction to human encroachment within 1/4 mile of active nests from 4/1-7/15 (p.3)		
RMBO BMPs for Shortgrass Prairie Birds						Preserve trees that already contain nests, as they return year after year; leave unused utility poles as perches (p.8)

RAPTOR: BURROWING OWL NESTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No.	none	1/4 mile from nests that have been active within the last 5 years	300 ft. from active nests from 3/1-8/15 -- No construction activity	none	Used CPW guidelines for timing limitations.
Inconsistences between sources	Whether year-round avoidance is needed or not. Various distances from burrows and nest areas.			150 ft.,300 ft., or 1/4 mile. Active nests vs. nest burrows. TL starts 3/1 or 3/15. TL ends 8/15, 8/31, or 10/31. No surface disturbance and/or no human encroachment.		
Legal: COGCC Rules						
CDOW BMPs				300 ft from 3/1-8/15: Conduct surface disturbance away from active nests (p.33)		Surveys (p.32-33)
CRCC BMPs				150 ft from 3/15-10/31: No human encroachment from active nests (based on CDOW) (p.1)		Surveys, offsets (p.1-2)
Lowry Range O&G Lease				300 ft: No surface disturbance within 300 ft. of any active nest site (p.7)		Surveys (p.7)
CDOW - Burrowing Owls	150 ft. (50 m.) from active burrows: When all active burrowing owl burrows have been located and marked, activity can proceed in areas greater than 150 feet from the burrows with little danger to the owls (p.3)			Wait to initiate activities until after 11/1 or until it can be confirmed that the owls have left the prairie dog town (p.3)		Surveys - whole document

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
CDOW Raptor Restrictions				150 ft from 3/15-10/31: No human encroachment from nests (p.3)		Surveys (p.3)
Expert opinion - C.Pague	Chris initially said no: "Over time the burrowing owls will occupy available habitat; they will move and nest elsewhere." 1/4 mile from nests. See note below.		1/4 mile from nests	yes		RMBO, Renee Rondeau, and TNC (Chris Pague) recommend 5 years for surveys. As Renee observes, "This five year window will account for episodic plague events. In certain areas where I have repeatedly worked and where prairie dogs have been plagued out, I often see pd's come back in within five years of the plague event."
Expert opinion - RMBO	1/4 mile from nesting areas - NSO. See note below.			1/4 mile from active nests 3/1 – 8/31. From 6/1-7/31 - Work schedules and shift changes should be set to avoid the periods from 30 min. before sunrise to 9:00am and from 5:00pm to 30 min. after sunset, when (owls) and other wildlife are most active." (Wyoming BLM BMP, 2005)		Maintain a buffer zone of 100–300 yards (up to 1/ 2 mile, if possible) around owl nest burrows, within which insecticide applications, rodent control, and other human disturbances are limited. Home range: 250m of nest (diurnal activity), mean = 2.4km^2 (BNA No. 61))
NM Wind BMPs						~~Conduct surveys to~~ determine presence of breeding burrowing owls prior to site development. Locate active nest sites
RMBO BMPs for Shortgrass Prairie Birds	100-300 yards up to 1/2 mile) buffer					

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
USFS Species Assessments						Manage to maintain historic burrowing owl nest sites and active colonies of prairie dogs (p.54).
USGS Effects of Management Practices on Grassland Birds	Preserve prey habitats (like road right-of-ways) within 1km radius of nesting areas (p.15)					Avoid traditional nesting sites as they are often reused (p.13)

Per TNC (C.Pague) - Burrowing Owls have limiting habitat criteria for the selection of nesting sites. Combined with their high site fidelity individuals of the species may be forced to abandon an area or suffer lowered reproductive success if it is heavily disturbed. An LSO status serves as a deterrent to developing within 1/8 mi of the active nests. However, the species is also known to occupy new habitat areas including areas where prairie dog towns have expanded or created satellite colonies. Since one can manage for such habitat, its expansion, and even its creation, it is reasonable to conclude that damage to this species can be mitigated if necessary.

RMBO believes that year-round avoidance *is* warranted, saying "Given grassland birds are among the highest of wildlife conservation priorities nationally and in Colorado, it would seem prudent that [we] would aim to offer the fullest of protections to species such as Mountain Plover and Burrowing Owl that are showing steeply negative population trends in Colorado for reasons that are not fully understood. Likewise, our understanding of what constitutes suitable and optimal habitat for these species is admittedly incomplete, thus caution and conservatism is warranted in allowing changes to their habitat if preserving their populations is the goal." They continue, "Our data from the MTP over the last 6 years area suggest a similar scenario to Mountain Plover, with high site fidelity, narrow habitat niche (only in small, isolated dog towns, or at edges of larger ones; not found everywhere p-dogs are found), and thus limited opportunities for expansion. Buffering existing BUOW breeding sites by 150 m would only require setting aside 1% of the landscape from oil and gas development. Our data suggests BUOW has declined in the MTP area since 2007 and is just now starting to recover. For these reason, RMBO recommends No Surface Occupancy to protect occupied Burrowing Owl breeding habitat." Also, RMBO continues, "The amount and nature of ground disturbing activities should be limited within identified nesting aggregation areas to avoid the abandonment of these areas. Directional drilling, the piping and storage of condensate off of the nesting concentration area, or to a centralized facility, or other techniques for the minimization of ground disturbance and habitat degradation should be implemented where practicable and feasible."

RAPTOR: OWLS & OTHER NESTING RAPTORS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 1/4 mile from active nests	none	1/4 mile from active nests	???	none	None are mapped in the planning area at present.
Inconsistences between sources	Distances ranging from 660 ft - 1/2 mile			Distances ranging from 1/4 mile - 1 mile. End dates of 7/31 vs. 8/15. No surface disturbance vs. restrict surface disturbance.		
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
BLM Atlantic Rim	Construct structures 825 feet from raptor nests			Restrict surface-disturbing activities from 2/1-7/31 within a 3/4-1 mile radius of raptor nests		Notify BLM if raptors are found nesting within 1200 feet of project facilities. oilandgasbmps.org
BLM Jonah	No surface occupancy within 825 feet from active nest sites			No surface disturbance within 1/2 mile of active nest from 2/1-7/31		oilandgasbmps.org
BLM Roan Plateau	No surface disturbance within 1/8 mile from raptor nest sites					oilandgasbmps.org
CDOW Raptor Guidelines						In addition to the other target raptor species in this report, guidance is available for ospreys, red-tailed hawks, peregrine falcons, and northern coshawks.
Expert Opinion - RMBO	1/4 mile					
Federal Lands Analysis Natural Gas Assessment	No surface occupancy within 1/8 mile (660 ft.) from raptor nest sites			No surface occupancy within 1/4 mile of the nest site between 2/1 and 8/15		oilandgasbmps.org

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
NM Wind BMPs	1/2 mile buffer from active raptor nests. Avoid placing turbines near landscape features that attract foraging, migrating, roosting, or nesting raptors.					Consider likely movement patterns of raptors between foraging areas (prairie dog towns, nesting sites). Mortality risk varies by species, topography, and location. A site-specific evaluation approach should be taken.

FISH: IOWA DARTER

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 600 ft. (200 m.) from the high water mark of creeks and streams	600 ft. (200 m.) from the high water mark of creeks and streams	none	none	none	
Inconsistences between sources	200 vs. 300 ft (100m)					
Legal: COGCC Rules						
CDOW BMPs						Various other recs, see Aquatic Species/Amphibians (p.47-48)
CRCC BMPs						
Lowry Range O&G Lease						
EPA wetlands and watersheds	200-300 ft. buffer around wetlands to protect wildlife habitat and corridors for rare, threatned and endangered species (p.23)					Although the buffer is for wetlands specifically, we are assuming it can also pertain to rivers and streams
Expert Opinion - C.Pague	300 ft (100 m.) from the high water mark of reservoirs, lakes, and perennial and ephemeral streams and rivers					

FUNGUS: *SMITHIOMYCES CROCODILINUS*

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 600 ft. (200 m.)	600 ft. (200 m.)	none	none	none	Treat it like a rare plant.
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert Opinion - R.Rondeau	600 ft. (200 m.)					Treat it like a rare plant.

INSECT: COLORADO BLUE (BUTTERFLY)

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 300 ft. (100 m.) from mapped occurrences	300 ft. (100 m.) from mapped occurrences	none	none	none	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert Opinion - C.Pague	300 ft. (100 m.) from mapped occurrences					

INSECT: AQUATIC INSECTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. 0-100 m. buffer of all creeks and streams. An additional 100-200 m on priority streams only.	0-300 ft (0-100 m) buffer of all creeks and streams.	300-600 ft (100-200 m) buffer of priority streams only.	none	600 ft. (200 m.) from the high water mark of creeks, rivers, and wetlands -- in spring and summer (4/15-10/1)- shine lights down toward the ground or ideally turn them off at night, to specific streams.	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease						
Expert Opinion - C.Pague	0-100 m. around all creeks and streams. 100-200 m on priority streams only.				600 ft. (200 m.) in spring and summer (4/15-10/1)- shine lights down toward the ground or ideally turn them off at night.	Bugs are attracted to mercury vapor lights and the flames, noise level on breeding birds, and human disturbance. Moths will fly 2 miles to a light. Should at least reduce the impacts

MAMMAL: BLACK-FOOTED FERRET CAPTIVE POPULATION

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. One mile buffer to the south, east and west (cut by the Interstate) and a 0.5 mile buffer to the north	0-1/2 mile buffer around the perimeter of the ferret center	1/2-1 mile to the south, east, and west.	???	none	
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						Avail. for released populations only (p.18)
CRCC BMPs						
Lowry Range O&G Lease						
Expert Opinion - P. Marinari	One mile buffer to the south, east and west (cut by the Interstate) and a 0.5 mile buffer to the north					
Federal Lands Analysis Natural Gas Assessment				Petroleum development in or near prairie dog colonies occupied by ferrets through recovery efforts should avoid the period between March 1 to August 31		oilandgasbmps.org

MAMMAL: BLACK-TAILED PRAIRIE DOG

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No.	none	none	3/1-6/15 - No construction activity within and over colonies	none	
Inconsistences between sources	Avoid all prairie dog colonies when possible, vs. avoiding those >5 acres and/or those where mtn. plovers or BUOW are actively nesting.					
Legal: COGCC Rules						
CDOW BMPs	Generally avoid: Avoid construction on or in prairie dog colonies whenever possible (p.38)			3/1-6/15: No O&G activity (p.38)		No Black-tailed guidance avail. Used guidance for White-tailed and Gunnison's. Surface density, other (p.38)
CRCC BMPs						
Lowry Range O&G Lease						Surveys, plan to minimize or mitigate impacts (p.8)
Expert Opinion - C.Pague	No new construction in prairie dog towns where burrowing owls or mountain plovers are actively nesting					
NM Wind BMPs						Minimize the number and length of access roads; use existing roads when feasible.
BLM Jonah	Avoid surface disturbance in all prairie dog towns					oilandgasbmps.org

MAMMAL: SWIFT FOX DEN SITES

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No.	none	none	1/4 mile from active den sites from 3/15-6/15: No construction activity while young are den-dependent	none	
Inconsistences between sources				Active vs. all		
Legal: COGCC Rules						
CDOW BMPs				1/4 mile from 3/15-6/15: Avoid surface disturbance within 0.25 miles of den sites while young are den-dependent (p.45)		Survey, other (p.45)
CRCC BMPs						
Lowry Range O&G Lease	Use current SLB wildlife stipulations and consult with CPW (p.8)			Use current SLB wildlife stipulations and consult with CPW (p.8)		

UNGULATE: ELK PRODUCTION AREAS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No, though some places within the broader habitat may warrant avoidance.	none	none	Legal: 5/15-6/30 - no construction activity	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal seasonal timing limitations.
Inconsistences between sources	Avoid activities in all areas vs. just in critical habitat types and patches.			Start date of 4/16 vs. 5/15.		
Legal: COGCC Rules				Elk production areas west of I-25 (p.100-10)		Sensitive Wildlife Habitat
CDOW BMPs	Avoid O&G activities in elk production areas (p.20)			5/15-6/30: Where O&G activities must occur…conduct these activities outside [of] 5/15-6/30 (p.20)		Various (p.22)
CRCC BMPs						
Lowry Range O&G Lease						
Federal Lands Analysis Natural Gas Assessment				No surface occcupancy from 4/16-6/30		oilandgasbmps.org

UNGULATE: ELK WINTER CONCENTRATION AREAS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No, though some places within the broader habitat may warrant avoidance.	none	none	Legal: From 12/1-4/15, no post-development well-site visits from 3p.m.-10a.m.	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations.
Inconsistences between sources	Avoid activities in all areas vs. just in critical habitat types and patches.					
Legal: COGCC Rules				Elk winter concentration areas west of I-25 (p.100-10)		Sensitive Wildlife Habitat
CDOW BMPs	Avoid O&G activities in elk winter concentration areas (p.22)			3p.m.-10a.m. from 12/1-4/15: Restrict post-development well-site visitations to between 10a.m.-3p.m. (p.22)		Surface density, other (p.22)
CRCC BMPs						
Lowry Range O&G Lease						

MAMMAL: MULE DEER CRITICAL WINTER RANGE

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No, though some places within the broader habitat may warrant avoidance.	none	none	Legal: From 12/1-4/15, no post-development well-site visits from 3p.m.-10a.m.	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations.
Inconsistences between sources	Avoid activities in all areas vs. just in critical habitat types and patches.					
Legal: COGCC Rules				Mule deer critical winter range (west of I-25)		Sensitive Wildlife Habitat
CDOW BMPs	Avoid O&G activities in mule deer critical winter range (p.22)			3p.m.-10a.m. from 12/1-4/15: Restrict post-development well-site visitations to between 10a.m.-3p.m. (p.22)		Surface density, other (p.22)
CRCC BMPs						
Lowry Range O&G Lease						

MAMMAL: MULE DEER SEVERE WINTER RANGE

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No, though some places within the broader habitat may warrant avoidance.	none	none	Legal: From 12/1-4/15, no post-development well-site visits from 3p.m.-10 a.m.	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations. Assumed that Severe Rinter Range and Critical Winter Range would use the same stips (stips available only for the latter)
Inconsistences between sources	Avoid activities in all areas vs. just in critical habitat types and patches.					
Legal: COGCC Rules				Mule deer severe winter range (west of I-25)		Sensitive Wildlife Habitat
CDOW BMPs	Avoid O&G activities (p.22)			3p.m.-10a.m. from 12/1-4/15: Restrict post-development well-site visitations to between 10a.m.-3p.m. (p.22)		Assumed that critical winter range and severe winter range used the same stips (stips avail. only for CWR). Surface density, other (p.22)
CRCC BMPs						
Lowry Range O&G Lease						

UNGULATE: PRONGHORN WINTER CONCENTRATION AREA

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	No, though some places within the broader habitat may warrant avoidance.	none	none	Legal: 1/1-3/31: No human disturbance or construction activity within winter concentration areas west of I-25	none	Sensitive Wildlife Habitat under the COGCC rules. Used CPW guidelines as the legal timing limitations.
Inconsistences between sources				Start date of 11/15 or 1/1. End date of 3/31 or 4/30		
Legal: COGCC Rules				Pronghorn winter concentration areas west of I-25 (Sensitive Wildlife Habitat) (p.100-10)		Sensitive Wildlife Habitat
CDOW BMPs				1/1-3/31: Avoid surface disturbance to and construction activities within winter concentration areas west of I-25 (p.31)	Reclamation, restoration, other (p.31)	
CRCC BMPs						
Lowry Range O&G Lease						
WYG&F Recs				No drilling on crucial winter ranges from 11/15-4/30		oilandgasbmps.org

PLANTS: RARE PLANTS

Surface occupancy recommendations and timing limitations, including justification

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
Recommendations to SLB	Yes. Legal: Avoid federally listed species and those that the Colorado Natural Heritage Program has rated as globally or critically imperiled (G1 or G2). Additional recommended: For all rare plants (incl. but not limited to those addressed by the SLB policy): 0-300 ft. (0-100 m.) = true avoidance. 100-200m. (300-600 ft.) = avoid, but negotiation may be possible.	Occurrence plus a 300 ft (100 m) buffer	300-600 ft (100-200 m) buffer.	none	none	Legal avoidance through SLB policy -- Procedures for Rare Plant Environmental Review for Development Projects and Land Use Changes
Inconsistences between sources						
Legal: COGCC Rules						
CDOW BMPs						
CRCC BMPs						
Lowry Range O&G Lease					Surveys (p.9)	
Legal: SLB Procedures for Rare Plant Review	Pertains to federally listed as threatened, endangered, or candidate species by UFWS and listed as globally or critically imperiled (G1 or G2) by the Colorado Natural Heritage Program. "If significant loss of viability or destruction of an occurrence or species is likely, the the projects will be halted, moved, altered, or mitigated as necessary to prevent this loss" (p.3).					

		Surface occupancy recommendations		Timing limitations (seasonal)		
Sources	**Is year-round avoidance warranted?**	**No Surface Occupancy (NSO)**	**Limited Surface Occupancy (LSO)**	**Affecting surface occupancy**	**Not affecting surface occupancy**	**Notes**
BLM Draft Recs for Plants	Avoid surface disturbance within 300 ft. (100 m.) of occupied sensitive species' habitat.					oilandgasbmps.org
NM Wind BMPs	Wind turbines and associated infrastructure should not be placed in or near areas where rare plants are located (600 ft. or 200 m)				To the extent practicable, keep motorized travel to designated roads and trails; Minimize soil disturbance and revegetate all bare areas ASAP after construction with carefully selected native species.	
Rare Plant BMPs	600 ft. (200 m.) recommended (p.25)					

APPENDIX 4. METHODS USED FOR CALCULATING THE COMPENSATORY MITIGATION FEES

This appendix describes the three inputs to the compensatory mitigation fees: The base per-acre cost of mitigation, the surface occupancy zone escalator, and the well pad density escalator.

BASE MITIGATION FEE

For the purpose of this project, the base cost of mitigation is the amount of funding needed to offset impacts to biological values using land protection as the mitigation tool. The Nature Conservancy calculated this amount to be $2,200 (rounded up from $2,168 to the nearest $100) based on a scientific methodology that the organization's Development by Design Team created. This methodology involves multiplying the cost of land protection (i.e., land value) by a "mitigation ratio." The mitigation ratio identifies the number of acres of land that must be protected to offset any one acre impacted by oil and gas development within the project area. For this project, the cost of land protection was calculated at $1,681 per acre while the mitigation ratio was calculated at 1.29:1 (i.e., 1.29 acres must be protected to offset every 1 acre impacted). $1,681 multiplied by 1.29 equals $2,168, or $2,200 after it is rounded to the nearest $100.

It is important to note that the base mitigation fee for this project is calculated solely based on using land protection as the offset activity. The Core Team considered incorporating the cost of restoration offsets into the base rate, but decided against it for two reasons: (1) The City and County identified land protection as preferable to restoration projects and (2) preliminary analyses indicated that offsetting impacts using restoration would be much more expensive than doing so using land protection. Incorporating restoration costs would increase the base rate so much as to be potentially unworkable for operators. For example, we roughly calculated the per-acre cost of restoring riparian woodlands and shrublands to be $16,900/acre and salt desert scrub to be $45,900/acre.

a. Land value justification

This base land value of $1,681/acre is based on an average appraised land value of conservation easement projects completed in the Laramie Foothills over the last 7 years. The appraised unencumbered land values for the projects used in this analysis include:[1]

- Red Mountain Open Space 2004 (14,928 acres) at $918/acre
- Property A 2004 (4,557 acres) at $1,239/acre
- Property B 2006 (11,971 acres) at $549/acre
- Property C 2012 (244 acres) at $4,016/acre

The differences among the per-acre values of the properties listed above can be attributed to factors like the size of the property, the date of the project, and the amount of infrastructure or development potential. The City and County anticipate using compensatory mitigation funds to protect lands that fall into a similar range of values

[1] Note: Land protection may be accomplished through fee title acquisition or conservation easements. Conservation easements have been valued at between 50%-60% of the unencumbered fee value in the Laramie Foothills area in recent years.

based on development potential, size, etc. Over time, land values will change, most likely increasing but at a rate that cannot be accurately predicted at this time.

b. Mitigation ratio justification and methods

The primary assumptions include:

- Years of impact – It is assumed the oil and gas wells in this project area will have a 30-year impact. So long as oil and gas well pads and infrastructure are in place, the land will not function in a natural state and thus warrants offsets elsewhere. We apply a temporal discounting factor over the years of impact in order to compare the impacts of the project to the benefits of the offset activity occurring during different time periods.
- Additionality – Offset activities need to provide protection at a ratio of greater than 1:1 to adequately compensate for impacts and achieve no net loss of functional value. This is termed "additionality." Functionally, if one acre is impacted and one is protected, one acre is still lost. However, the protection of the other acre compensates for that loss at some rate less than 100%, because the protection assures it will not be lost in the future. We use the background rate of loss of land from natural land cover in order to calculate the value that offsets provide and determine a mitigation ratio. The background rate of loss is the rate at which the lands of interest for protection are protected to be converted from their natural state to other uses. For example, an offset that protects 100 acres against an annual background rate of loss of 5% delivers an additional benefit of 5 acres in year one and a benefit of 10 acres in year two (undiscounted). For this project, TNC calculated the background rate of loss at 1.9%.

More specifically, calculating the per-acre value of protection or restoration offsets against current development impacts involved three steps: (1) calculating the present value of the anticipated impact footprint summed in acre-years over the number of years that impact is expected to occur; (2) calculating the present value of potential benefits in acre-years following protection actions; and (3) calculating the quantity of offsets required to balance impacts with benefits accrued from protection activities.

i. *Calculate the value of anticipated impacts*

To calculate the acre-years of anticipated impact resulting from development, the following parameters were incorporated:

(a) The extent of the anticipated footprint (in acres) of potential development activities;
(b) The number years over which the impacts from oil and gas development are expected to occur;
(c) The year that reclamation efforts are expected to begin and the number of years over which reclamation efforts are expected to last; and
(d) A discount rate to calculate the present value of impacts and benefits accrued over time. It is common practice in environmental damage awards to use a discount rate of 3%, although it is possible to use a different discount rate based on different criteria.

To illustrate how we sum the acre-years of impact over the life of a project, assume a scenario where there is an anticipated 1,000 acres of impact to last for 30 years, followed by 10 years of reclamation efforts within the Mountains to Plains project area. To calculate the present value of the impact in year 1 after impact occurs, the impact footprint (1,000 acres) was discounted by 3%. For example, in year 8 after the impact year the present value of an initial 1,000 acre footprint was calculated to be 789 acres:

$$Impact\ acres\ \times \frac{1}{(1+discount)^j}$$

where j = impact year. The per-year discounted value of impact acres were summed over the course of the project life to derive an estimated acre-years of impact. In the example above, the acre-years of impact totaled 22,267.

ii. Calculate the value of anticipated benefits from protection activities

To scale the anticipated benefits accrued from protection activities to the losses from impacts, the protection benefits in acre-years were also calculated. To do so, an additional parameter was incorporated:

(e) Background rate of loss from conversion

To calculate the background rate of loss for the Mountains to Plains project, first, areas within the county at risk of conversion were identified using the 2001 National Land Cover Dataset (NLCD) and the Colorado Ownership, Management and Protection Database (COMaP). These lands included 89,000 acres that were not already under protection from development (e.g., Research Natural Areas, Wilderness, private land with protection) or were not already developed. These lands at risk of conversion were then overlaid with the 2006 NLCD Land Cover Change Dataset to identify areas that had been developed from 2001-2006 (8,438 acres) to estimate a 1.9% annual background rate of loss for this 5-year period.

The background rate of loss was incorporated to identify the additional value of the benefits resulting from protecting an area over time. To continue the example above, assuming an annual background rate of loss of natural cover to residential development or agricultural conversion of 1.9%, the value of protecting 1,000 acres in year one after impact year was calculated, to result in 19 acres of additional conservation benefit. This amount was further discounted to estimate the present value of future protection benefits and sum the resulting annual protection gains to produce an estimate of the total acre-years of protection benefits accrued. Again, in the example above, the acre-years of benefits accrued was estimated to be 17,318.

iii. Calculate the offset ratio for protection or restoration

Once the losses to anticipated impacts and benefits from protection were discounted and summed across the project's life, the level of compensation required to offset anticipated impacts from a project was estimated based on the ratio of the present value of total impacts in acre years to the present value of total benefits expected. Returning once again to the scenarios above, the offset ratio for the protection example was calculated to be 1:1.29 (=22,267/17,318). In other words, it is estimated that it would take 1.29 acres under protection to deliver benefits equal to the loss of 1 acre to development.

SURFACE OCCUPANCY AREA MULTIPLIERS

It is a basic premise of this plan that development impacts to land across the Project Area are not equal. Disturbance in LSO has significantly higher ecological impact than the same scale of impact in a CSO or PSO area due to the higher relative rarity or sensitivity of the biological values in these places. Also due to this varying rarity or sensitivity, it is expected that the cost to offset impacts to LSO will be higher than in CSO, which in turn will be more than in PSO. Therefore, the Core Team created a "surface occupancy area multiplier" to account for the increasing degree of difficulty (i.e., cost of) securing the conservation of equivalent ecological values as impacts occur in LSO, CSO, and PSO respectively. The ratio multipliers are:

- **PSO**: 1.0
- **CSO**: 1.5
- **LSO**: 3.0
- **NSO** – No disturbance allowed[2]

The aim of using the multipliers is to capture the increased difficulty of successfully mitigating development impacts as biological values become increasingly rare or sensitive. To put it another way, the probability of success for mitigating impacts to LSO is lower than that for CSO, which is lower than that for PSO, and these probabilities must be accounted for to assure mitigation outcomes. This is true even when the mitigation strategy is legal protection such as acquiring a conservation easement because it is typically more costly or difficult to protect rarer or more sensitive species or ecological systems.

WELL PAD DENSITY RATIO MULTIPLIERS

In addition to the increasing cost of replacing more rare or sensitive resources, there is a cumulative impact factor that must be considered as well pad densities increase above a minimum threshold. To account for the cumulative impact of increasing well pad density, the following well pad density ratio multipliers have been established for each section to be developed:

- **One or two well pads per section**: No additional multiplier
- **3 well pads per section**: No additional multiplier for PSO; multiplier of 1.5 for CSO and LSO
- **4 well pads per section**: No additional multiplier for PSO; multiplier of 2.0 for CSO and LSO

Mitigation for well pad densities is difficult factor to quantify, but it is critical in order to address the cumulative impacts of development. Cumulative impacts can cause an ecological system to suffer "death by a thousand cuts," so it must be considered in establishing mitigation ratios. It is well established that ecological systems and most species that depend on them are in better condition and more resilient if they are less fragmented. The Core Team decided not to exceed a combined mitigation ratio of 6:1 with the intent of achieving credible ecological equivalence while honoring the valid and existing rights of others. Using this 6:1 sideboard, a well pad multiplier of 2.0 was determined based on the already established surface occupancy zone multiplier of 3.0 for LSO. The Core Team applied the same well pad multiplier to both CSO and LSO because both have important biological values and it is assumed that fragmentation will significantly impact both of them.

[2] Note: Surface Owners may consider making exceptions to allow development in NSO areas on a case-by-case basis in circumstances where small impacts to NSO would result in the avoidance of significant impacts to LSO or CSO zones.