3.5 TERRESTRIAL VEGETATION

Vegetative cover is an important component in the classification of ecoregions that reflects differences in ecosystem quality and integrity (EPA 2007). Ecoregions are described through analysis of patterns and composition of geology, physiography, native vegetation, climate, soils, land use, wildlife, and hydrology. Variation in temperatures and precipitation, and differences in soils and parent materials along the northwest to southeast gradient crossed by the proposed Project, result in wide variation in vegetation communities. At the northern end of the proposed Project in Montana and South Dakota mixed-grass prairies and sagebrush[1] (*Artemisia* spp.) predominate; which transition to tall grass prairies through Nebraska, Kansas, and Oklahoma to southern piney woods, bald cypress (*Taxodium distichum*) and tupelo (*Nyssa* spp.) swamps at the southern end of the proposed Project in Texas. The proposed Project would cross 11 Level III Ecoregions of the United States from northwest to southeast:

- Northwestern Glaciated Plains (9 percent);
- Northwestern Great Plains (36 percent);
- Nebraska Sand Hills (7 percent);
- Central Great Plains (11 percent);
- Flint Hills;
- Cross Timbers (4 percent);
- Arkansas Valley (3 percent);
- South Central Plains (20 percent);
- East Central Texas Plains (4 percent);
- Texas Blackland Prairies (2 percent); and
- Western Gulf Coastal Plain (5 percent, Figure 3.5-1, Table 3.5-1).

Level IV Ecoregions (EPA 2002, 2007) supported by descriptions of dominant native vegetation communities within each state are presented to describe potential native vegetation cover and generalized landuse (Table 3.5-2, Woods et al. 2002, Bryce et al. 1996, Chapman et al. 2001, Woods et al. 2005, Griffith et al. 2004).

The occurrence of vegetation communities identified as conservation priorities are summarized from the states' Comprehensive Wildlife Conservation Strategies and agency correspondence (MFWP 2005, SDGFP 2006, Schneider et al. 2005, Wasson et al. 2005, ODWC 2005, Bender et al. 2005). Landcover types crossed by the proposed Project were identified and delineated based on review of literature, internet database resources, interpretation of aerial photographs, general observations made during field reconnaissance, and information collected during wetland delineation surveys. Generalized landcover types, and areas with native vegetation cover within wildlife areas, preserves, parklands, wetlands and forests crossed by the proposed pipeline ROW, access roads, workspaces, and transmission lines provide the basis for assessing potential impacts to vegetation cover.

[1] Common names of plants are used in this section. Scientific names for plants are used after their initial mention in text or tables following nomenclature in the U.S. Department of Agriculture, Natural Resources conservation Service's PLANTS database (USDA NRCS 2009). Scientific names for noxious weeds are listed in Table 3.5.4-1.

TABLE 3.5-1
EPA Level III Ecoregions Crossed by the Proposed Project

Ecoregion (Identifier)	Location of Occurrence in the Project Area	Description
Northwestern Glaciated Plains (42)	Montana, South Dakota, and Nebraska	This is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciations. This region is pocked by a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to a Prairie Potholes.
Northwestern Great Plains (43)	Montana, South Dakota, and Nebraska	This region includes the Missouri Plateau section of the Great Plains. It is a semiarid rolling plain of shale and sandstone punctuated by occasional buttes. Native grasslands, largely replaced on level ground by winter and spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.
Nebraska Sand Hills (44)	Nebraska, South Dakota	This is one of the most distinct and homogenous regions in North America and one of the largest areas of grass stabilized sand dunes in the world. The Sand Hills are generally devoid of cropland agriculture, and except for some riparian areas in the north and east, the region is treeless. Much of the region contains numerous lakes and wetlands that lack connecting streams.
Central Great Plains (27)	Nebraska, Kansas, and Oklahoma	This region is slightly lower, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grasslands, with scattered low trees and shrubs in the south, much of this region has been converted to croplands. The eastern boundary marks the eastern limits of the major winter wheat--growing area of the United States.
Flint Hills (28)	Kansas	This is a region of rolling hills, with relatively narrow steep valleys, composed of shale and cherty limestone with rocky soils. In contrast to surrounding regions that are mostly in cropland, most of the Flint Hills region is grazed. The Flint Hills mark the western edge of the tall-grass prairie and contain the largest remaining intact tall-grass prairie in the Great Plains.
Cross Timbers / Central Oklahoma/Texas Plains (29)	Oklahoma	This is a transition area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains of eastern Oklahoma. The region is not suitable for grain crops such as corn and soybeans that are common to the northeast. Cross-Timbers [little bluestem (*Schizachyrium scoparium*) grassland with scattered blackjack oak (*Quercus marilandica*) and post oak (*Q. stellata*) trees] is the native vegetation, and presently rangeland and pastureland are the predominant land covers. Oil extraction has been a major activity in this region for over eighty years.

TABLE 3.5-1
EPA Level III Ecoregions Crossed by the Proposed Project

Ecoregion (Identifier)	Location of Occurrence in the Project Area	Description
Arkansas Valley (37)	Oklahoma	This is a region of mostly forested valleys and ridges that is much less irregular than that of the Boston Mountains to the north and the Ouachita Mountains to the south, but is more irregular than the regions to the west and east. About one fourth of the region is grazed and roughly one tenth is cropland.
South Central Plains (35)	Texas	Locally called the "piney woods", this region of mostly irregular plains was once covered by oak-hickory-pine forests, but is now predominantly loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*). Only about one sixth of the region is cropland, and about two thirds are forests and woodlands. Lumber and pulpwood production are major economic activities.
East Central Texas Plains (33)	Texas	Also called the Clay Pan Area, this region of irregular plains was originally covered by post oak savanna vegetation, in contrast to the more open prairie-type regions to the north, south and west and the piney woods to the east. The bulk of this region is now used for pasture and range.
Texas Blackland Prairies (32)	Texas	This discontinuous region is distinguished from surrounding regions by its fine textured clayey soils and predominantly prairie vegetation. This region contains a higher percent of croplands than adjacent regions, although much of the land has been converted to urban and industrial uses.
Western Gulf Coastal Plain (34)	Texas	The distinguishing characteristics of this region are its relatively flat coastal plain topography and grassland vegetation. Inland from this region the plains are more irregular and have mostly forest or savanna-type vegetation. Largely because of these characteristics, a higher percentage of the land is in cropland compared to bordering regions, although much land has been converted to urban and industrial uses.

Sources: See Appendix M; Classification of Level III Ecoregions is based on EPA (2007); descriptions of the regions are based on EPA (2002).

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Steele City Segment and Cushing Pump Stations					
MT **7.8**	0.0	7.8	Cherry Patch Moraines (42m) (Northwestern Glaciated Plains)	Grama (*Bouteloua* spp.)-needlegrass (*Hesperostipa* spp.)-wheatgrass (*Pascopyrum* spp.); Shrubs limited to moister depressional areas	Undulating to strongly sloping with many seasonal lakes and wetlands. Shortgrass prairie vegetation is native with shrubs restricted to moist depressions. Extensive cereal farming, steep slopes, moraines, gullies and ridges are often grazed.
MT 82.4 7.7 **90.1**	7.8 109.0	90.2 116.7	Glaciated Northern Grasslands (42j) (Northwestern Glaciated Plains)	Grama-needlegrass-wheatgrass	Glaciated, dissected, rolling to strongly rolling drift plain with many seasonal impoundments. Mostly rangeland with some farming on scattered, un-dissected benches and on alluvial, irrigated soils.
MT 14.5 6.0 **20.5**	90.2 192.3	104.7 198.3	River Breaks (43c) (Northwestern Great Plains)	Bottomlands with heavy soils– western wheatgrass (*Pascopyrum smithii*), buffalograss (*Bouteloua dactyloides*); with gravelly soils – threadleaf sedge (*Carex filifolia*) needle and thread (*Hesperostipa comata*). On north facing slopes – junipers (*Juniperus* spp.) and deciduous trees	Unglaciated, very dissected terraces and uplands that descent to the Missouri River system (89.9 to 104.3) and to the Yellowstone River system (191.8 to 197.4). Primarily used for grazing on native grasses with remnant woodlands in draws and on north facing slopes and alluvial flats.
MT 4.3 16.6 83.7 **104.6**	104.7 116.7 198.3	109.0 133.3 282.0	Central Grassland (43n) (Northwestern Great Plains)	Grama-needlegrass-wheatgrass	Unglaciated, rolling plains studded with buttes and badlands dissected by many small, ephemeral or intermittent streams, underlain by fine-grained sedimentary rock. Primarily rangeland, with some irrigated and dry-land farming, and coal mining.
MT **59.0**	133.3	192.3	Missouri Plateau (43a) (Northwestern Great Plains)	Wheatgrass-needlegrass	Primarily unglaciated, treeless, rolling hills and gravel covered benches, less arid soils result in mosaic of rangeland and farmland with spring wheat, hay, barley and oats; in contrast to neighboring regions which are mainly rangelands. Subject to wind erosion.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
MT 0.4 SD 55.3 **55.7**	282.0 282.4	282.4 337.7	Sagebrush Steppe (43e) (Northwestern Great Plains)	Little sagebrush (*Artemisia arbuscula*), big sagebrush (*A. tridentata*), with western wheatgrass, green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), Sandberg bluegrass (*Poa secunda*), and buffalograss.	Unglaciated, level to rolling plains with occasional buttes, badlands, scoria mounds, and salt pans with thick mats of short-grass prairie and dusky gray sagebrush. Primarily grazing with minimal cultivation.
SD **49.2**	337.7	386.9	Moreau Prairie (43j) (Northwestern Great Plains)	Western wheatgrass, green needlegrass, blue grama and buffalograss	Unglaciated, level to rolling plains with occasional buttes, badlands, and numerous salt pans on alkaline soils. Mostly cattle and sheep ranching, with occasional dry-land wheat and alfalfa.
SD **30.5**	386.9	417.4	Missouri Plateau (43a) (Northwestern Great Plains	Blue grama, wheatgrass/needlegrass, little bluestem, prairie sandreed (*Calamovilfa longifolia*)	Unglaciated, moderately dissected rolling plains with isolated sandstone buttes. Mosaic of dry-land farming with spring wheat, barley, oats, sunflowers, and alfalfa.
SD 47.9 5.8 41.1 24.4 **119.2**	430.5 487.2 494.2 546.0	478.4 493.0 535.4 570.4	Subhumid Pierre Shale Plains (43f) (Northwestern Great Plains)	Short grass prairie: western wheatgrass, green needlegrass, blue grama and buffalograss	Unglaciated, undulating to rolling plains with steep-sided, incised streams on shale. Rangeland cattle grazing, dry-land farming winter wheat and alfalfa.
SD 8.9 4.2 8.8 1.2 10.6 **33.7**	417.4 426.3 478.4 493.0 535.4	426.3 430.5 487.2 494.2 546.0	River Breaks (43c) (Northwestern Great Plains)	Blue grama, western wheatgrass, buffalograss, some bluestem, prairie sandreed. Rocky Mountain juniper (*Juniperus scopulorum*) in draws and on north slopes, scattered cottonwoods (*Populus* spp.) in riparian areas	Unglaciated, highly dissected hills and uplands bordering Cheyenne River, Bad River, and White River and alluvial plains. Mostly rangeland and native grasses, cattle grazing, remnant woodlands in draws and on alluvial flats.
SD **5.1**	570.4	575.5	Keya Paha Tablelands (43i) (Northwestern Great Plains)	Blue grama, sideoats grama, western wheatgrass, little bluestem, and needle and thread.	Unglaciated, level to rolling sandy plains with isolated gravelly buttes, dissected near streams. Rangeland with areas of cropland, alfalfa, winter wheat, millet, and corn.
SD **13.3**	575.5	588.9	Ponca Plains (42g) (Northwestern Glaciated Plains)	Mixed grass prairie - little bluestem, prairie sandreed, green needlegrass and needle and thread	Unglaciated, level to rolling plains. Intensive row crops, soybeans, corn, sunflowers, alfalfa and some grazing.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
SD 8.4 NE 3.0 **11.4**	588.9 597.3	597.3 600.3	Southern River Breaks (42h) (Northwestern Glaciated Plains)	Mixed grass prairie: western wheatgrass, little bluestem, sideoats grama (*Bouteloua curtipendula*), green needlegrass on uplands. Deciduous woodland: bur oak (*Quercus macrocarpa*), American basswood (*Tilia americana*), and eastern redcedar (*Juniperus virginiana*) in canyons and northfacing slopes. Plains cottonwood (*Populus deltoides monilifera*), green ash (*Fraxinus pennsylvanica*), peachleaf willow (*Salix amygdaloides*), boxelder (*Acer negundo*), buffaloberry (*Shepherdia* spp.), sumac (*Rhus* spp.).	Lightly glaciated, dissected hills and canyons with high relief bordering Keya Paha River. Mixed grass and woodlands - grazing.
NE **13.3**	600.3	613.5	Keya Paha Tablelands (43i) (Northwestern Great Plains)	Mosaic of Sand Hills transition prairie and gravelly mixed grass prairie: little bluestem, prairie sandreed, threadleaf sedge, and needle and thread.	Unglaciated, level to rolling sandy plains with isolated gravelly buttes, dissected near streams. Rangeland with areas of cropland, alfalfa, winter wheat, millet, and corn.
NE **3.6**	613.5	617.1	Niobrara River Breaks (43r) (Northwestern Great Plains)	Ponderosa pine (*Pinus ponderosa*) woodlands with eastern redcedar south-facing bluffs and canyon slopes. Deciduous woodlands: bur oak, American basswood, green ash, and some paper birch (*Betula papyrifera*) on north-facing bluffs and lower canyon slopes. Plains cottonwoods and eastern redcedar on floodplains and mixed grass and Sand Hills prairies in valley	Unglaciated, dissected canyons with high relief bordering the Niobrara River. Rangeland with scattered cropland in valley bottom. Pine woodlands, deciduous woodlands, floodplain forest and mixed grass and Sand Hills prairies.
NE **46.8**	617.1	663.9	Wet Meadow and Marsh Plain (44c) (Nebraska Sand Hills)	Sand Hills transition mixed grass prairie: prairie sandreed, little bluestem, sand bluestem (*Andropogon hallii*), sun sedge (*Carex inops*), porcupinegrass (*Hesperostipa spartea*), needle and thread, blue grama and hairy grama (*Bouteloua hirsuta*). Wetlands: big bluestem (*Andropogon gerardii*), bluejoint (*Calamagrostis canadensis*), prairie cordgrass (*Spartina pectinata*), and sedges (*Carex* spp.)	Flat, sandy plain with numerous marshes and wetlands. Grassland with a small acreage used for cultivated crops, some irrigation.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
NE **44.8**	663.9	708.7	Sand Hills (44a) (Nebraska Sand Hills)	Sand Hills mixed grass prairie: prairie sandreed, little bluestem, sand bluestem, switchgrass (*Panicum virgatum*), sand lovegrass (*Eragrostis trichodes*), needle and thread, blue grama, and hairy grama.	Sand sheets and dune fields, high water table. Rangeland.
NE **30.4**	708.7	739.1	Central Nebraska Loess Plains (27e) (Central Great Plains)	Mixed grass prairie: big bluestem, little bluestem, sideoats grama, blue grama, and western wheatgrass with eastern redcedar intrusion. Redcedar concentrated in northwest and next to Sand Hills.	Rolling dissected plains with deep loess layer, perennial and intermittent streams. Predominantly rangeland with large areas of cropland in winter wheat, corn, forage crops, and some irrigated agriculture
NE **19.8**	739.1	758.9	Platt River Valley (27g) (Central Great Plains)	Lowland tall grass prairie with areas of wet meadow and marsh. With flood management and reduced river flow, floodplain forests have increased along the Platte River.	Flat, wide, alluvial valley with shallow, interlacing streams on a sandy bed. Extensive cropland, much of which is irrigated, corn, grain sorghum, soybeans, and alfalfa. Some native rangeland and hay lands, many channelized streams and flood control structures.
NE **89.5**	758.9	848.4	Rainwater Basin Plains (27f) (Central Great Plains)	Transitional tall grass prairie to the east and mixed grass prairie in the west dominated by big bluestem, little bluestem, and sideoats grama. Wetlands dominated by western wheatgrass, sedge, spikerush (*Eleocharis* spp.) and slender bulrush (*Schoenoplectus heterochaetus*).	Flat to gently rolling loess-covered plains, historically covered with extensive rainwater basins and wetlands. Extensive cropland, dry land sorghum and winter wheat, irrigated corn, and alfalfa. Most of the basins have been drained for cultivation.
NE **3.2** KS 0.0	848.4 PS 27	851.6	Smokey Hills (27a) (Central Great Plains)	Transition from tall grass prairie in the east to mixed grass prairie in the west. Some floodplain forests along riparian areas.	Undulating to hilly dissected plain, broad belt of low hills formed by dissection of sandstone formations. Cropland with winter wheat, corn in irrigated areas and areas of grassland.
KS 0.0	PS 29		Flint Hills (28) (Flint Hills)	Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass (*Sorghastrum nutans*).	Undulating to rolling hills, cuestas, cherty limestone, and shale outcrops, perennial streams and springs common. Rangeland cattle grazing, limited areas of croplands along river valleys.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Gulf Coast Segment					
OK **15.5**	0.0	15.5	Cross Timbers Transition (27o) (Central Great Plains)	Mixed grass prairie: little bluestem, sideoats grama, blue grama, Indiangrass. Cross timbers: blackjack oak, post oak, hickory (*Carya* spp.), little bluestem. Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass. Uplands: oak (*Quercus* spp.), hickory, eastern redcedar. Riparian: cottonwood, willow, elm (*Ulmus* spp.), ash, walnut (*Juglans* spp.), pecan (*Carya illinoinensis*).	Rough plains that are sometimes broken, incised stream with rocky or muddy substrates. Mixture of rangeland and cropland, small grains, sorghum, alfalfa, soybeans. Stream banks previously supported hardwood forests. Upland trees increased due to fire suppression, riparian forests and wetlands degraded or lost due to channelization or landuse changes.
OK **62.2**	15.5	77.7	Northern Cross Timbers (29a) (Cross Timbers)	Cross timbers: post oak, blackjack oak, little bluestem. Tall grass prairie: big bluestem, little bluestem, switchgrass, Indiangrass. Mosaic of tall grass prairie and oak-hickory forest. Riparian forest: common hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), post oak, black walnut (*Juglans nigra*), green ash, willow, American sycamore (*Platanus occidentalis*), cottonwood.	Rolling hills, cuestas, ridges, and ledges. Stream flow annually variable. Scrubby oak forests, oak savannas, riparian forests and prairie openings. Woodland, grassland, rangeland, pastureland and limited croplands. Main crops are small grains, sorghum, hay and soybeans. Fire suppression has allowed the woodlands to expand.
OK **41.1**	77.7	118.8	Lower Canadian Hills (37e) (Arkansas Valley)	Cross timbers, tall grass prairie, mosaic of tall grass prairie and oak-hickory forest, and oak-hickory-pine forest. High terraces mixed deciduous forests: post oak, black oak (*Quercus velutina*), southern red oak (*Q. falcata*), and black hickory (*Carya texana*). Wooded hills and ridges: post oak, blackjack oak, white oak (*Q. alba*), hickory, eastern redcedar, shortleaf pine. Floodplains: eastern cottonwood (*Populus deltoides*), sycamore, oaks, black willow (*Salix nigra*), green ash, pecan, sweetgum (*Liquidambar styraciflua*), black walnut.	Mosaic of hills and valleys in Arkoma Basin, scattered ridges and numerous ponds. Woodland, pastureland, cropland with soybeans, wheat, sorghum, alfalfa, peanuts, and corn, coal strip mines.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
OK 19.5 15.6 **35.1**	118.8 139.7	138.3 155.3	Cretaceous Dissected Uplands (35d) (South Central Plains)	Oak-hickory-pine forest. Shortleaf pine more abundant than loblolly pine in natural woodlands. Floodplains: deciduous forest. Moist upland forests: sweetgum, hickory, blackgum (*Nyssa sylvatica*), oak. Drier upland forests: oaks and pines. Floodplain forests American elm, common hackberry, water oak (*Quercus nigra*), southern red oak and green ash.	Level to hilly, dissected uplands and low cuestas underlain by poorly consolidated often calcareous sands, clays, gravels, and limestone. Mostly forests and pastureland, logging, livestock farming, poultry production, some croplands in gently sloping areas, corn, soybeans, hay, small grains, peanuts.
OK **1.4**	138.3	139.7	Eastern Cross Timbers (29b) (Cross Timbers)	Cross timbers (dominants: post oak, blackjack oak, black hickory, little bluestem) and tall grass prairie (dominants: big bluestem, little bluestem, switchgrass, and Indiangrass). Native bottomlands: pecan, black walnut, American elm and cottonwood.	Rolling hills, cuestas, long narrow ridges and a few strongly dissected areas underlain by sand, shale, clay, sandstone, calcareous shale and limestone. Vegetation diversity, density and growing season typically greater than Northern Cross Timbers. Primarily livestock grazing – grassland, pasture, rangeland and woodland, with some small grains, sorghum, and peanuts. Fire suppression and passive land use have allowed woodlands to expand, small impoundments are common.
OK 0.4 TX 4.9 **5.3**	155.3 155.7	155.7 160.6	Red River Bottomlands (35g) (South Central Plains)	Southern floodplain forest: eastern cottonwood, sycamore, hackberry, sweetgum, green ash, pecan, water oak, willow, American elm, southern red oak, and river birch (*Betula nigra*).	Broad, level to nearly level floodplains and low terraces with oxbow lakes, meander scars, backwaters. Mostly cleared and drained for cropland and pastures. Crops soybeans, sorghum, alfalfa, corn, wheat, pecans, cotton. Artificial levees and drainage ditches are common.
TX **2.5**	160.6	163.1	Pleistocene Fluvial Terraces (35c) (South Central Plains	Pine-hardwood forests with post oak, Shumard oak (*Quercus shumardii*) and eastern redcedar woods	Terrace deposits along the Red River, broad flats and gently sloping stream terraces mostly forest covered.
TX 9.0 3.2 1.4 5.8 10.0 **29.4**	163.1 198.9 203.7 206.5 217.6	172.1 202.1 205.1 212.3 227.6	Northern Post Oak Savanna (33a) (East Central Texas Plains)	Deciduous forest: post oak, blackjack oak, eastern redcedar, black hickory. Prairie openings: little bluestem and other grasses.	Level to gently rolling plains. Improved pasture, some coniferous trees planted loblolly pine

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
TX **26.8**	172.1	198.9	Northern Blackland Prairie (32a) (Texas Blackland Prairies)	Mixed grass prairie: little bluestem, big bluestem, Indiangrass, dropseed (*Sporobolus* spp.). Northeast grass communities dominated by Silveus' dropseed (*S. silveanus*), Mead's sedge (*Carex meadii*), bluestems (*Andropogon* spp., *Bothriochloa* spp., *Schizachyrium* spp.), and longspike tridens (*Tridens strictus*) with asters (*Aster* spp.), diamondflowers (*Stenaria nigricans*), prairie clover (*Dalea* spp.), and blackeyed Susan (*Rudbeckia hirta*). Riparian woodlands: bur oak, Shumard oak, sugarberry (*Celtis laevigata*), elm, ash, eastern cottonwood, pecan.	Rolling to nearly level plains underlain by interbedded chalks, marls, limestone, and shales. Most of the prairie has been converted to cropland, non-native pasture, and expanding urban areas.
TX 1.6 1.8 **3.4**	202.1 212.3	203.7 214.1	Floodplains and Low Terraces (33f) (East Central Texas Plains)	Bottomland forests: water oak, post oak, elms, green ash, pecan, willow oak (*Quercus phellos*), hackberry, eastern cottonwoods.	Floodplain and low terrace deposits, wider floodplains of Sulfur River on Holocene deposits. Northern floodplains have more forested cover than cropland and pasture.
TX 1.4 3.5 **4.9**	205.1 214.1	206.5 217.6	Northern Prairie Outliers (33d) (East Central Texas Plains)	Tall grass prairie: little bluestem, big bluestem, Indiangrass, dropseed.	Small disjunct areas historically containing a mosaic of forest and prairie. Fire suppression has allowed invasion of woody vegetation. Mostly pasture with some croplands
TX 33.7 69.1 **102.8**	227.6 263.8	261.3 332.9	Tertiary Uplands (35a) (South Central Plains)	Mixed forest: loblolly pine, shortleaf pine, southern red oak, post oak, white oak, hickory, sweetgum and mixed and tall grasses, Indiangrass, little bluestem, longleaf woodoats (*Chasmanthium sessiliflorum*), panicgrass (*Panicum* spp.); with American beautyberry (*Callicarpa americana*), sumac, greenbrier (*Smilax* spp.) and hawthorn (*Crataegus* spp.) understory. Sandier areas have more bluejack oak (*Quercus incana*), post oak, and stunted pines.	Irregular plains at the western edge of the coniferous forest belt. Rolling uplands, gently to moderately sloping plains. Once covered with a mix of pine and hardwood, much of the region is now in loblolly and shortleaf pine plantations. Pastures, loblolly pine timber forest, lumber and pulpwood production, grazing and poultry production.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
TX 2.5 3.1 1.4 0.9 1.3 2.2 2.8 **14.1**	 261.3 334.0 347.9 352.7 360.5 364.8 367.0	 263.8 337.1 349.2 353.6 361.8 367.0 369.8	Floodplains and Low Terraces (35b) (South Central Plains)	Wetland communities: water oak, willow oak, sweetgum, blackgum, elm, red maple (*Acer rubrum*), southern red oak, swamp chestnut oak (*Quercus michauxii*), loblolly pine. Bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) in semipermanently flooded areas.	Alluvial floodplains and low terraces of the Sabine River, Angelina River, Neches River where there is a distinct vegetation change into bottomland oaks and gum forest. Lumber and pulpwood production.
TX 1.1 10.8 3.5 6.9 3.0 40.9 **66.2**	 332.9 337.1 349.2 353.6 361.8 369.8	 334.0 347.9 352.7 360.5 364.8 410.7	Southern Tertiary Uplands (35e) (South Central Plains)	Longleaf pine (*Pinus palustris*) forests on sand ridges and uplands. Mesic forests: American beech (*Fagus grandifolia*), magnolia-beech loblolly pine (*Magnolia* spp.*, Fagus* spp.*, Pinus* spp.) forests. Acid bogs: sweetbay (*Magnolia virginiana*), holly (*Ilex* spp.), bayberry (*Morella* spp.), insectivorous plants, orchids (Orchidaceae), rhododendron (*Rhododendron* spp.).	Hilly and dissected longleaf pine range, sand ridges and uplands, open forests, some sandstone outcrops. Seeps in sand hills with acid bog species. More pine than oak-pine forests and pasture, large areas are National Forests.
TX 44.3 0.2 **44.5**	 410.7 459.3	 455.0 459.5	Flatwoods (35f) (South Central Plains)	Upland pine forest: longleaf pine, sweetgum, white oak, southern red oak, willow oak, blackgum and holliy. Wetter, flat areas: pine savannas, small prairies: beech-magnolia communities, swamp chestnut oak, loblolly pine, laurel oak (*Quercus laurifolia*).	Mostly flat to gently sloping, irregular plains at the western edge of the southern coniferous forest belt. Once supported diversity of mixed pine-hardwood forests with mosaic of well-drained and poorly drained communities. Much of the region in loblolly and shortleaf pine plantations about one sixth of the region is cropland, two thirds is forests and woodland. Lumber, pulpwood production.
TX 4.3 23.2 1.1 **27.2**	 455.0 459.5 482.7	 459.3 482.7 483.8	Northern Humid Gulf Coastal Prairies (34a) (Western Gulf Coastal Plain)	Grasslands with clusters of oaks: little bluestem, Indiangrass, brownseed paspalum (*Paspalum plicatulum*), hairawn muhly (*Muhlenbergia capillaris*), switchgrass. Some loblolly pine in northern portion.	Deltaic sands, silts, and clays on gently sloping coastal plain. Flat grasslands, more irregular and with forest or savanna vegetation further inland. Almost all coastal prairies converted to cropland, rangeland, pasture, urban use. Primarily croplands, rice sorghum, cotton and soybeans. Urban and industrial developments.

TABLE 3.5-2
Level IV Ecoregions Crossed by the Proposed Project

State Length (miles)	Milepost In	Milepost Out	Level IV (Identifier) (Level III)	Potential Natural Vegetation	Description
Houston Lateral Segment					
TX 3.2 0.5 **3.7**	0.0 15.9	3.2 16.4	Flatwoods (35f) (South Central Plains)	Upland pine forest: longleaf pine, sweetgum, white oak, southern red oak, willow oak, blackgum and holly. Wetter, flat areas: pine savannas, small prairies: beech-magnolia communities, swamp chestnut oak, loblolly pine, laurel oak.	Mostly flat to gently sloping, irregular plains at the western edge of the southern coniferous forest belt. Once supported diversity of mixed pine-hardwood forests with mosaic of well-drained and poorly drained communities. Much of the region in loblolly and shortleaf pine plantations about one sixth of the region is cropland, two thirds is forests and woodland. Lumber, pulpwood production.
TX 12.7 26.0 **38.7**	3.2 22.6	15.9 48.6	Northern Humid Gulf Coastal Prairies (34a) (Western Gulf Coastal Plain)	Grasslands with clusters of oaks: little bluestem, Indiangrass, brownseed paspalum, hairawn muhly, switchgrass. Some loblolly pine in northern portion.	Deltaic sands, silts, and clays on gently sloping coastal plain. Flat grasslands, more irregular and with forest or savanna vegetation further inland. Almost all coastal prairies converted to cropland, rangeland, pasture, urban use. Primarily croplands, rice sorghum, cotton and soybeans. Urban and industrial developments.
TX **6.2**	16.4	22.6	Floodplains and Low Terraces (35b) (South Central Plain)	Wetland communities: water oak, willow oak, sweetgum, blackgum, elm, red maple, southern red oak, swamp chestnut oak, loblolly pine. Bald cypress and water tupelo in semipermanently flooded areas.	Floodplains and low terraces of the lower Trinity River.

Sources: See Appendix M; Level III Ecoregions is based on EPA (2002, 2007); Level IV Ecoregions are based on Woods et al. 2002, Bryce et al. 1996, Chapman et al. 2001, Woods et al. 2005, Griffith et al. 2004. Plant names follow USDA NRCS (2009) PLANTS Database.

3.5.1 General Vegetation Resources

Generalized vegetation cover including prairie, forest, wetland communities and croplands that may occur within landcover classes crossed by the proposed Project is summarized in Table 3.5.1-1. Grassland/rangeland upland forest, palustrine emergent wetland, palustrine shrub/scrub wetlands, palustrine forested wetland, streams, and open water areas support naturally occurring terrestrial and aquatic vegetation. Shrublands are included in the grassland/rangeland landcover class. Residential, commercial, industrial, and special designation areas (e.g., schools, parks, and recreational facilities) primarily include artificially created landscapes with minimal naturally occurring vegetation. Cropland and irrigated cropland primarily include introduced crop species, which provide forage and grain for livestock and human consumption. ROW areas consist of previously disturbed areas associated with pipelines and other utilities that have been restored primarily with native herbaceous and introduced plants.

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Proposed Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State						
			Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Agriculture									
Cropland	• Cultivated land • Row crops • Hayfields	Wheat, barley, oats, sorghum, corn, beans, hay	X	X	X		X	X	X
Irrigated Cropland	Cultivated, center pivot irrigated	Wheat, barley oats, corn, beans, alfalfa	X	X	X	X			
Hay Meadows		Non-native grasslands	X	X	X		X	X	
Urban / Built-Up Areas									
Residential	Suburban and rural residential areas	Ornamental trees, shrubs, windbreaks	X	X	X	X	X	X	X
Commercial	Commercial development areas	Planted vegetation	X	X	X	X	X	X	X
Industrial	• Electric power and gas utility stations • Roads • Landfills • Mines • Wind farms, etc.	Planted and potential native vegetation	X	X	X	X	X	X	X
Right of Way	Roads, Railroads and utility corridors	Mixture of native and non-native grasses and forbs	X	X	X	X	X	X	X
Grasslands / Rangeland									
Tall-Grass Prairie	Grassland community dominated by 3 to 6 foot tall grasses	Big Bluestem, Little Bluestem, Indiangrass			X	X	X		X
Mixed-Grass Prairie	Grassland community dominated by 1 to 2 foot tall grasses	Blue Grama, Needle and Thread, Green Needlegrass, Western Wheatgrass, Little Bluestem, Buffalograss	X	X	X		X		X
Short-Grass Prairie	Grassland community dominated by grasses less than 1 foot tall	Blue Grama, Buffalograss	X	X					

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Proposed Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State						
			Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Sand Hills Dune Prairie	Grassland community on sand or gravel soils, dominated by sand-adapted grasses	Sand Bluestem, Hairy Grama, Prairie Sandreed, Little Bluestem		X	X				
Non-native Grassland	Pasturelands planted with nonnative cool-season grasses	Smooth Brome (*Bromus inermis*), Crested Wheatgrass (*Agropyron cristatum*) and other seeded pasture grasses	X	X	X		X	X	X
Deciduous Shrubland	Upland or lowland communities dominated by shrubs	Chokecherry (*Prunus virginiana*), Sandbar Willow (*Salix interior*), Silver Buffaloberry (*Shepherdia argentea*), Western Snowberry (*Symphoricarpos occidentalis*)	X				X	X	X
	Sagebrush communities dominated by shrubs	Silver Sagebrush (*Artemisia cana*), Big Sagebrush	X	X					
Conservation Reserve Program	Fallow, mixed native and non-native grasses, forbs and shrubs.	A variety of native and introduced grass species	X	X	X				
Upland Forest									
Deciduous Forest	Forests dominated by a wide variety of mixed native and non-native deciduous trees	Green Ash, Quaking Aspen (*Populus tremuloides*), Bur Oak, Post Oak, Blackjack Oak, American Hickory, Boxelder, Common Hackberry	X	X	X		X	X	X
Mixed Forest	Forest composed by a wide variety of mixed deciduous and evergreen species, with neither type more than 75 percent of total tree cover.	Juniper, Pine, Green Ash, Quaking Aspen, Bur Oak, Shortleaf Pine, Water, Blackgum, Winged Elm (*Ulmus alata*)	X	X	X		X	X	

TABLE 3.5.1-1
Landcover Types with Generalized Plant Communities Crossed by the Proposed Project

General and Subclass Designation	General Description	Common Plants	Occurrence along ROW by Route Segment and State						
			Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
			MT	SD	NE	KS	OK	TX	TX
Riverine / Open Water									
Open Water	Open water, sometimes associated with wetland habitat	Not applicable	X	X	X		X	X	X
Riverine Wetlands	Wetlands contained within a channel	Not applicable						X	X
Palustrine Forested									
Riparian or Floodplain Woodland	Temporarily flooded woodland	Green Ash, Eastern Cottonwood, Boxelder, Bur Oak, American Elm , Willow	X	X	X		X		
	Bald Cypress-Water Tupelo Swamp	Bald Cypress, Water Oak, Water Hickory (*Carya aquatica*), Swamp Tupelo (*Nyssa biflora*), Swampprivet (*Forestiera* spp.)					X	X	X
Palustrine Emergent / Scrub-Shrub Wetlands									
Emergent Wetlands	Wetlands dominated by persistent emergent vegetation	Common Spikerush (*Eleocharis palustris*), Rush (*Juncus* spp.), Rice Cutgrass (*Leersia oryzoides*), Bulrush, Bur-reed (*Sparganium* spp.), Cattail (*Typha* spp.), Sedges, Fowl Bluegrass (*Poa palustris*), Foxtail Barley (*Hordeum jubatum*)	X	X	X		X	X	X
Riparian Shrubland	Temporarily flood scrub-shrub community	Sedge, Willow, Bulrush, Western Snowberry, Greasewood (*Sarcobatus vermiculatus*), Winterfat (*Krascheninnikovia lanata*), Fourwing Saltbush (*Atriplex canescens*)	X	X	X				
Aquatic Bed Wetland	Intermittently, temporarily, or permanently flooded wetlands	Saltgrass (*Distichlis spicata*), Knotweed (*Polygonum* spp.), Pondweed (*Potamogeton* spp.)			X				

3.5.2 Vegetation Communities of Conservation Concern

Native vegetation communities throughout the proposed Project area are altered by agricultural, urban and industrial development and by changes in ecosystem processes that maintain or reset succession including fire, bison grazing and prairie dogs. Vegetation communities crossed by the proposed Project that have become conservation concerns because of declining abundance, sensitivity to disturbance, and/or reliance of listed or sensitive species on the habitats that they create include: native grasslands, sagebrush grasslands, riparian habitats and bottomland hardwoods, and native forests. Vegetation cover within wetlands, conservation and reserve areas, wildlife production areas, and unique landscapes are areas of concern. The following sections provide brief descriptions of these unique and often rare vegetation communities. Figure 3.5.2-1 illustrates the current distribution of grasslands and prairies, forestlands, and croplands and pasture in the states crossed by the proposed Project.

3.5.2.1 Native Grasslands

Native grasslands or prairies are among the most threatened native vegetation communities in the United States. In the past, grasslands such as the tall-grass prairies, mixed-grass prairies, and short-grass prairies dominated central North America. Across the proposed Project area the influence of fire and grazing, especially by large herds of bison, maintained native grasslands in a relatively treeless condition. With suppression of fires, woody vegetation has encroached upon the prairie landscape in some parts of Great Plains. Prairies have been lost to agriculture, urbanization, and mineral exploration and altered by invasions of non-native plants, fire suppression, establishment of woodlots and shelterbelts, and water developments.

Tall-grass prairie is the wettest of the grasslands composed of sod-forming grasses. Mixed-grass prairies are intergrades between tall-grass and short-grass prairies characterized by the warm-season grasses of the short-grass prairie and the cool and warm-season grasses of the tall-grass prairie. Short-grass prairies are dominated by blue grama and buffalograss – two warm-season grasses that flourish under intensive grazing. Estimated declines in native tall-grass prairie range from 83 to 99 percent, mixed-grass prairie range from 30 to 75 percent, and short-grass prairie ranges from 35 to 79 percent in some of the Great Plains states crossed by the proposed Project (Samson et al. 1998). Because of this decline and the importance of these areas as wildlife habitat, conservation of native prairie remnants is a high priority throughout the proposed Project area. Many of the sensitive plant species discussed in Section 3.8 that occur along the pipeline ROW occur within native grasslands.

Sand Hills

The Sand Hills is one of the largest grass-stabilized dune regions in the world (Schneider et al. 2005). Dunes are oriented northwest to southeast in alignment with the prevailing winds. Rainwater and snowmelt percolate rapidly through the poorly developed soils and most lakes and wetlands in the area are small, shallow and clustered near stream headwaters where surface drainage is poor (Schneider et al. 2005). Typical grassland communities include: dune prairie with a mixture of sand-adapted grasses; dry valley prairie with taller prairie grasses in wetter areas between dunes; blowout communities with unique plant communities in wind-excavated depressions; and wet meadows (Schneider et al. 2005). Most (95 percent) of the Sand Hills region remains in a relatively natural state maintained as native grasslands for livestock grazing and contains a variety of native plant communities, with nearly 700 native plants and associated high biological diversity (Schneider et al. 2005). The rich flora and fauna supported by the Sand Hills is one of the few remaining examples of a functioning prairie ecosystem. The proposed Project crosses through the Elkhorn Headwaters Unique Landscape in Nebraska (Schneider et al. 2005).

Rainwater Basin

The Rainwater Basin is a complex of wetlands and grasslands on the flat to rolling loess-covered plains of the Rainwater Basin Plains. This complex of playa wetlands formed by wind scour retain water because of impervious clay layers accumulated in the bottoms of the depressions over thousands of years slows water from seeping into the ground (LaGrange, 2005). Surface water drainage is poorly developed, and wetlands fill with precipitation and snowmelt (Schneider et al. 2005). This region supports millions of migratory ducks, geese, and shorebirds. Vegetation communities include mixed grass, tall grass, and saline prairie communities. The proposed Project crosses through the Rainwater Basin-East Unique Landscape in Nebraska (Schneider et al. 2005).

Prairie Dog Towns

Prairie dogs change grassland habitats by digging and maintaining extensive burrow complexes, by selective grazing which changes the associated grasses, and by urination and defecation that change soil nutrients. Vegetation typically associated with active and inactive prairie dog towns may include: threeawn (*Aristida* spp.), sixweeks fescue (*Vulpia octoflora*), fetid marigold (*Dyssodia papposa*), curlycup gumweed (*Grindelia squarrosa*), saltgrass (*Distichlis spicata*), prairie junegrass (*Koeleria macrantha*), threadleaf sedge, blue grama, and western wheatgrass (SDGFP 2006).

Sagebrush Grasslands

Mixed shrub and grass habitats characterize large expanses of grasslands throughout Montana and South Dakota. Depending on site moisture communities may include, silver sagebrush in more moist areas, big sagebrush and rabbitbrush (*Chrysothamnus* spp. and *Ericameria* spp.) in drier areas, or greasewood in alkali flats. Large areas of intact native sagebrush grasslands are a conservation priority in Montana and South Dakota. Sagebrush is susceptible to fire and low-lying, xeric big sagebrush communities may have a natural fire return interval of 100 to 200 years depending on topography and exposure, while sagebrush communities on more moist sites may have a natural fire interval of decades (USFWS 2008). Post-fire reestablishment of sagebrush communities may require 20 to 50 years.

3.5.2.2 Riparian Habitats and Bottomland Hardwoods

Riparian vegetation changes substantially in character from woody draws in the northwest portion of the proposed Project area to bald cypress-tupelo swamps in the southeast. Riparian areas are important as wildlife habitat within the western United States (USFWS, 1997). Riparian areas represent a transition between wetland and upland habitats, generally lack the amount or duration of water present in wetlands, and riparian vegetation may include wetland or upland plants. Riparian habitats identified as conservation priorities in Montana include: woody draws (dry streambed areas dominated by broadleaf riparian communities such as cottonwood-alder-chokecherry-willow communities); shrub riparian communities (alder-chokecherry-dogwood community); graminoid and forb riparian communities (bluejoint reedgrass-cinquefoil-cattails); and mixed riparian communities (mixed grasses and shrubs). Extensive riparian habitats occur near the confluence of the Milk and Missouri rivers, and near the Yellowstone River in Montana. High-priority conservation riparian communities in South Dakota include areas with emergent, scrub-shrub, or forest vegetation in semi-permanent or permanent depressional wetlands and low gradient perennial streams and rivers (SDGFP 2006). The proposed Project crosses through the Keya Paha Watershed, Lower Niobrara River, and Lower Loup River Unique Landscapes in Nebraska with priority cottonwood-willow riparian woodlands. In Oklahoma, priority riparian communities include: oak and hickory bottomland hardwood forests, and small streams and associated riparian forests (ODWC 2005). In Texas, priority riparian communities include bottomland hardwoods

and riparian conservation areas (Bender et al. 2005). Specific communities of conservation concern in Texas include the Water Oak – Willow Oak Series community (Brewer 2009).

3.5.2.3 Forest Communities

Native wooded communities were once an integral component of the prairie landscape throughout the Great Plains where they provide foraging, breeding, and refuge habitats for many wildlife species. Prairie woodlands were generally limited in size and distribution by fire to river breaks and protected areas. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development. At the southern end of the proposed Project in Oklahoma and Texas, native trees develop within the prairies creating savannas and continue increasing in density creating woodlands and forests within the Cross Timbers and South Central Plains or Piney Woods. In the Cross Timbers region, fire suppression has led to expansion of forests. Much of the South Central Plains is used for silviculture. Some forest communities in uplands or outside of riparian areas are priorities for conservation across the proposed Project. In Montana, green ash and cottonwood woodlands are declining in abundance (MFWP 2005). No forested habitats are considered high conservation priorities within the Great Plains Steppe region of South Dakota (SDGFP 2006). Within the biologically unique landscapes identified in Nebraska several forest communities are identified as conservation priorities including: Keya Paha Watershed (oak woodland); Middle Niobrara River (bur oak-basswood-ironwood forest, oak woodland, and ponderosa pine woodland); and Lower Loup River (oak woodland) (Schneider et al. 2005). Forest community conservation priorities within the Cross Timbers Region of Oklahoma include: oak and hickory bottomland hardwood forest, post oak/blackjack oak/hickory woodlands and forest, and post oak/blackjack oak shrubland. Forest community conservation priorities by ecoregion in Texas include: Post Oak Savanna (mesic hardwood woodlands and bottomland hardwoods); Piney Woods (longleaf pine forests and savanna and East Texas hardwood upland and slope forests) (Bender et al. 2005). Potential occurrences of remnant ancient Cross Timbers forest that would be crossed by the proposed Project in Oklahoma and Texas were evaluated using the predictive model developed by the Ancient Cross Timbers Consortium (Therrell and Stahl 1998).

3.5.2.4 Traditionally Used Native Plants

Native Americans have traditionally used many native plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, and Gilmore 1977). Although the dependence on plants for many aspects of survival in the natural environment have become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Native Americans. The plants themselves are important and in some cases, indigenous peoples consider them sacred. Places where traditionally used plants grow and have been collected for millennia may be considered to have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the proposed Project area include plants from all native vegetation communities, although many grow in wetlands and riparian areas. Important wetland and riparian plants include: cottonwood (*Populus* spp.), hawthorn (*Crataegus* spp), sweet grass (*Hierochloe odorata*), cattail (*Typha* spp.), snowberry (*Symphoricarpos* spp.), silver buffaloberry (*Sheperdia argentea*), and saskatoon (*Amelanchier alnifolia*). Wetlands and riparian habitats are a small percentage of the land area in the Great Plains, however, they are disproportionately important as sources of traditionally used plants. Native grasslands also provided numerous traditionally used plants including: Indian bread-root (*Psoralea esculenta*), wild flax (*Linum lewisii*), prickly pear cactus (*Opuntia* spp.), fringed sage (*Artemisia frigida*), and white sage (*Artemisia ludoviciana*). Reductions in native grasslands have also reduced populations of plants valued by Native Americans. In addition to plants traditionally used by Native Americans, many people also use and collect for sale the purple (or prairie) coneflower (*Echinacea* spp.) as an herbal supplement.

3.5.3 Wetland and Conservation Easements

The Steele City Segment Gulf Coast Segment, and Houston Lateral would potentially cross multiple conservation easements including USFWS wetland easements, Montana Fish, Wildlife, and Parks Conservation Easements, and multiple conservation easements enrolled in the NRCS Conservation Reserve Program (CRP) and the Wetland Reserve Program (WRP). The WRP and CRP are described in Section 3.9.4.6.

3.5.4 Noxious Weeds

Noxious weeds and invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. The term "noxious weed" is legally defined under both federal and state laws. Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801–2814]), a noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." The Federal Plant Protection Act contains a list of 137 federally restricted and regulated noxious weeds, as per CFR Title 7, Chapter III, Part 360, including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds. Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and to manage its lands accordingly. Four federally listed exotic noxious weed species and one noxious weed genus have been reported to occur in Texas, a state that would be crossed by the construction ROWs (USDA NRCS 2009) (Table 3.5.4-1). The parasitic genus (dodder) occurs as both native and introduced species within all states crossed by the ROW (Table 3.5.4-1).

In addition to federal noxious weed lists, each state maintains a list of state and local noxious weeds. County weed control boards or districts are present in most counties along the proposed pipeline corridor. These county weed control boards monitor local weed infestations and provide guidance on weed control. Weed distributions (USDA NRCS 2009) in the counties along the proposed pipeline corridor suggest that 93 noxious weeds and invasive plants could potentially occur within the construction ROW including:

- 29 aquatic or wetland weeds;
- 51 upland weeds; and
- 13 weeds that may occur in either wetland or upland habitats.

Of these, 66 are federally or state designated noxious weeds, including:

- 15 aquatic or wetland weeds;
- 42 upland weeds; and
- 8 weeds that may occur in either wetland or upland habitats.

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Proposed Project Route[a]

Species[b]	Status / Habitat	Occurrence and State Designations[c]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Hardheads [Russian knapweed] (*Acroptilon [Centaurea] repens*)	Introduced / Upland	√ C1	√ NW		√ NW	√		
Alligatorweed (*Alternanthera philoxeroides*)	Introduced / Wetland					√ NAP	√ NW	√ NW
Wollyleaf bur ragweed [Wollyleaf burdock] (*Ambrosia grayi*)	Native / Upland				√ NW			
Lesser [Common] burdock (*Arctium minus*)	Introduced / Upland	√ LW	√ LW	√	√	√	√	√
Absinthium (*Artemisia absinthium*)	Introduced / Upland	√	LW					
Giant reed (*Arundo donax*)	Introduced / Upland				√	√	√ NW	√ NW
Flowering rush (*Butomus umbellatus*)	Introduced / Wetland	√ C3		√				
Hedge false bindweed (*Calystegia sepium*)	Native / Upland	√	√	√	√	√	√ NW	√ NW
Whitetop [Hoary cress] (*Cardaria draba*)	Introduced / Upland	√ C1	√ NW	√	√ NW	√		
Balloon vine (*Cardiospermum halicacabum*)	Introduced / Upland					√	√ NW	√ NW
Spiny plumeless thistle (*Carduus acanthoides*)	Introduced / Upland		LW	√ NW		√		
Nodding plumeless [Musk] thistle (*Carduus nutans*)	Introduced / Upland	√	LW	√ NW	√ NW	√ NW		
Diffuse [White] knapweed (*Centaurea diffusa*)	Introduced / Upland	√ C1	LW	√ NW	IW			
Yellow star-thistle (*Centaurea solstitialis*)	Introduced / Upland	C3	√	√		√		
Spotted knapweed (*Centaurea stoebe* [*maculosa*])	Introduced / Upland	√ C1	√ LW	√ NW	IW			

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Proposed Project Route[a]

Species[b]	Status / Habitat	Occurrence and State Designations[c]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Chicory (*Cichorium intybus*)	Introduced / Upland	√	√ LW	√	√	√	√	√
Canada thistle (*Cirsium arvense*)	Introduced / Wetland and Upland	√ C1	√ NW	√ NW	√ NW	NW		
Bull thistle (*Cirsium vulgare*)	Introduced / Upland	√	√ LW		√ LW			
Poison hemlock (*Conium maculatum*)	Introduced / Wetland and Upland	LW	√ LW	√	√			
Field bindweed (*Convolvulus arvensis*)	Introduced / Upland	√ C1	√ LW	√	√ NW	√	√ NW	√ NW
Common crupina (*Crupina vulgaris*)	Introduced / Upland	√ C3						
Japanese dodder (*Cuscuta japonica*)	Introduced / Upland						√ NW	√ NW
Dodder (*Cuscuta* spp.)	Introduced and Native / Upland	√	√	√	√	√	√	√
Gypsyflower [Houndstongue] (*Cynoglossum officinale*)	Introduced / Upland	√ C1	√ LW	√	√			
Woodrush flatsedge [Deep-rooted sedge] (*Cyperus entrerianus*)	Introduced / Wetland					√	√ NW	√ NW
Common viper's bugloss [Blueweed] (*Echium vulgare*)	Introduced / Upland	C2					√	√
Common water hyacinth (*Eichhornia crassipes*)	Introduced / Aquatic					WL	√ NW	√ NW
Quackgrass (*Elymus repens*)	Introduced / Upland	√	√	√	NW		√	√
Leafy spurge (*Euphorbia esula*)	Introduced / Upland	√ C1	√ NW	√ NW	√ NW			
Baby's breath (*Gypsophila paniculata*)	Introduced / Upland	LW	√		√			

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Proposed Project Route[a]

Species[b]	Status / Habitat	Occurrence and State Designations[c]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Orange hawkweed (*Hieracium aurantiacum*)	Introduced / Upland	√ C2	√					
Meadow hawkweed complex (*Hieracium caespitosum, H. x. floribundum, H. piloselloides*)	Introduced / Upland	√ C2						
Waterthyme (*Hydrilla verticillata*)	Introduced / Aquatic				IW	WL	√ NW	√ NW
Indian swampweed (*Hygrophilla polysperma*)	Introduced / Aquatic					NAP	√	√
Common St. Johnswort (*Hypericum perforatum*)	Introduced / Upland	√ C1	LW	√	√			
Paleyellow iris [Yellow flag iris] (*Iris pseudacorus*)	Introduced / Upland and wetland	√ C2				WL	√	
Dyer's woad (*Isatis tinctoria*)	Introduced / Upland	√ C3						
Dotted duckmeat [Giant duckweed] (*Landoltia punctata [Spirodela oligorrhiza]*)	Native / Aquatic					√ WL	√ NW	√ NW
Broadleaved [Perennial] pepperweed (*Lepidium latifolium*)	Introduced / Upland	√ C2			√			
Sericea [Chinese] lespedeza (*Lespedeza cuneata*)[d]	Introduced / Wetland				√ NW	√ IW		
Oxeye daisy (*Leucanthemum vulgare [Chrysanthemum leucanthemum]*)	Introduced / Upland	√ C1	√		√		√	√
Dalmatian toadflax (*Linaria dalmatica*)	Introduced / Upland	√ C1	√ LW		IW			
Butterandeggs [Yellow toadflax] (*Linaria vulgaris*)	Introduced / Upland	√ C1	√ LW	√	√ IW	√	√	√
Purple loosestrife (*Lythrum salicaria*)	Introduced / Wetland	√ C2	NW	√ NW	IW	√ NAP	NW	NW

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Proposed Project Route[a]

Species[b]	Status / Habitat	Occurrence and State Designations[c]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
European wand loosestrife (*Lythrum virgatum*)	Introduced / Wetland	√ C2		NW				
Eurasian (Spike) watermilfoil (*Myriophyllum spicatum*)	Introduced / Aquatic	C3		√		WL	NW	NW
Scotch cottonthistle (*Onopordum acanthium*)	Introduced / Upland		LW			√ NW		
Hemp broomrape (*Orobanche ramosa*)	Introduced / Upland						√ NW	√ NW
Ducklettuce (*Ottelia alismoides*)	Introduced / Aquatic					NAP	√	√
Torpedograss [Couch panicum] (*Panicum repens*)	Introduced / Upland					WL	√ NW	√ NW
Common reed (*Phragmites australis*)	Native / Wetland	√	√ LW	√ NW			√	√
Waterlettuce (*Pistia stratiotes*)	Native / Aquatic				√	WL	NW	NW
Japanese knotweed complex [Crimson beauty] (*Polygonum cuspidatum, P. polystachyum, P. sachalinense*)	Introduced / Upland and wetlands	√ C3	√ LW	√	√	√		
Sulphur cinquefoil (*Potentilla recta*)	Introduced / Upland	√ C1		√		√		
Kudzu (*Pueraria montana* [*lobata*])	Introduced / Upland			√	√ NW	√ IW	√ NW	√ NW
Multiflora rose (*Rosa multiflora*)	Introduced / Upland				√ LW			
Itchgrass (*Rottboellia cochinchinensis*)	Introduced / Upland						√ NW	√ NW
Water spangles (*Salvinia minima*)	Introduced / Aquatic					√	√ NW	√ NW

TABLE 3.5.4-1
Federal, State, or Local Noxious Weeds Potentially Occurring along the Proposed Project Route[a]

Species[b]	Status / Habitat	Occurrence and State Designations[c]						
		Steele City Segment			Cushing Pump Stations	Gulf Coast Segment		Houston Lateral
		MT	SD	NE	KS	OK	TX	TX
Field [Perennial] sowthistle (*Sonchus arvensis*)	Introduced / Wetland and Upland	√ LW	√ NW		√		√ NW	√ NW
Johnsongrass (*Sorghum halepense*)[d]	Introduced / Wetland and Upland				√ NW	√ IW	√	√
Tamarisk [Saltcedar] (*Tamarix* spp.)	Introduced / Wetland and Upland	√ C2	√ NW	NW		√ IW	√ NW	√ NW
Common tansy (*Tanacetum vulgare*)	Introduced / Upland	√ C1	LW	√				
Chinese tallow [tree] (*Triadica sebifera*)	Introduced / Wetland and Upland						√ NW	√ NW
Puncturevine (*Tribulus terrestris*)	Introduced / Upland	√	√ LW	√	√	√	√	
Common mullein (*Verbascum thapsus*)	Introduced species / Upland	√	√ LW	√	√	√	√	√

Notes:

√ = Occurs within counties crossed by proposed Project or within state if county data not available (USDA NRCS 2009).
CP = Classified as a state regulated plant.
C1 = Classified as a category 1 noxious weed for the state of Montana.
C2 = Classified as a category 2 noxious weed for the state of Montana.
C3 = Classified as a category 3 noxious weed for the state of Montana.
IW = Classified as a state invasive plant.
LW = Classified as a local noxious weed.
NAP = Classified as a state noxious aquatic plant.
NW = Classified as a state noxious weed or state noxious plant.
WL = Classified as a "Watch List" invasive plant.

[a] This information was compiled from weed surveys completed by Keystone across the proposed Project ROW. It is not intended to represent a comprehensive list of weeds in all states.

[b] Species in bold are federal noxious weeds (USDA NRCS 2009). Common and species synonyms in square brackets [] are as listed on state noxious weed or plant lists.

[c] Sources: USDA NRCS 2009, MDA 2008, MDA 2009, SDA 2009, NDA 2009, KDA 2007, KDA 2009, ODA 2000, ODWC 2002, OBS undated, TDA 2008.

[d] Neither Sericea [Chinese] lespedeza (Lespedeza cuneata) or Johnsongrass (Sorghum halepense) are considered noxious weeds in Nebraska http://www.agr.state.ne.us/division/bpi/nwp/nwp1.htm.

Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species can cause. It further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits outweigh the potential harm and that all feasible and prudent measures to minimize risk have been taken.

3.5.5 Potential Impacts and Mitigation

Total miles crossed and acres of terrestrial vegetation affected during construction and operation of the proposed Project are presented in Tables 3.5.5-1 and 3.5.5-2.

Potential construction- and operations-related effects include:

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion due to lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the pipeline ROW as a result of construction and operational vegetation maintenance;
- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting water infiltration and seed germination, or increasing siltation;
- Alteration in vegetation productivity and phenology due to increased soil temperatures associated with heat input from the pipeline; and
- Loss of vegetation due to exposure to toxic materials or crude oil releases (addressed in Section 3.13).

3.5.5.1 General Vegetation Resources

The primary impacts on vegetation from construction and operation of the proposed Project would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. The degree of impact would depend on the type and amount of vegetation affected, the rate at which vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted on the ROW during pipeline operation.

Impacts on annually tilled croplands also generally would be short-term and limited to the current growing season if topsoil is segregated and soils are not compacted during construction. Impacts on pastures, rotated croplands, and open grassland range generally would be short to long-term, with vegetation typically reestablishing within 1 to 5 years after construction. Perennial herbaceous cover may require as long as 5 to 8 years to establish cover similar to adjacent undisturbed lands in northern arid portions of the proposed Project especially when drought conditions or livestock grazing interfere with reestablishment. Impacts on these communities during operation of the pipeline would be minimal because these areas would recover following construction and typically would not require maintenance mowing.

TABLE 3.5.5-1
Summary of Estimated Impacts on Vegetation Communities by State for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Steele City Segment			
Montana			
Cropland	70.2	1,005	448
Grassland/rangeland	204.4	3,010	1,261
Upland forest	0.6	8	4
Riverine/open water	3.5	48	21
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	<0.0	1	0
Emergent wetlands	1.2	16	7
Developed land	2.8	41	19
Montana total	*282.7*	*4,128*	*1,760*
South Dakota			
Cropland	80.9	1,152	510
Grassland/rangeland	223.7	3,255	1,389
Upland forest	0.9	15	6
Riverine/open water	3.6	45	22
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	1.9	23	12
Developed land	3.0	48	20
South Dakota total	*314.0*	*4,538*	*1,959*
Nebraska			
Cropland	112.8	1,578	693
Grassland/rangeland	126.1	1,955	780
Upland forest	4.5	67	29
Riverine/open water	1.9	22	11
Forested wetlands	0.1	1	1
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	5.5	88	43
Developed land	3.9	60	26
Nebraska total	*254.8*	*3,771*	*1,583*
Cushing Extension Pump Stations			
Kansas			
Cropland	0.0	0	0
Grassland/rangeland	0.0	14	14
Upland forest	0.0	1	1

TABLE 3.5.5-1
Summary of Estimated Impacts on Vegetation Communities by State for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Riverine/open water	0.0	0	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.0	0	0
Kansas total	*0.0*	*15*	*15*
Gulf Coast Segment and Houston Lateral			
Oklahoma			
Cropland	11.7	166	71
Grassland/rangeland	83.4	1,224	539
Upland forest	40.3	607	245
Riverine/open water	1.4	20	9
Forested wetlands	1.3	13	8
Shrub-scrub wetlands	0.1	1	1
Emergent wetlands	0.3	4	2
Developed land	17.3	220	113
Oklahoma total	*155.9*	*2,255*	*987*
Texas			
Cropland	53.6	755	323
Grassland/rangeland	116.8	1,664	719
Upland forest	129.2	1,840	782
Riverine/open water	3.6	42	22
Forested wetlands	26.0	281	155
Shrub-scrub wetlands	2.5	33	15
Emergent wetlands	7.1	94	46
Developed land	37.6	506	259
Texas total	*376.4*	*5,215*	*2,321*

[a] Includes acres disturbed on a temporary basis (permanent ROW width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Project. Acreage does not include disturbance associated with tank farm, access roads, pipe stockpile sites, rail sidings, contractor yards, and construction camps.

TABLE 3.5.5-2
Summary of Estimated Impacts on Vegetation Communities by Pipeline Segment for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Steele City Segment			
Cropland	263.9	3,735	1,651
Grassland/rangeland	554.2	8,220	3,430
Upland forest	6.0	90	39
Riverine/open water	9.0	115	54
Forested wetlands	0.1	1	1
Shrub-scrub wetlands	<0.1	1	0
Emergent wetlands	8.6	127	62
Developed land	9.7	149	65
Steele City Segment total	*851.5*	*12,438*	*5,302*
Cushing Extension Pump Stations			
Cropland	0.0	0	0
Grassland/rangeland	0.0	14	14
Upland forest	0.0	1	1
Riverine/open water	0.0	0	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.0	0	0
Pump Station total	*0.0*	*15*	*15*
Gulf Coast Segment			
Cropland	62.1	879	374
Grassland/rangeland	181.1	2,621	1,142
Upland forest	151.8	2,211	922
Riverine/open water	4.8	59	29
Forested wetlands	24.7	262	147
Shrub-scrub wetlands	2.6	34	16
Emergent wetlands	3.4	50	23
Developed land	53.2	703	360
Gulf Coast Segment total	*483.7*	*6,819*	*3,013*
Houston Lateral			
Cropland	3.2	43	19
Grassland/rangeland	19.1	267	116
Upland forest	17.7	236	105
Riverine/open water	0.3	3	2

TABLE 3.5.5-2
Summary of Estimated Impacts on Vegetation Communities by Pipeline Segment for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Forested wetlands	2.6	32	16
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	4.0	48	24
Developed land	1.7	23	12
Houston Lateral total	*48.6*	*652*	*294*
Proposed Project			
Cropland	329.2	4,657	2,045
Grassland/rangeland	754.4	11,122	4,702
Upland forest	175.5	2,538	1,067
Riverine/open water	14.1	177	85
Forested wetlands	27.4	295	164
Shrub-scrub wetlands	2.6	35	16
Emergent wetlands	16.0	225	109
Developed land	64.6	875	437
Proposed Project Total	**1,383.8**	**19,924**	**8,625**

[a] Includes acres disturbed on a temporary basis (permanent ROW width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Project. Acreage does not include disturbance associated with tank farm, access roads, pipe stockpile sites, rail sidings, contractor yards, and construction camps.

Clearing trees within upland and riparian forest communities would result in long-term impacts on these vegetation communities, given the length of time needed for the community to mature to pre-construction conditions. Permanent impacts would occur within the 50-foot-wide permanent easements centered on the pipeline. In this area, trees would be removed and would not be allowed to reestablish due to periodic mowing and brush clearing during pipeline operation. Routine maintenance vegetation clearing would occur no more frequently than every one to three years.

Impacts on shrubland also would be long-term because of the time required to reestablish the woody vegetation characteristic of this community type. Most shrubs would be expected to reestablish within the non-maintained portion of the ROW within 5 to 15 years. The permanent easement in shrubland would not be regularly mowed or cleared and would be allowed to revegetate.

Operation of the proposed Project would cause increases in soil temperatures at the soil surface (from 4 to 8 ˚F) primarily during winter, and at depths of 6 inches (from 10 to 15 ˚F), with the most notable increases during spring in the northern portion of the pipeline (see Appendix L). While many plants would not produce root systems that would penetrate much below 6 inches, the root systems of some plants, notably native prairie grasses, trees, and shrubs; often penetrate well below 6 inches. Soil temperatures closer to the buried pipeline may be as much as 40 ˚F warmer than the ambient surrounding soil temperatures (Appendix L). In general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in annual crops such as corn and soybeans

and in tall-grass prairie species (Appendix L). Increased soil temperatures may lead to localized soil drying and localized decreases in soil moisture available for evapotranspiration.

To reduce impacts on vegetation within the construction and permanent ROW and to improve the probability of successful revegetation of disturbed areas, the following measures as described in the proposed Project CMR Plan (Appendix B) would be implemented in accordance with applicable permits:

- Limit construction traffic to the construction ROW, existing roads, newly constructed roads, and approved private roads;
- Clearly stake construction ROW boundaries including pre-approved temporary workspaces to prevent disturbance to unauthorized areas;
- Mow or disc crops if present to ground level unless an agreement is made for the landowner to remove for personal use;
- Prohibit burning on cultivated lands, as well as on rangelands and pastures when recommended by regulatory agencies;
- In South Dakota, limit the width of the construction ROW at timber shelterbelts in agricultural areas to the minimum necessary to construct the pipeline;
- Strip topsoil in cultivated and agricultural lands to the actual depth of the topsoil to a maximum depth of 12 inches;
- Stockpile stripped topsoil in a windrow along the edge of the ROW, such that the potential for subsoil and topsoil mixing is minimized;
- Prohibit the use of topsoil as construction fill;
- Increase adhesion in topsoil piles by using water or an alternative adhesive agent if required to prevent wind erosion;
- Leave gaps in rows of topsoil and subsoil and prevent obstructions in furrows, furrow drains, and ditches to allow drainage and prevent ponding of water next to or on the ROW;
- Install flumes and ramps in furrows, furrow drains, ditches, and for any watercourse where flow is continuous during construction to facilitate water flow across the trench;
- Ramp bar ditches with grade or ditch spoil to prevent damage to the road shoulder and ditch;
- Restore original contours and drainage patterns to the extent practicable after construction;
- Survey agricultural areas with terraces such that pre-construction contours may be restored after construction;
- Use timber mats, timber riprap, or other methods to stabilize surface conditions when the construction surface is inadequate to support equipment and remove these mats or riprap when construction is complete;
- Provide and maintain temporary and permanent erosion control measures on steep slopes or wherever erosion potential is high;
- Install sediment barriers below disturbed areas where there is a hazard of offsite sedimentation such as at the base of slopes next to road crossings, at the edge of the construction ROW next to a roadway, stream, spring, wetland or impoundment, at trench or test water discharge locations, or where waterbodies or wetlands are next to the construction ROW, across the ROW at flowing

waterbody crossings, upslope of saturated wetlands or wetlands with standing water boundaries, along the edge of the ROW to contain spoil and sediment;

- Install slope breakers (water bars) on slopes greater than 5 percent on all disturbed lands to prevent erosion, or on slopes greater than 8 percent in some areas not prone to erosion on the Steele City Segment;
- Use appropriate erosion control measures (water bars, silt fencing, temporary mulch, etc.) on disturbed construction work areas that have been inactive for one month or are expected to be inactive for a month or more;
- Ensure all temporary mulch materials are weed free; and
- Limit soil compaction by prohibiting access by certain vehicles, using only machinery with low ground pressure (tracks or extra-wide tires), limiting access and minimize frequency of all vehicle traffic, digging ditches to improve surface drainage, using timber riprap, matting or geotextile fabric overlain with soil, and stopping construction when necessary.

To restore disturbed areas to pre-construction use and vegetation cover, the following reclamation and revegetation measures as described in the proposed Project CMR Plan (Appendix B) would be implemented in accordance with applicable permits:

- Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas;
- Relieve soil compaction on all croplands by ripping a minimum of three passes at least 18 inches deep, and on all pastures by ripping or chiseling a minimum of three passes at least 12 inches deep;
- Relieve subsoil compaction on areas stripped for topsoil salvage by ripping a minimum of three passes at 18 inches or less followed by grading and smoothing if necessary (disc or harrow) to avoid topsoil mixing;
- Replace topsoil to pre-existing depths once ripping and discing of subsoil is complete up to a maximum of 12 inches, alleviate compaction on cultivated fields by cultivation;
- Consult with NRCS if there are any disputes between landowner and Keystone as to areas where compaction should be alleviated;
- Plow under organic matter, including wood chips, manure, or planting a new crop such as alfalfa, to decrease soil bulk density and improve soil structure or any other measures in consultation with the NRCS if mechanical relief of compaction is deemed unsatisfactory;
- Inspect the ROW in the first year following construction to identify areas of erosion or settling;
- If soil quality has been deteriorated the application of soil amendments such as fertilize and soil pH modifiers may be required in accordance with written recommendations from local soil conservation authorities and land management agencies and authorized by the landowners;
- Reseed the reclaimed construction ROW following cleanup and topsoil replacement as closely as possible using seed mixes based on input from the local NRCS and specific seeding requirements as requested by the landowner or the land management agency;
- Use certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjust seeding rates based on test results;
- Remove and dispose of excess mulch prior to seedbed preparation to prevent seed drills from becoming plugged and to ensure that seed incorporation can operate effectively;

- Re-apply and anchor temporary mulch, such as erosion control blankets, on the construction ROW following seeding;
- Seed at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed;
- Use seeding methods appropriate for weather conditions, construction ROW constraints, site access, and soil types using drill seeding unless the ROW is too steep. Temporary cover crop seed shall be broadcast;
- Delay seeding until soil is in an appropriate condition for drill seeding;
- Use Truax or an equivalent-type drill seeder equipped with a cultipacker that is designed and equipped to apply grass and grass-legume seed mixtures, with mechanisms such as seed box agitators to allow even distribution of all species in each seed mix and with an adjustable metering mechanism to accurately deliver the specified seeding rate and depth;
- Operate and calibrate drill seeders so that the specified seeding rate is planted using seed depths consistent with local or regional agricultural practices and row spacing that does not exceed 8 inches;
- Use broadcast or hydro-seeding in lieu of drilling at the recommended seeding rates and use a harrow, cultipacker, or other equipment immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed;
- Delay broadcast seeding during high wind conditions and when the ground is frozen;
- Hand rake all areas that are too steep or otherwise cannot be safely harrowed or cultipacked to incorporate broadcast seed to the specified depth;
- Use hydro-seeding on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods; and
- Work with landowners to the extent practicable to discourage intense livestock grazing of the construction ROW during the first growing season by using temporary fencing, deferred grazing, or increased grazing rotation frequency.

3.5.5.2 Vegetation Communities of Conservation Concern

The proposed pipeline corridor would cross an estimated 339 miles that lie within 66 high-quality native grasslands, and would also cross an estimated 2 miles that lie within 16 prairie dog grasslands (Table 3.5.5-3). High quality grasslands are sites dominated by native grass (>75 percent) and corridor areas adjacent to large tracts of native grasslands with a relatively high diversity of native grasses (three or more) and native forbs (four or more that are relatively common), and very few exotic weeds. As delineated in Table 3.5.5-3, this category may also include some sagebrush grasslands. These impacts would contribute to the decline in native grasslands described in Table 3.5.2-1 and represent an additional loss to current grassland areas across the proposed Project area. Although native grasslands would be restored, construction affects on previously untilled native prairies could be long-term, as destruction of the prairie sod during trenching may require more than a 100 years for recovery. Short-grass prairie and mixed-grass prairie areas may take 5 to 8 or more years to reestablish due to poor soil conditions and low moisture levels. Construction through the native grasslands in the Sand Hills region would expose the fragile soils to erosion by wind and water and re-establishment of vegetative cover in this region will be difficult requiring an estimated 4 or more years. Re-establishment of diverse native Sand Hills vegetation communities would likely require a longer term. Construction through prairie dog towns would destroy the burrow systems and surrounding soil characteristics at active and inactive burrow sites. If the burrow

sites are active, prairie dogs may reconstruct some of the burrows, if the site is inactive, the loss would be permanent. Soil compaction within extra work-spaces and changes in vegetation structure within the construction ROW would likely lead to reduced use or abandonment of previously used areas by ground squirrels or prairie dogs as habitat suitability would likely be reduced (Lauzon et al. 2002). Heat dissipated from the pipeline as discussed above would potentially lead to early germination and increased productivity of native prairie grasses but may lead to decreased soil water that could be detrimental to native prairie plants (Appendix L). Invasion of non-native plants also may prevent recovery of prairie grasslands, as would altered land management that may require suppression of wildfires that maintain prairie sod.

The proposed pipeline corridor would cross an estimated 34.4 miles that lie within 86 sagebrush grasslands (Table 3.5.5-3). Construction through shrublands would remove shrubs most of which would typically become reestablished within 5 to 15 years. The permanent easement in shrublands would not be regularly mowed or cleared and would be allowed to revegetate with sagebrush. Sagebrush would require 20 to 50 years to reestablish within the non-maintained ROW. The proposed pipeline corridor would cross an estimated 47 miles that lie within 223 riparian areas and bottomland forests (Table 3.5.5-3). Bottomland forests would require 20 to 50 years or more to reestablish late succession floodplain forests. The proposed pipeline corridor would cross an estimated 32 miles that lie within 614 upland forests potentially containing tree communities of conservation concern (Table 3.5.5-3). Based on modeled occurrence the proposed pipeline corridor would potentially cross predicted old-growth Cross Timbers forest remnants in 29 locations (41 acres) in Oklahoma and 4 locations (3 acres) in Texas (Table 3.5.5-3).

TABLE 3.5.5-3
Estimated Impacts on Vegetation Communities of Conservation Concern Occurring along the Proposed Project Route

Community Type	Length (miles)[a]	Number of Communities Crossed	Milepost[a]
Steele City Segment			
Montana			
Broadleaf mixed forests	4.3	36	84.3 – 261.1
High-quality native grasslands	164.4	35	0.0 – 280.9
Prairie dog towns	0.2	2	46.8 – 115.6
Riparian habitats	16.3	164	1.0 – 281.8
Sagebrush grasslands	21.9	51	40.4 – 280.0
South Dakota			
High-quality native grasslands	103.6	17	282.5 – 576.3
Prairie dog towns	2.1	13	285.9 – 584.3
Sagebrush grasslands	12.6	35	285.7 – 366.9
Nebraska			
Deciduous forests and woods	4.0	174	597.6 – 849.5
High-quality native grasslands	70.6	14	601.4 – 724.1
Prairie dog towns	0.1	1	600.3
Riparian woodlands	0.4	5	740.0 – 755.9

TABLE 3.5.5-3 Estimated Impacts on Vegetation Communities of Conservation Concern Occurring along the Proposed Project Route			
Community Type	**Length (miles)[a]**	**Number of Communities Crossed**	**Milepost[a]**
Gulf Coast Segment			
Oklahoma			
Bottomland forests	3.9	42	2.6 – 151.8
Oak forests and savannas	20.8	371	0.0 – 156.0
Predicted old-growth Cross Timbers forest	2.9	29	20.0 – 155.5
Texas			
Swamp chestnut oak-willow oak	4.0	3	453.5 – 458.5
Water oak-willow oak	12.2	7	257.5 – 371.3
Predicted old-growth Cross Timbers forest	0.2	4	163.5 – 164.7
Houston Lateral			
Texas			
Water oak-willow oak	10.3	2	18.0 – 29.0

[a] Approximate mileage and milepost ranges, categories may overlap. Summaries generated using a variety of data sources including GAP databases (USGS 2009), old-growth Cross Timbers model (Therrell and Stahle 1998), and Texas Natural Diversity Database (TPWD 2009).

Sources: Redmond et al. 1998, Smith et al. 2001, Henebry et al. 2005, Fisher and Gregory 2001, Brewer 2009, USGS 2009, TPWD 2009.

The following measures as identified in the proposed Project CMR Plan (Appendix B) would be implemented to minimize impacts to native grasslands:

- Seed disturbance areas in native range with a native seed mix after topsoil replacement; and
- Monitor the ROW to determine the success of revegetation after the first growing season, and for areas in which vegetation has not been successfully reestablished, reseed the area[2].

In addition, to minimize impacts to native grasslands in the Sand Hills region, the following measures as described in the CMR Plan (Appendix B) would be implemented:

- Educate construction personnel about the fragility of Sand Hills soils and the necessity to adhere to BMPs designed to minimize impacts;
- Incorporate minor route alterations to avoid particularly erosion-prone locations where practicable;
- Avoid highly saturated areas to the maximum extent possible;
- Strive to reduce width of disturbance to the native prairie landscape by adopting trench-line or blade-width stripping procedures where practicable;
- Conserve topsoil to a maximum of 12 inches in depth in all areas where excavation occurs;

[2] Any areas with unsuccessful revegetation would be monitored until adequate vegetation cover is achieved. In addition, the pipeline corridor would be monitored continually during operations to identify areas of erosion.

- Protect topsoil piles from erosion to the degree practicable; and
- Manage vehicle traffic in areas with high erosion potential or sensitive habitat.

Reclamation and revegetation measures applicable to the Sand Hills region were developed in consultation with regional experts in Sand Hills restoration and ecology (see Appendix H). These measures were then incorporated into the CMR Plan (Appendix B) for native grasslands in the Sand Hills region in accordance with applicable permits:

- Develop noxious-weed-free native seed mixes with input from the local NRCS offices and through collaboration with regional experts;
- Mulch and crimp into the soil noxious-weed-free straw or native prairie hay to prevent wind erosion;
- Imprint the land surface to create impressions in the soil to reduce erosion, improve moisture retention and create micro-sites for seed germination;
- Reduce soil disturbance by using sediment logs or straw wattles in place of slope breakers that are constructed of soil;
- Apply photodegradable matting anchored with biodegradable pins on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops;
- Work with landowners to prevent overgrazing of the newly established vegetation;
- Monitor reclamation, repair erosion, and reseed poorly revegetated areas as necessary for several years; and
- Develop a noxious-weed management plan specific to the Sand Hills region pending consultation with state and county experts.

In response to concerns expressed relative to wind erosion and re-vegetation in the Sand Hills topographic region, DOS coordinated exchange between experts in Sand Hills reclamation and vegetation communities who provided input to the Keystone plans included in Appendix H of the EIS and for restoration of Sand Hills grassland habitats used by the endangered American burying beetle in Section 3.8. Based on input received through these contacts, the following additional considerations relative to Sand Hills erosion are provided (Wedin, Pers. Comm. 2011):

- Use of erosion control mats or blankets may be advisable anywhere in the Sand Hills that is not in a wet meadow environment;
- A fire management plan should be developed and implemented during proposed Project construction;
- Revegetation seed beds should not be over-prepared but rather left more heterogeneous and irregular; and
- Landowners should be reminded that revegetated areas would be attractive as cattle forage and fencing of the revegetated ROW may be advisable, since animal trackways can serve as incipient blowout areas, and due to potentially warmer soils in the immediate vicinity of the proposed pipeline early forage may be concentrated along the ROW over time.

Native forests, especially forested floodplains, were once an integral component of the landscape throughout the Great Plains. Many of these communities have been lost due to land conversion to

agricultural uses, levee construction, and urban development although in some areas trees have invaded native prairie habitats due to reduced incidence of fire.

DOS received comments expressing concern over the potential that the proposed Project corridor would cross areas containing old growth Cross Timber forest remnants. At the request of DOS, Keystone evaluated predicted occurrence of old-growth Cross Timber forest remnants. While the Cross Timber old growth forest remnant model suggests that the proposed Project ROW could cross old growth forest remnants, potential impacts to this resource would be reduced through the following measures:

- The proposed Project ROW would parallel other pipeline ROWs for 26 of the 33 predicted old-growth forest remnants;
- The proposed Project ROW would be located in pastures with few trees at 2 of the 33 predicted old-growth forest remnants; and
- HDD river crossings would avoid 3 of the 33 predicted old-growth forest remnants.

Two potential old growth forest remnants occur along the proposed Project ROW in areas not previously disturbed by older pipeline construction. The routing of the proposed Project ROW in these two areas was selected to avoid a cultural resource site and an existing primitive road.

These measures for forested uplands and wetlands as identified in the CMR Plan (Appendix B) would be implemented:

- Salvage timber or allow landowner to salvage timber as requested by landowners;
- Grub tree stumps to a maximum of 5 feet on either side of the trench line and where necessary for grading a level surface for construction equipment using bulldozers equipped with brush rakes to preserve organic matter;
- Dispose of trees, brush, and stumps as per landowners' requirements as stated in the easement agreement;
- Fell trees toward the center line of the ROW to avoid damage to nearby trees and branches and recover trees and slash falling outside of the ROW;
- Prune any broken or damaged branches and branches hanging over the ROW as necessary;
- Burn, chip, or remove tree wastes incorporating chips into soil such that revegetation is not prevented;
- Establish decking sites, approximately 2,000 feet apart in timbered areas, on sites located on approved temporary workspaces in existing cleared areas, and size them appropriately to accommodate the loading equipment; and
- Remove unwanted timber from the construction ROW and transport it to a designated all-weather access point or mill.

In addition to the measures to protect terrestrial vegetation, the following potential mitigation measures have been suggested by regulatory agencies:

- In Montana, re-inspect the ROW after 5 years to identify areas of erosion or settling and to evaluate the reestablishment of vegetation cover (MDEQ);

- In Montana, test topsoils and subsoils for compaction at regular intervals on rangelands and pastures where requested by landowners, land management agencies or permitting agencies (MDEQ);
- In Montana, relieve compaction on rangelands by ripping or chiseling a minimum of three passes at least 12 inches deep where requested by landowners, land management agencies or permitting agencies (MDEQ);
- In Montana, reseed disturbed areas with seed sources from local populations of Native American traditional use plants in areas used to harvest these resources (MDEQ); and
- In Texas, avoid impacts to water oak – willow oak forest communities; survey route to determine extent and quality of water oak – willow oak community (tree species, tree heights, tree diameter at breast height, and percent canopy); avoid by re-route or by boring underneath; where unavoidable provide mitigation for permanent impacts that do not fall under the jurisdiction of the USACE through habitat restoration, purchase of mitigation bank credits (TPWD).

3.5.5.3 Conservation Reserve Program

There would be temporary and permanent impacts similar to those described in Sections 3.5.5.1 and 3.5.5.2 on about 51 miles of CRP land and less than 2 miles of WRP lands along the proposed pipeline corridor. Successful restoration of native vegetation and CRP fields (defined as 90 percent cover of desirable perennial plants, stable soils, and comparable vegetation community composition) would be expected within 4 to 8 years (see Appendix K).

3.5.5.4 Noxious Weeds

After removal of vegetation cover and disturbance to the soil, reestablishment of vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of many weeds. Construction equipment traveling from weed-infested areas into weed-free areas could disperse noxious weed seeds or propagules, resulting in the establishment of noxious weeds in previously weed-free areas. A total of 9.9 miles containing 99 individual noxious weed sources occur along the Steele City Segment of the proposed pipeline corridor. These noxious weed sources could lead to additional noxious weed distribution during construction (Table 3.5.5-4).

TABLE 3.5.5-4
Noxious Weed Sources Occurring along the Steele City Segment of the Proposed Project

State and Number of Counties	Weed Type	Length (mi)	Number of Weed Sources
Steele City Segment			
Montana (six counties)			
Three	Bindweeds	0.98	5
One	Common Burdock	0.01	1
Two	Field Sowthistle	0.04	2
One	Gypsyflower	0.88	3
One	Hawkweeds	<0.01	1
Two	Knapweeds	0.62	15
Two	Leafy Spurge	1.31	13

TABLE 3.5.5-4 Noxious Weed Sources Occurring along the Steele City Segment of the Proposed Project			
Two	Plumeless Thistles	0.13	3
One	Thistles – Canada and Bull (*Cirsium* spp.)	0.79	8
Montana total		***4.76***	**51**
South Dakota (ten counties)			
Two	Bindweeds	0.10	2
One	Common Burdock	0.03	1
Four	Thistles – Canada and Bull	1.25	11
South Dakota total		***1.38***	**14**
Nebraska (fourteen counties)			
One	Leafy Spurge	0.56	11
Three	Plumeless Thistles	3.09	21
One	Tamarisk – Saltcedar	0.05	1
One	Thistles – Canada and Bull	0.05	1
Nebraska total		***3.75***	**34**
Steele City Segment total		***9.89***	**99**

Specific noxious weed sources along the proposed pipeline corridor in Kansas, Oklahoma and Texas have not yet been identified through field surveys. A list of potential noxious weeds that occur in these states is shown in Table 3.5.4-1.

In a commitment to control the introduction and spread of noxious weeds, the construction and restoration procedures detailed in the CMR Plan (Appendix B) would be implemented. The plan would be coordinated with appropriate local, state, and federal agencies to prevent the spread of noxious weeds, and would include the following procedures:

- Clean all construction equipment, including timber mats, with high-pressure washing equipment prior to moving equipment to the job site;
- Mark all areas of the ROW which contain infestation of noxious weeds;
- Clean the tracks, tires, and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed infested areas, or use cleaning stations to remove vegetative materials with high pressure washing equipment;
- Strip and store topsoil contaminated with weed populations separately from clean topsoil and subsoil;
- Use mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control;
- Use pre-construction treatment such as mowing prior to seed development or herbicide application (in consultation with county or state regulatory agencies, and landowners) for areas of noxious weed infestations prior to clearing grading, trenching or other soil disturbing work to weed infestation locations identified on construction drawings;
- Limit the potential for spread of weeds by providing weed control by a state-licensed pesticide applicator at valve sites, metering stations and pump stations;

- Reimburse adjacent landowners when they must control weeds that are determined to have spread from the proposed Project's aboveground facilities; and
- Implement weed control measures as required by any applicable plan and in conjunction with the landowner.

3.5.5.5 Potential Additional Mitigation Measures

- Use erosion control mats or blankets in the Sand Hills of Nebraska anywhere that is not in a wet meadow to reduce erosion potential (Professor Wedin, UNL). The construction reclamation plan in the Sand Hills would be determined by a committee of experts from the USFWS Nebraska Game and Parks Commission and erosion experts including Professor Wedin. The committee would decide when the use of erosion control mats or blankets would be appropriate;

- Revegetation seed beds should not be over-prepared but rather left more heterogeneous and irregular (Professor Wedin, UNL). The construction reclamation plan in the Sand Hills would be determined by a committee of experts from the USFWS Nebraska Game and Parks Commission and erosion experts including Professor Wedin. The committee would decide the level of preparation of seed beds;
- Landowners should be informed that revegetated areas would be attractive as cattle forage and fencing of the revegetated ROW may be advisable, since animal trackways can serve as incipient blowout areas, and due to potentially warmer soils in the immediate vicinity of the proposed pipeline early forage may be concentrated along the ROW over time (Professor Wedin, UNL). Keystone has agreed to inform landowners; and

- A fire management plan should be developed and implemented during proposed Project construction (Professor Wedin, UNL). Keystone has agreed to follow the BLM fire management protocol in the Sand Hills that was developed for the proposed Project for federal lands in Montana and South Dakota.

3.5.6 Connected Actions

3.5.6.1 Power Distribution Lines and Substations

The primary impacts on vegetation from construction of power distribution lines to pump stations would be cutting, clearing, or removing the existing woody vegetation within the construction work area and potential invasion by noxious weeds. In general, distribution line construction impacts to vegetation would be minor, as many distribution lines would run alongside existing roadways. Where necessary, trees generally would be removed from the distribution line ROW, and the ROW would be maintained free of vegetation that poses an outage risk to the lines or interferes with access for maintenance. Total miles and area by vegetation community affected by construction and operation of the 430 miles of new distribution lines for the proposed Project is presented in Table 3.5.6-1 and Table 3.5.6-2. After construction, power providers would reclaim affected lands in accordance with state and local standards and associated permits.

TABLE 3.5.6-1
Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Steele City Segment			
Montana			
Cropland	25.0	82	61
Grassland/rangeland	105.5	345	255
Upland forest	0.3	1	4
Riverine/open water	1.7	6	4
Forested wetlands	<0.1	1	1
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.6	2	1
Developed land	2.7	9	7
Montana subtotal	*135.8*	*446*	*333*
South Dakota			
Cropland	42.0	137	102
Grassland/rangeland	96.3	315	233
Upland forest	0.3	1	4
Riverine/open water	2.9	9	7
Forested wetlands	0.1	0	1
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	1.3	4	3
Developed land	16.5	54	40
South Dakota subtotal	*159.4*	*520*	*390*
Nebraska			
Cropland	32.5	106	79
Grassland/rangeland	27.7	91	67
Upland forest	1.7	6	21
Riverine/open water	1.1	4	3
Forested wetlands	0.5	2	6
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.3	1	1
Developed land	4.4	14	11
Nebraska subtotal	*68.2*	*224*	*188*
Cushing Extension Pump Stations			
Kansas			
Cropland	5.8	19	14
Grassland/rangeland	6.6	22	16

TABLE 3.5.6-1
Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Upland forest	0.5	2	7
Riverine/open water	0.2	1	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.4	1	1
Kansas subtotal	*13.5*	*45*	*38*
Gulf Coast Segment and Houston Lateral			
Oklahoma			
Cropland	0.5	1	1
Grassland/rangeland	8.0	26	19
Upland forest	2.7	9	33
Riverine/open water	0.1	0	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	<0.1	0	0
Developed land	1.4	5	3
Oklahoma subtotal	*12.7*	*41*	*56*
Texas			
Cropland	8.1	27	20
Grassland/rangeland	3.4	11	8
Upland forest	4.6	15	55
Riverine/open water	0.2	1	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.2	1	0
Emergent wetlands	0.0	0	0
Developed land	1.4	5	3
Texas subtotal	*17.9*	*60*	*86*

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80- or 150-foot-wide right-of-way, around pole structures, and crossed by operational access roads. Some power lines have not been surveyed and data presented is from aerial photointerpretation.

TABLE 3.5.6-2
Summary of Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Steele City Segment			
Cropland	99.5	325	241
Grassland/rangeland	229.5	750	556
Upland forest	2.3	8	28
Riverine/open water	5.7	19	14
Forested wetlands	0.6	3	8
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	2.2	7	5
Developed land	23.6	77	57
Steele City Segment subtotal	*363.4*	*1189*	*909*
Cushing Extension Pump Stations			
Cropland	5.8	19	14
Grassland/rangeland	6.6	22	16
Upland forest	0.5	2	7
Riverine/open water	0.2	1	0
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.0	0	0
Emergent wetlands	0.0	0	0
Developed land	0.4	1	1
Pump Station subtotal	*13.5*	*45*	*38*
Gulf Coast Segment			
Cropland	8.6	28	21
Grassland/rangeland	11.4	37	27
Upland forest	7.3	24	88
Riverine/open water	0.3	1	1
Forested wetlands	0.0	0	0
Shrub-scrub wetlands	0.2	1	0
Emergent wetlands	<0.1	0	0
Developed land	2.8	10	6
Gulf Coast Segment subtotal	*30.7*	*101*	*142*
Proposed Project			
Cropland	113.9	372	276
Grassland/rangeland	247.5	809	599
Upland forest	10.1	34	123
Riverine/open water	6.2	21	14

TABLE 3.5.6-2
Summary of Impacts on Vegetation Communities Crossed by Proposed Electric Distribution Lines for the Proposed Project

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres)[a]	Community Area Affected by Operations (acres)[a]
Forested wetlands	0.6	3	8
Shrub-scrub wetlands	0.2	1	0
Emergent wetlands	2.2	7	5
Developed land	26.8	88	64
Proposed Project Total	**407.5**	**1,335**	**1,089**

[a] Temporary disturbance areas include structure pads, access roads, pulling and tension area, turn around areas, and staging areas. Permanent disturbance areas include forested areas within 80- or 150-foot-wide right-of-way, around pole structures, and crossed by operational access roads. Some power lines have not been surveyed and data presented is from aerial photointerpretation.

3.5.6.2 Big Bend to Witten 230-kV Transmission Line

Upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota would include construction of a new 230-kV transmission line and a new substation.

As described in Section 2.5.2 of the EIS, Western and BEPC have identified two Alternative Corridors (Alternative Corridors A and B) for the proposed Big Bend to Witten 230-kV transmission line project, and there are several route options within each corridor.

Lengths of vegetation communities crossed by the route options within the two alternative corridors are based on National Land Cover Data presented in Tables 3.5.6-3 and 3.5.6-4. For corridor A, these vegetation communities range from 67.2 to 72.0 miles of primarily agricultural and range lands and for corridor B, these range from 73.9 to 75.2 miles of primarily agricultural and range lands. Construction and operation impacts on vegetation cover would be the same as for the distribution lines discussed above, however, it is likely that the poles would be larger and that the area disturbed around the installation site would likely be larger.

TABLE 3.5.6-3
Summary of Impacts on Vegetation Communities Crossed by Proposed Big Bend to Witten 230-kV Transmission Line Corridor A Route Options for the Project

Vegetation Community Classification	Western (miles)	BEPC-A (miles)	BEPC-B (miles)	BEPC-C (miles)	BEPC-D (miles)
Cropland	33.1	25.7	26.7	28.2	26.3
Grassland/rangeland	30.3	41.3	40.9	38.0	40.1
Upland forest	0.1	0.1	0.1	0.1	0.1
Riverine/open water	0.3	0.3	0.3	0.3	0.2
Forested wetlands	0.5	0.4	0.2	0.3	0.2
Shrub-scrub wetlands	0.0	0.0	0.0	0.0	0.0
Emergent wetlands	0.3	0.1	0.1	0.2	0.1
Developed land	2.6	1.8	1.8	4.6	5.0
Total	*67.2*	*69.7*	*70.1*	*71.7*	*72.0*

Source: *Homer et al. 2004.*

TABLE 3.5.6-4
Summary of Impacts on Vegetation Communities Crossed by Proposed Big Bend to Witten 230-kV Transmission Line Corridor B Route Options for the Project

Vegetation Community Classification	BEPC-E (miles)	BEPC-F (miles)	BEPC-G (miles)	BEPC-H (miles)
Cropland	22.9	23.0	28.6	24.7
Grassland/rangeland	45.7	47.0	40.4	42.5
Upland forest	0.2	0.1	0.1	0.2
Riverine/open water	0.4	0.2	0.2	0.2
Forested wetlands	0.2	0.1	0.5	0.4
Shrub-scrub wetlands	0.0	0.0	0.0	0.0
Emergent wetlands	0.1	0.2	0.3	0.1
Developed land	4.4	4.0	4.4	7.1
Total	*73.9*	*74.6*	*74.5*	*75.2*

Source: Homer et al. 2004.

3.5.6.3 Bakken Marketlink and Cushing Marketlink Projects

Construction and operation of the Bakken Marketlink Project would include metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. Keystone reported that the property proposed for the Bakken Marketlink facilities near Pump Station 14 is currently used as pastureland and hayfields and that a survey of the property indicated that there were no waterbodies or wetlands on the property. DOS reviewed aerial photographs of the area and confirmed the current use of the land and that there are no waterbodies associated with the site. A site inspection by the DOS third-party contractor confirmed these findings. As a result, the potential impacts associated with expansion of the pump station site to include the Bakken Marketlink facilities would likely be similar to those described above for the proposed Project pump station and pipeline ROW in that area.

The Cushing Marketlink project would be located within the boundaries of the proposed Cushing tank farm of the Keystone XL Project would include metering systems and two storage tanks. As a result, the impacts of construction and operation of the Cushing Marketlink Project on terrestrial vegetation would be the same as potential impacts associated with construction and operation of the proposed Cushing tank farm described in this section.

Currently there is insufficient information to complete an environmental review of these projects. The permit applications for these projects would be reviewed and acted on by other agencies. Those agencies would conduct more detailed environmental review of the Marketlink projects. Potential impacts to terrestrial vegetation would be evaluated during the environmental reviews for these projects and potential vegetation impacts would be evaluated and minimized or mitigated to the extent practicable in accordance with direction from federal and state land management agencies.

3.5.7 References

Bender, S., S. Shelton, K. Conrad Bender, A. Kalmbach. 2005. Texas Comprehensive Wildlife Conservation Strategy 2005-2010. Texas Parks and Wildlife, Austin, Texas.

Brewer, C. 2009. TransCanada Keystone XL Pipeline: West Canadian Sedimentary Basin to the Texas Gulf Coast. Correspondence from Clay Brewer, Interim Director, Wildlife Division, Texas Parks and Wildlife, Austin Texas to U.S Department of State, Washington, D.C.

Bryce, S. A., Omernik, J. M., Pater, D. A., Ulmer, M., Schaar, J., Freeouf, J., Johnson, R., Kuck, P., and Azevedo, S.H., 1996, Ecoregions of North Dakota and South Dakota, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

Chapman, S. S., J. M Omernik, J. A. Freeouf, D. G. Huggins, J. R. McCauley, C. C. Freeman, G. Steinauer, R. T. Angelo, and R. L. Schlepp. 2001. Ecoregions of Nebraska and Kansas (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,950,000).

EPA. See U.S. Environmental Protection Agency.

Fisher, W. L., and M. S. Gregory. 2001. Oklahoma Gap Analysis Project: a Geographic Approach to Planning for Biological Diversity. June 2001 Final Report. U.S. Geological Survey, Biological Resources Division, Oklahoma Cooperative Fish and Wildlife Research Unit, and Oklahoma State University, Stillwater Oklahoma.

Gilmore, M. 1977. Uses of plants by the Indians of the Missouri River region. University of Nebraska Press. Lincoln and London.

Griffith, G. E., S. A. Bryce, J. M. Omernik, J. A. Comstock, A. C. Rogers, B. Harrison, S. L. Hatch and D. Bezanson. 2004. Ecoregions of Texas (color poster with map, descriptive text, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:2,500,000).

Hart, J. and J. Moore. 1976. Montana - Native plants and early people. The Montana Historical Society and Montana Bicentennial Administration.

Henebry, G. M., B. C. Putz, M. R. Vaitkus, and J. W. Merchant. 2005. The Nebraska Gap Analysis Project Final Report. School of Natural Resources, University of Nebraska-Lincoln.

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan. 2004. Development of a 2001 National Landcover Database for the United States. Photogrammetric Engineering and Remote Sensing, Vol. 70, No. 7, July 2004, pp. 829-840.

Johnston, A. 1987. Plants and the Blackfoot. Occasional Paper No. 15. Lethbridge Historical Society. Lethbridge, Alberta.

Kansas Department of Agriculture (KDA). 2007. The Kansas Noxious Weed Law and Regulations. April, 2007. Website: http://www.ksda.gov/plant_protection. Accessed June 30, 2009.

_____. 2009. Invasive Weed Watch List Poster. Website: http://www.ksda.gov/plant_protection. Accessed June 30, 2009.

KDA. See Kansas Department of Agriculture.

LaGrange, T. 2005. Guide to Nebraska's Wetlands and Their Conservation needs. Second Edition, 2005. Nebraska Game and parks Commission, Ducks Unlimited and U.S. Environmental Protection Agency. Website: http://www.nebraskawetlands.com. Accessed July 27, 2009.

Lauzon, R. D., S. D. Grindal, and G. E. Hornbeck. 2002. Ground squirrel re-colonization of a pipeline ROW in southern Alberta. Pages 439-445 in J.W. Goodrich-Mahoney, D.F. Mutrie, and C.A. Guild (eds.). Environmental Concerns in Rights-of-Way Management: Seventh International Symposium, Elsevier Science Ltd.,

MDA. See Montana Department of Agriculture.

MFWP. See Montana Fish, Wildlife and Parks.

Montana Department of Agriculture (MDA). 2008. Noxious Weed List: Effective March 27, 2008. Website: http://agr.mt.gov/weedpest/noxiousweeds.asp. Accessed June 30, 2009.

_____. 2009. County-Listed Noxious Weeds: June 2009. Website: http://agr.mt.gov/weedpest/noxiousweeds.asp. Accessed June 30, 2009.

Montana Fish, Wildlife and Parks. 2005. Montana's Comprehensive Fish and Wildlife Conservation Strategy. Montana fish Wildlife and Parks, 1420 East sixth Avenue, Helena, MT.658 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe. Arlington, VA. Website: http://www.natureserve.org/explorer. Accessed July 27, 2009.

NDA. See Nebraska Department of Agriculture.

Nebraska Department of Agriculture (NDA). 2009. Plant Industry: Noxious Weed Program. Website: http://www.agr.state.ne.us/division/bpi/nwp/nwp1.htm. Accessed June 30, 2009.

OBS. See Oklahoma Biological Survey.

Oklahoma Biological Survey. 2004. Oklahoma's Least Wanted. Flora of Oklahoma. Oklahoma Biological Survey. Website: http://www.biosurvey.ou.edu/floraok/leastwanted.html. Accessed July 6, 2009.

ODA. See Oklahoma State Department of Agriculture.

ODWC. See Oklahoma Department of Wildlife Conservation.

Oklahoma Department of Wildlife Conservation (ODWC). 2002. Oklahoma Administrative code 800:20-3 Department of Wildlife Conservation. Subchapter 3. Noxious Aquatic Plants. Website: http://www.wildlifedepartment.com/aquaticplants.htm. Accessed July 2, 2009.

_____. 2005. Oklahoma Comprehensive Wildlife Conservation Strategy: Planning for the Future of Oklahoma's Wildlife. Oklahoma Department of Wildlife Conservation, Oklahoma.

Oklahoma State Department of Agriculture (ODA). 2000. Oklahoma Noxious Weed Law and Rules. Website: http://www.ok.gov/~okag/forms/law/noxweedlaw.htm. Accessed June 30, 2009.

Redmond, R.L., M.M. Hart, J.C. Winne, W.A. Williams, P.C. Thornton, Z. Ma, C.M. Tobalske, M.M. Thornton, D.P. McLaughlin, T.P. Tady, F.B. Fisher, S.W. Running. 1998. The Montana Gap Analysis Project: final report. Unpublished report. Montana Cooperative Wildlife Research Unit, The University of Montana, Missoula. xiii + 136 pp. + appendices.

Samson, F. B., F. L. Knopf, and W. R. Ostlie. 1998. Grasslands. Pages 437-472 in M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran (eds.). Status and Trends of the Nation's Biological Resources, Vol. 2. Jamestown, ND: Northern Prairie Wildlife Research Center Online. (Version 21JAN2000). Website: http://www.npwrc.usgs.gov/resource/habitat/grlands/index.htm. Accessed July 27, 2009.

Schneider, R., M. Humpert, K. Stoner, G. Steinauer. 2005. The Nebraska Natural legacy Project: A Comprehensive Wildlife Conservation Strategy. August 2005. The Nebraska Game and Parks commission, Lincoln Nebraska.

SDA. See South Dakota Department of Agriculture.

Smith, V. J., C. J. Kopplin, D. M. Fecske, and J. A. Jenks. 2001. South Dakota Gap Analysis Project Land Cover Classification and Analysis. Department of Wildlife and Fisheries Sciences, South Dakota State University, Brookings, South Dakota.

South Dakota Department of Agriculture (SDA). 2009. South Dakota Noxious Weed List. Website: http://www.state.sd.us/doa/das/hp-w&p.htm. Accessed June 30, 2009.

SDGFP. See South Dakota Department of Game, Fish, and Parks.

South Dakota Department of Game, Fish, and Parks (SDGFP). 2006. South Dakota Comprehensive Wildlife Conservation Plan. South Dakota Department of Game, Fish and Parks, Pierre, Wildlife Division Report 2006-08. 261 pp.

TDA. See Texas Department of Agriculture.

Texas Department of Agriculture (TDA). 2008. Texas Department of Agriculture – Noxious Weed List. Website: http://www.texasinvasives.org/invasives_database/tda_results.php. Accessed July 2, 2009.

Texas Parks and Wildlife Department (TPWD). 2009. Texas Natural Diversity Database. Austin, Texas.

Therrell, M. D., and D. W. Stahle. 1998. A predictive model to locate ancient forests in the Cross Timbers of Osage County, Oklahoma. Journal of Biogeography 25:847-854.

TPWD. See Texas Parks and Wildlife Department.

TransCanada Keystone Pipeline, LP. See Keystone.

U.S. Environmental Protection Agency (EPA). 2002. Primary Distinguishing Characteristics of Level III Ecoregions of the Continental United States. Draft. Website: ftp://ftp.epa.gov/wed/ecoregions/us/useco_desc.doc. Accessed February 16, 2007.

_____. 2007. Level III Ecoregions of the Continental United States. Revised March 2007. National Health and Environmental Effects Research Laboratory. Website: http://www.epa.gov/wed/pages/ecoregions/level_iii.htm. Accessed June 17, 2009.

U.S. Fish and Wildlife Service (USFWS). 1997. A System for Mapping Riparian Areas in the Western United States. U.S. Fish and Wildlife Service, National Wetlands Inventory, Denver. 15 pp.

_____. 2008. Greater Sage-Grouse Interim Status Update. October 31, 2008. U.S. Fish and Wildlife Service, Mountain-Prairie Region, Wyoming Ecological Services Office in collaboration with the Montana and Utah Ecological Services Office in the Mountain-Prairie Region; the Upper Columbia, Snake River, and Oregon Fish and Wildlife Offices in the Pacific Region, and the Nevada Fish and Wildlife Office in the California and Nevada Region. Website: http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/. Accessed June 29, 2009.

USDA NRCS. See U.S. Department of Agriculture, Natural Resources Conservation Service.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA, NRCS). 2009. The PLANTS Database. U.S. Department of Agriculture. National Plant Data Center. Baton Rouge, LA. Website: http://plants.usda.gov. Accessed between May and July 2009.

USGS. See U.S. Geological Survey.

U.S. Geological Survey (USGS). 1998. Global Land Cover Characteristics Map of Seasonal Land Cover Regions for North America, Version 1.2L. National Center for Earth Resources Observation and Science, Sioux Falls, SD.

_____. 2009. GAP Regional Data. U.S. Geological Survey, National Biological Information Infrastructure. Website: http://gapanalysis.nbii.gov/portal/community/GAP_Analysis_Program/Communities/GAP_Home. Accessed July 30, 2009.

Wasson, T., L. Yasui, K. Brunson, S. Amend and V. Ebert. 2005. A Future for Kansas Wildlife, Kansas' comprehensive Wildlife Conservation Strategy. Prepared by Dynamic Solutions, Inc. in cooperation with Kansas Department of Wildlife and Parks. 170 pp.

Western Area Power Administration (Western). 2009. Lower Brule to Witten Project Description. August 2009 submittal from Dirk Shulund, Western Area Power Administration, Billings, Montana.

Woods, A. J., J. M. Omernik, J. A. Nesser, J. Shelden, J. A. Comstock and S. H. Azevedo. 2002. Ecoregions of Montana, 2nd edition (color poster with map, descriptive text, summary tables, and photographs). Map scale 1:1,500,000.

Woods, A.J., J. M. Omernik, D. R. Butler, J. G. Ford, J. E. Henley, B. W. Hoagland, D. S. Arndt, and B. C. Moran. 2005. Ecoregions of Oklahoma (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,250,000).

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