

3.4 WETLANDS

3.4.1 Environmental Setting

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (Cowardin et al. 1979). Many wetlands in eastern North Dakota and South Dakota are isolated depressional wetlands of the Prairie Potholes region. This formerly glaciated landscape is pockmarked with an immense number of potholes that fill with melted snow and rain in spring. The hydrology of prairie pothole marshes varies from temporary to permanent; concentric circle patterns of submerged and floating aquatic plants generally form in the middle of the pothole, with bulrushes and cattails growing closer to shore, and wet sedge marshes next to the upland areas.

Wetlands throughout Nebraska, Kansas, Oklahoma, Missouri, and Illinois include isolated depressional wetlands associated with the Rainwater Basin wetlands, glaciated kettle-hole wetlands, and sinkhole wetlands, as well as isolated floodplain wetlands such as oxbows (naturally caused by changes in river channel configuration or artificially caused by levee construction or other diversions). States also contain wetlands with direct connections to minor and major drainages of the Red River basin in North Dakota and the Mississippi River basin in all seven states.

Wetland functions provided by both isolated and connected wetlands include surface water storage (flood control), shoreline stabilization (wave damage protection/shoreline erosion control), stream flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge (some types replenish water supplies), sediment removal and nutrient cycling (water quality protection), supporting aquatic productivity (fishing, shell fishing, and waterfowl hunting), production of trees (timber harvest), production of herbaceous growth (livestock grazing and haying), production of peaty soils (peat harvest), and provision of plant and wildlife habitat (hunting, trapping, plant/wildlife/nature photography, nature observation, and aesthetics) (USFWS 2007).

Wetland types in the Keystone Project area (Table 3.4.1-1) were identified based on photo interpretation of 1:6,000-scale aerial photography dated 2006. Some wetlands have been verified by ground surveys, in accordance with direction provided by COE staff in the Omaha, Kansas City, St. Louis, and Tulsa districts, during 2005 to 2007 for the Keystone Mainline Project and Cushing Extension routes and for contractor yards, pipe storage yards, and access roads. Small linear features such as windbreaks were included with the surrounding land use when less than 50 feet wide; and perennial, intermittent, and ephemeral streams were identified at a resolution of about 10 feet wide. Descriptions of plant communities typical of emergent, forested, and scrub-shrub wetland types within the pipeline ROW are presented in Section 3.5 (Table 3.5.1-1).

As part of federal regulatory requirements under the Clean Water Act (CWA), inventories of wetlands and other waters of the United States involving field surveys are required to evaluate the potential for adverse effects to waters of the United States along the proposed pipeline ROW and other associated areas of disturbance related to Project construction. Information gathered during the inventories will be used to complete notification and permitting requirements under Sections 401 and 404 of the CWA, as managed by COE and applicable state agencies.

**TABLE 3.4.1-1
Description of Wetlands Communities in the Keystone Project Area**

Wetland Type	National Wetland Inventory Code	Description
Palustrine emergent wetland	PEM	Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years. Emergent wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough. (See Table 3.5.1-1 for habitat types within this group for the Keystone Project area.)
Palustrine forested wetland	PFO	Forested wetlands are characterized by woody vegetation that is 6 meters tall or taller. All water regimes are included except subtidal. Forested wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. Forested wetlands normally possess an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer.
Palustrine scrub-shrub wetland	PSS	Scrub-shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. Vegetation forms found in this wetland include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes are included except subtidal. Scrub-shrub wetlands may represent a successional stage leading to a forested wetland or they may be relatively stable communities.
Riverine-perennial water	R2	The lower perennial subsystem includes low-gradient rivers and streams (riverine system) where some water flows throughout the year and water velocity is slow. The upper perennial subsystem includes high-gradient rivers and streams where some water flows throughout the year, water velocity is high, and there is little floodplain development. Perennial streams have flowing water year-round during a typical year, the water table is located above the stream bed for most of the year, groundwater is the primary source of water, and runoff is a supplemental source of water.
Riverine-intermittent water	R4	The intermittent subsystem includes channels where the water flows for only part of the year, when groundwater provides water for stream flow. When water is not flowing, it may remain in isolated pools or surface water may be absent. Runoff is a supplemental source of water.
Open water	OW	Open water habitats are rivers, streams, lakes, and ponds (riverine, lacustrine, and palustrine systems) where, during a year with normal precipitation, standing or flowing water occurs for a sufficient duration to establish an ordinary high-water mark. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered as open waters.

Sources: Cowardin et al. 1979, COE 2002.

The Keystone Project crosses four COE districts:

- Mainline Project: Omaha District (North Dakota, South Dakota, and Nebraska), Kansas City District (Kansas and Missouri), St. Louis District (eastern Missouri and Illinois), and Tulsa District (Oklahoma).
- Cushing Extension: Omaha District (Nebraska), Kansas City District (Kansas), and Tulsa District (Oklahoma).

Each of these districts has slightly different surveying and permitting requirements. Keystone will continue consultations with the COE district offices and state resource agencies to develop the specific wetland and waters of the United States information required for permit applications.

3.4.2 Wetlands of Special Concern or Value

Depressional wetlands of the Prairie Potholes region in North Dakota and South Dakota support large numbers of migrating and nesting waterfowl, as do depressional wetlands associated with the Rainwater Basin in Nebraska (EPA 2007). USFWS has negotiated wetland easements with private landowners throughout North Dakota and South Dakota to protect depressional wetlands of the Prairie Potholes region. Wetlands are protected by the USFWS easement under 16 USC 668dd(c). USFWS will oppose any pipeline project activity that results in easement wetlands being filled or drained as an easement violation under 16 USC 668dd(c). The USFWS' procedure with any cooperating entity such as Keystone is to restore the ponding capability of the wetland(s). If fill material remains in any easement wetland(s) after the pipeline is installed, USFWS will work with Project personnel to remove the fill material from the basin. If a wetland(s) no longer ponds water after the pipeline is installed, USFWS will work with Project personnel to improve soil compaction and water retention capability in that wetland(s). If measures taken to restore the ponding capability of a wetland(s) are unsuccessful, USFWS will require Keystone to locate a similar wetland and execute an exchange for a replacement wetland(s) according to USFWS guidance. Karst or sinkhole wetlands and forested floodplains associated with the Missouri, Mississippi, and Arkansas Rivers also are wetland habitats of conservation concern due primarily to their rarity (sinkhole wetland) and previous destruction (floodplain forest) (EPA 2007). No fen wetlands have been identified within the Keystone Project ROW.

The COE Riverlands Management Area at the Mississippi River and Missouri River confluence in St. Charles County, Missouri, contains a 2,500-acre prairie marsh restoration site that has been designated as an Important Bird Area by the Audubon Society. This restoration area is designed as a flow-through wetland, with controlled water levels, and supports an abundant array of waterfowl, shorebirds, and raptors. The Missouri Confluence State Park is also located within this region where the Missouri River joins the Mississippi River; wetlands restoration projects, including tree plantings to restore floodplain forests, also have been established within this park. The Missouri Department of Natural Resources considers this region to be a Conservation Opportunity Area (COA) and has designated the region at the confluence in St. Charles and Lincoln Counties in Missouri as the Mississippi/Missouri Confluence COA. The COE will require additional specific mitigation and management practices should construction be unavoidable through the Mississippi/Missouri Confluence COA or Carlyle Lake WMA. For any habitat losses within these areas COE will require additional compensatory mitigation. After discussions with the COE Riverlands Office and local landowners, Keystone has routed the pipeline west of the Confluence Point State Park to a location that avoids COE property adjacent to the County Highway. Keystone has routed the pipeline through the Confluence Point State Park in such a way as to avoid an area of recently planted hardwood trees and an area where decurrent false aster are located.

3.4.3 Potential Impacts and Mitigation

Wetland and riverine communities that would be affected by the proposed Keystone Project, including valve, meter, ancillary facilities, contractor yards, pipe storage yards, and access roads, are summarized in Tables 3.4.3-1, 3.4.3-2, and 3.4.3-3. The delineation of jurisdictional and non-jurisdictional wetlands will occur prior to the issuance of required permits. Wetland impacts that affect non-jurisdictional wetlands under the CWA Section 404 would not require mitigation. A table of all water body crossings is located in Appendix J. The table includes the location of crossing by state and approximate milepost, and the water body use and state classification where applicable.

Emergent wetlands are the most common type of wetland community that would be crossed by the pipeline routes, followed by forested wetlands, intermittent and perennial streams, open water, and scrub-shrub wetlands (Table 3.4.3-3). Most (70 percent, 284 of 403 acres) of the emergent wetland habitats are located in the Prairie Pothole region of North Dakota and South Dakota. Most of the forested wetlands (72 percent, 58 of 80 acres) are riparian woodlands of the Missouri and Arkansas drainages in Chariton, St. Charles, and Lincoln counties in Missouri and Clay, Dickinson, and Butler counties in Kansas. Other wetland communities that would be disturbed by the Keystone Project include perennial riverine wetlands (37 acres), intermittent riverine wetlands (107 acres), and scrub-shrub wetlands (32 acres).

Table 3.4.3-4 summarizes wetlands that would be crossed by the Mainline Project and Cushing Extension that are considered important for conservation—as indicated by inclusion within state forestlands, state park lands, conservation areas and reserves, wetland easements, and wildlife areas. A total of 95.4 miles of conservation lands with 8.8 miles of wetlands would be crossed by the pipelines. Conservation wetlands include perennial and intermittent riverine wetlands, emergent wetlands, forested wetlands, and scrub-shrub wetlands.

Construction of the pipeline primarily would affect wetlands and their functions during and immediately following construction activities, but permanent changes also are possible. Wetlands function as natural sponges that trap and slowly release surface water, rain, snow melt, groundwater, and flood waters. Trees, root mats, and other wetland vegetation slow flood waters and distribute them over the floodplain. Wetlands at the margins of lakes, rivers, and streams protect shorelines and stream banks against erosion. Wetland plants hold the soil in place with their roots, absorb the energy of waves, and break up the flow of stream or river currents. This combined water storage and braking can lower flood heights and reduce erosion. The water-holding capacity of wetlands reduces flooding and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can help or supplant flood control otherwise provided by expensive dredge operations and levees (EPA 1995, in USFWS 2007).

**TABLE 3.4.3-1
Wetlands Estimated Impact Summary for the Keystone Mainline Project**

Wetland Classification^a	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres)^a	Wetland Area Affected by Operations (acres)^a	Number of Crossings
North Dakota				
Palustrine emergent wetland	13.7	187	73	318
Palustrine forested wetland	0.3	4	2	9
Palustrine scrub-shrub wetland	0.0	0	0	0
Riverine-perennial water	0.1	2	1	7
Riverine-intermittent water	0.5	9	4	157
Open water	0.1	1	<1	3
<i>North Dakota subtotal</i>	<i>14.7</i>	<i>203</i>	<i>80</i>	<i>494</i>
South Dakota				
Palustrine emergent wetland	6.9	97	39	184
Palustrine forested wetland	0.0	0	0	2
Palustrine scrub-shrub wetland	0.1	1	<1	2
Riverine-perennial water	0.1	1	<1	8
Riverine-intermittent water	0.3	5	2	82
Open water	0	0	0	2
<i>South Dakota subtotal</i>	<i>7.4</i>	<i>104</i>	<i>41</i>	<i>280</i>
Nebraska				
Palustrine emergent wetland	1.5	19	8	56
Palustrine forested wetland	0.2	3	1	8
Palustrine scrub-shrub wetland	0.1	3	1	5
Riverine-perennial water	0.2	3	1	21
Riverine-intermittent water	1.0	13	5	178
Open water	0.1	1	1	5
<i>Nebraska subtotal</i>	<i>3.1</i>	<i>43</i>	<i>17</i>	<i>273</i>
Kansas				
Palustrine emergent wetland	0.4	10	3	27
Palustrine forested wetland	0.3	8	3	9
Palustrine scrub-shrub wetland	0.0	0	0	2
Riverine-perennial water	0.2	3	1	32
Riverine-intermittent water	0.7	10	3	157
Open water	0.2	3	1	10
<i>Kansas subtotal</i>	<i>1.8</i>	<i>34</i>	<i>11</i>	<i>237</i>

**TABLE 3.4.3-1
(Continued)**

Wetland Classification^a	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres)^a	Wetland Area Affected by Operations (acres)^a	Number of Crossings
Missouri				
Palustrine emergent wetland	1.9	29	10	113
Palustrine forested wetland	2.6	40	14	41
Palustrine scrub-shrub wetland	0.5	7	3	11
Riverine-perennial water	0.9	13	5	80
Riverine-intermittent water	2.0	30	18	449
Open water	0.4	6	2	47
<i>Missouri subtotal</i>	<i>8.3</i>	<i>125</i>	<i>45</i>	<i>741</i>
Illinois				
Palustrine emergent wetland	1.3	28	11	19
Palustrine forested wetland	0.7	15	6	16
Palustrine scrub-shrub wetland	1.4	30	12	10
Riverine-perennial water	0.2	3	1	24
Riverine-intermittent water	0.8	10	4	37
Open water	0.1	1	<1	12
<i>Illinois subtotal</i>	<i>4.5</i>	<i>87</i>	<i>34</i>	<i>118</i>
Mainline Project				
Palustrine emergent wetland	25.7	380	148	717
Palustrine forested wetland	4.1	70	26	85
Palustrine scrub-shrub wetland	2.1	31	12	30
Riverine-perennial water	1.7	25	9	172
Riverine-intermittent water	5.3	78	29	1,060
Open water	0.9	12	4	79
Mainline Project total	39.8	596	228	2,143

^a Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

**TABLE 3.4.3-2
Wetlands Estimated Impact Summary for the Keystone Cushing Extension**

Wetland Classification	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres)^a	Wetland Area Affected by Operations (acres)^a	Number of Crossings
Nebraska				
Palustrine emergent wetland	0.0	0	0	0
Palustrine forested wetland	0.0	0	0	0
Palustrine scrub-shrub wetland	0.0	0	0	0
Riverine-perennial water	0.0	0	0	3
Riverine-intermittent water	0.0	0	0	3
Open water	0.0	0	0	1
<i>Nebraska subtotal</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>7</i>
Kansas				
Palustrine emergent wetland	1.1	14	5	47
Palustrine forested wetland	0.8	10	4	11
Palustrine scrub-shrub wetland	0.0	0	0	2
Riverine-perennial water	0.3	9	4	43
Riverine-intermittent water	0.7	21	8	106
Open water	0.1	3	1	14
<i>Kansas subtotal</i>	<i>3.0</i>	<i>57</i>	<i>22</i>	<i>223</i>
Oklahoma				
Palustrine emergent wetland	0.7	9	4	36
Palustrine forested wetland	0	0	0	3
Palustrine scrub-shrub wetland	0.1	1	<1	1
Riverine-perennial water	0.2	3	1	33
Riverine-intermittent water	0.5	8	3	32
Open water	0.1	1	<1	8
<i>Oklahoma subtotal</i>	<i>1.6</i>	<i>22</i>	<i>8</i>	<i>113</i>
Cushing Extension				
Palustrine emergent wetland	1.8	23	9	83
Palustrine forested wetland	0.8	10	4	14
Palustrine scrub-shrub wetland	0.1	1	<1	3
Riverine-perennial water	0.5	12	5	79
Riverine-intermittent water	1.2	29	11	141
Open water	0.2	4	1	23
Cushing Extension total	4.6	79	30	343

^a Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

**TABLE 3.4.3-3
Wetlands Estimated Impact Summary for the Keystone Project**

Wetland Classification	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres)^a	Wetland Area Affected by Operations (acres)^a	Number of Crossings
Mainline Project				
Palustrine emergent wetland	25.7	380	148	717
Palustrine forested wetland	4.1	70	26	85
Palustrine scrub-shrub wetland	2.1	31	12	30
Riverine-perennial water	1.7	25	9	172
Riverine-intermittent water	5.3	78	29	1,060
Open water	0.9	12	4	79
<i>Mainline Project subtotal</i>	<i>39.8</i>	<i>596</i>	<i>228</i>	<i>2,143</i>
Cushing Extension				
Palustrine emergent wetland	1.8	23	9	83
Palustrine forested wetland	0.8	10	4	14
Palustrine scrub-shrub wetland	0.1	1	<1	3
Riverine-perennial water	0.5	12	5	79
Riverine-intermittent water	1.2	29	11	141
Open water	0.2	4	1	23
<i>Cushing Extension subtotal</i>	<i>4.6</i>	<i>79</i>	<i>30</i>	<i>343</i>
Keystone Project				
Palustrine emergent wetland	27.5	403	157	800
Palustrine forested wetland	4.9	80	30	99
Palustrine scrub-shrub wetland	2.2	32	12	33
Riverine-perennial water	2.2	37	14	251
Riverine-intermittent water	6.5	107	40	1,201
Open water	1.1	16	5	102
Keystone Project total	44.4	675	258	2,486

^a Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

**TABLE 3.4.3-4
Wetlands of Special Interest or Conservation Concern for the Keystone Project**

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT					
North Dakota					
6.8–7.7	0.8	Tetrault Woods State Forest	North Dakota Forest Service	R2	0.02
76.2–77.2	1.0	U.S. Fish and Wildlife Service (USFWS) wetland easement	Private	PEM	0.05
79.3–79.9	0.5	USFWS wetland easement	Private	R4, PEM	0.11
80.4–82.5	2.1	USFWS wetland easement	Private	PEM	0.15
86.0–86.7	0.7	USFWS wetland easement	Private	PEM	0.07
87.2–88.3	1.0	USFWS wetland easement	Private	R4, PEM	0.01
89.7–90.1	0.4	USFWS wetland easement	Private	PEM	0.09
91.9–92.9	1.0	USFWS wetland easement	Private	PEM	0.09
98.0–98.5	0.6	USFWS wetland easement	Private	PEM	0.06
101.1–101.4	0.3	USFWS wetland easement	Private	R4	0.01
109.8–110.3	0.5	USFWS wetland easement	Private	None	
110.8–111.3	0.5	USFWS wetland easement	Private	R4, PEM	0.01
117.5–118.0	0.5	USFWS wetland easement	Private	R4, PEM	0.02
119.1–119.4	0.3	USFWS wetland easement	Private	None	
122.0–122.6	0.5	USFWS wetland easement	Private	None	
127.9–128.1	0.3	USFWS wetland easement	Private	R4	0.01
128.2–128.4	0.2	USFWS wetland easement	Private	None	
137.6–138.4	0.8	USFWS wetland easement	Private	None	
139.2–140.3	1.1	USFWS wetland easement	Private	PEM	0.10
169.9–170.9	1.0	USFWS wetland easement	Private	R4, PEM	0.05
171.2–171.6	0.4	USFWS wetland easement	Private	PEM	0.07
172.8–173.6	0.8	USFWS wetland easement	Private	R4, PEM	0.05
173.9–174.0	0.1	USFWS wetland easement	Private	None	
174.7–175.3	0.5	USFWS wetland easement	Private	PEM	0.03
176.3–176.8	0.5	USFWS wetland easement	Private	PEM	0.03
178.5–178.8	0.3	USFWS wetland easement	Private	PEM	0.05

TABLE 3.4.3-4
(Continued)

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT(CONTINUED)					
North Dakota (Continued)					
179.1–179.8	0.7	USFWS wetland easement	Private	None	
182.4–184.1	1.8	USFWS wetland easement	Private	R4, PEM	0.31
185.1–185.4	0.3	USFWS wetland easement	Private	None	
187.4–187.9	0.5	USFWS wetland easement	Private	PEM	0.04
188.5–190.0	1.5	USFWS wetland easement	Private	PEM	0.04
South Dakota					
218.8–219.9	1.0	USFWS wetland easement	Private	PEM	0.10
311.7–312.2	0.5	USFWS wetland easement	Private	PEM	0.02
317.6–318.1	0.5	USFWS wetland easement	Private	R4, PEM	0.04
320.1–320.6	0.5	USFWS wetland easement	Private	PEM	0.16
322.7–323.2	0.5	USFWS wetland easement	Private	PEM	0.10
326.8–328.0	1.2	USFWS wetland easement	Private	PEM	0.59
332.0–332.1	0.1	USFWS wetland easement	Private	None	
333.7–334.2	0.5	USFWS wetland easement	Private	PEM	0.32
335.2–336.2	1.0	USFWS wetland easement	Private	None	
339.2–339.3	0.1	USFWS wetland easement	Private	PEM	0.27
340.3–341.4	1.0	USFWS wetland easement	Private	R4, PEM	0.21
350.6–351.3	0.7	USFWS wetland easement	Private	PEM	0.14
358.0–358.1	0.1	Game production area	South Dakota Game, Fish and Parks Department	None	
365.5–366.1	0.7	USFWS wetland easement	Private	PEM	0.03
368.8–369.3	0.5	USFWS wetland easement	Private	None	
380.2–380.6	0.4	USFWS wetland easement	Private	PEM	0.07
387.1–387.3	0.3	USFWS wetland easement	Private	PEM	0.22
387.6–387.8	0.3	USFWS wetland easement	Private	PEM	0.09
395.0–395.3	0.3	USFWS wetland easement	Private	PEM	0.06
435.8–437.5		Missouri National Recreational River	Private and designated Wild and Scenic	R2, PEM	0.30

**TABLE 3.4.3-4
(Continued)**

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT (CONTINUED)					
Missouri					
Unknown		USDA Wetlands Reserve Program easement	Private		
750.9–755.2	4.1	Western Missouri River Alluvial Plain/ Missouri River Loess Woodland Conservation Opportunity Area (COA)	Private and Missouri Department of Conservation	R2, R4, PEM, PFO	0.31
750.0–751.1	0.1	Jentell Brees Access	Missouri Department of Conservation		
760.9–761.3	0.4	Pigeon Hill Conservation Area	Missouri Department of Conservation	R4	0.01
770.0–771.4	1.4	Little Prairie River Woodland/Forest Scarped Hills COA	Private	R2, R4	0.01
773.5–775.0	1.0	Little Platte River Woodland/Forest Scarped Hills COA	Private	R4, PEM, PFO	0.02
781.9–784.0	2.1	Cameron Upland Prairie Plain COA	Private	R2, R4, PFO	0.05
825.8–829.2	1.3	Shoal Creek Prairie/Woodland Scarped Plain COA	Private	R4, PEM, OW	0.10
841.6–844.4	2.8	Lower Grand River Lowland Plains/Missouri- Grand River Alluvial Plain COA	Private	R2, R4, PEM, PSS	0.11
870.6–875.2	2.2	Chariton River Alluvial Plains COA	Private	R2, R4	0.13
931.8		West Fork Salt River		R2	0.01
958.3–959.7	1.4	Veronica Baier – The Nature Conservancy	The Nature Conservancy	R2, R4	0.02
964.3–976.0	1.9	Cuivre River Woodland/Forest Hills COA	Private	R2, R4, OW, PFO	0.20
987.7–1024.9	37.2	St. Charles/ Lincoln Alluvial Plain, Mairas Temp Clair Alluvial Plain, West Alton Alluvial Plain COA	Private	R2, R4, OW, PEM, PSS, PFO	2.18
1023.5–1024.7	1.2	Edward "Ted" & Pat Jones – Confluence Point State Park	Missouri Department of Natural Resources	R2, PEM, PSS	0.52

**TABLE 3.4.3-4
(Continued)**

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT (CONTINUED)					
Illinois					
1069.6–1072.7	3.1	Carlyle Lake	U.S. Army Corps of Engineers (COE)	R2, R4, PEM	0.05
CUSHING EXTENSION					
Kansas					
4.2		Little Blue River		R2	
9.71–13.59		Mill Creek		R2, R4	0.08
50.0–54.3	3.4	Milford Wildlife Area (Republican River)	COE	R2, R4, PEM	0.29
68.9		Chapman Creek		R2	0.01
76.15		Oxbow		PFO	0.17
76.6		Smokey Hill River		R2	0.04
87.1		Carry Creek		R2	0.01
117.2		Cottonwood River		R2	0.03
128.3		Doyle Creek		R2	0.01
148.8–148.9	0.1	Four Mile Creek		R2	0.06
158.3		Whitewater River		R2, PFO	0.08
205.7		Arkansas River		R2	0.12
Keystone Project total	95.4				8.81

PEM = Palustrine emergent wetland.
PFO = Palustrine forested wetland.
PSS = Palustrine scrub-shrub wetland.
R2 = Riverine – perennial.
R4 = Riverine – intermittent.

Sources: ENSR 2006a; TransCanada 2007b, d (Tables 3.8-4 and 3.8-5).

Potential construction- and operations-related effects include:

- Modification in wetland productivity due to modification of surface and subsurface flow patterns;
- Temporary and permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (clearing temporarily affects the wetland's capacity to buffer flood flows and/or control erosion);
- Loss of wetlands due to backfilling or draining;
- Wetland soil disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native wetland vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation;
- Temporary increase in turbidity and changes in wetland hydrology and water quality;
- Permanent alteration in water-holding capacity due to alteration or breaching of water-retaining substrates in the Prairie Pothole region; and
- Alteration in vegetation productivity and life stage timing due to increased soil temperatures associated with heat input from the pipeline.
- Alteration in freeze-thaw timing due to increased water temperatures associated with heat input from the pipeline.

Generally, the wetland vegetation community eventually would transition back into a community functionally similar to that of the wetland prior to construction, if pre-construction conditions such as elevation, grade, and soil structure are successfully restored. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 3 to 5 years). In forested and scrub-shrub wetlands, the effects of construction would be extended due to the longer period needed to regenerate a mature forest or shrub community. Following revegetation, there would be little permanent effects on emergent wetland vegetation because these areas naturally consist of, and would remain as, an herbaceous community. Herbaceous wetland vegetation in the pipeline ROW generally would not be mowed or otherwise maintained, although Keystone's CMR Plan (Appendix B) allows for annual maintenance of a 20- to 30-foot-wide strip centered over the pipeline. Tree species that typically dominate forested wetlands in the Keystone Project area (maple, hickory, and oak) have regeneration periods of up to 50 years. Trees and shrubs would not be allowed to regenerate within the maintained ROW; therefore, removal of forested and scrub-shrub wetland habitats due to pipeline construction would be long term, and the maintained ROW would represent a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands. The total acreage of affected forested wetland during construction is small (148 acres), as is the total acreage of scrub-shrub wetland affected during construction (33 acres). Restoration of some of these forested and scrub-shrub wetlands may be possible; however, long-term effects would remain.

Operation of the Keystone Project would cause slight increases in soil temperatures at the soil surface (1 to 2 °F) primarily during winter months; and at depths of 6 inches (1 to 5 °F), with most notable increases during spring (March). While many species would not produce root systems that would penetrate much below 6 inches, some species, notably native prairie grasses, trees, and shrubs, have root systems penetrating well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 30 °F warmer than the ambient surrounding soil temperatures. In general, increased soil temperatures during early spring would cause early germination and emergence and increased

productivity in wetland plant species (TransCanada 2007c). Increased soil temperatures also may stimulate root development (TransCanada 2007c).

Operation of the Keystone Project also would cause slight increases in water temperatures where the pipeline crosses through wetlands. Effects would be most pronounced in small ponds and wetlands, as any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands may remain unfrozen a few days later than surrounding wetlands and may thaw a few days sooner than surrounding wetlands. Early and late migrant waterfowl may be attracted and concentrated in these areas during spring and fall migrations.

To minimize potential construction- and operations-related effects, Keystone would implement procedures outlined in the CMR Plan (Appendix B) for wetland crossings. Keystone would minimize impacts and restore wetlands affected by construction activities, to the extent practicable. Pipeline construction through wetlands must comply with COE Section 404 permit conditions and NRCS Standards and Practices for Construction in Wetlands (NRCS 2007). Additional specific mitigation measures would be required for crossings in the COE Riverlands Management Area (St. Louis COE, May 1, 2007).

Keystone has committed to the following measures in its CMR Plan:

- Avoid placement of aboveground facilities in a wetland, except where the location of such facilities outside of wetlands would preclude compliance with DOT pipeline safety regulations;
- Directionally drill large river crossings, except as indicated in Section 3.3.2.2, to minimize effects on streamside wetlands or floodplain forests;
- Use open-cut crossing methods for smaller streams and ephemeral or intermittent drainages; trench wetlands;
- Limit the width of the construction zone to 85 feet through non-cultivated wetlands, unless a wider zone is requested on a site-specific basis;
- Limit the operation of construction equipment within wetlands to that equipment essential for clearing, excavation, pipe installation, backfilling, and restoration;
- Limit grading in wetlands to directly over the trenchline, except where necessary to ensure safety;
- Segregate and replace wetland soils (except in areas of standing water, saturated wetlands, or where no topsoil is evident) to aid in restoration;
- Minimize the length of time that topsoil is segregated and the trench is open;
- Install trench breakers at the boundaries of wetlands as needed to prevent draining of a wetland and to maintain original wetland hydrology;
- Prohibit storage of hazardous materials, chemicals, fuels, and lubricating oils within a wetland or within 100 feet of a wetland boundary;
- Limit post-construction maintenance of vegetation within herbaceous wetlands to a 10-foot wide strip of vegetation centered over the pipeline; and
- Limit post-construction maintenance within forested areas to removal of trees greater than 15 feet in height and within 15 feet of the pipeline centerline.

Additional procedures for dry wetlands (those with groundwater levels below the surface and with stable trench excavations and normal trench widths), standard wetlands (those with saturated and non-cohesive

soils, and difficult trenching conditions), and flooded wetlands (those with standing water over much of the wetland area) are discussed below.

The following additional measures for dry wetlands are specified in Keystone's CMR Plan (Appendix B):

- A standard construction ROW width would be used,
- Extra work areas may be placed no closer than 10 feet from the wetland edge,
- The use of sediment barriers in jurisdictional dry wetlands will be negotiated as part of the Section 404 permitting process.
- Topsoil would be stripped and segregated using trench and spoil side method at the same depth as adjacent upland areas, and
- Seeding requirements for agricultural lands would be applied to farmed wetlands.

The following additional measures for standard wetlands are specified in Keystone's CMR Plan (Appendix B):

- The width of the construction zone would be limited to 85 feet, unless a wider zone is requested on a site-specific basis;
- Low-ground-pressure construction equipment or support equipment on timber rip-rap or timber mats would be used; and
- Sediment barriers would be installed across the entire ROW where it enters and exits the wetland.

The following additional measures for flooded wetlands are specified in Keystone's CMR Plan (Appendix B):

- Topsoil stripping would not be possible (the trench would be up to 35 feet wide),
- Pipe stringing and fabrication would be conducted in a designated extra workspace adjacent to the wetland,
- Pipe would be pushed or pulled across the wetland, and
- Pipe flotation using metal barrels (or styrofoam floats) may be used.

Restoration and reclamation procedures for wetland crossings that are outlined in Keystone's CMR Plan (Appendix B) include:

- Replace topsoil, spread to its original contours with no crown over the trench;
- Remove any excess spoil, stabilize wetland edges and adjacent upland areas using permanent erosion control measures and revegetation;
- For standard wetlands, install a permanent slope breaker and trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas;
- Apply temporary cover crop at a rate adequate for germination and ground cover using annual ryegrass or oats unless standing water is present (in the absence of detailed revegetation plans or until appropriate seeding season);
- Apply seeding requirements for agricultural lands or as required by the landowner for farmed wetlands;

- No application of fertilizer, lime, or mulch unless required by the appropriate land management or state agency;
- No herbicides or pesticides may be used within 100 feet of a wetland (unless allowed by the appropriate land management or state agency);
- Monitor the success of wetland revegetation after construction until revegetation is successful (success is defined as at least 80 percent cover by herbaceous or woody vegetation of the type, density, and distribution in undisturbed adjacent wetland areas within 3 years); and
- If revegetation is not successful within 3 years, develop a remedial revegetation plan and continue efforts until successful.

In addition to the mitigation measures committed to by Keystone in the CMR Plan (Appendix B), all wetland areas within conservation lands or easements would be restored to a level consistent with any additional criteria established by the relevant managing agency.

Implementation of the measures identified in Keystone's CMR Plan (Appendix B) would reduce impacts on wetlands. These additional measures could further reduce impacts to wetlands:

- Encouraging landowners to use native vegetation for restoration (Willie R. Taylor, USFWS, October 11, 2007).
- Replacing topsoil, spread to its original contours with no crown over the trench (John Cochnar, USFWS May 27, 2007). The temporary disposition of trench spoils will be addressed in the COE permit for jurisdictional wetlands.
- Removing any excess spoil and stabilize wetland edges and adjacent upland areas, using permanent erosion control measures and revegetation (John Cochnar, USFWS May 27, 2007).
- Restoring wetland areas within conservation lands or easements to the criteria established by the managing agency (John Cochnar, USFWS May 27, 2007; Matthew Judy, NRCS, April 30, 2007).
 - In shallow farmed easement wetlands, USFWS recommends that a gap be left in the spoil so that no fill material is left in the wetlands, and that the spoil be piled outside the wetland basin (Willie R. Taylor, USFWS, October 11, 2007). Final mitigation measures in easement wetlands will be negotiated between Keystone and USFWS.
 - USFWS requires that Keystone restore all easement wetland contours where spoil must be piled, including dry and farmed wetlands, to plus or minus 1 inch to reduce the possibility of filling shallow wetlands.
- Establishing buffer zones of a minimum width of 100 feet around wetland mitigation areas (John Cochnar, USFWS April 28, 2006).
- Developing a wetland restoration monitoring plan that includes:
 - Direct field evaluations of wetlands crossed by the pipeline to ensure that wetland functions and values are recovering;
 - Continued monitoring for a period of time, normally 5 years; (Robert E. Robert, EPA, October 9, 2007); and
 - Evaluation of wetlands for noxious and invasive species (Larry Svoboda, EPA, November 30, 2006).

Keystone has agreed to some of these additional mitigation measures based on discussions during this environmental analysis. Additional mitigation measures for jurisdictional wetlands and wetlands

contained within federal conservation easements may be added during final permit and crossing easement negotiations. Keystone has agreed to revise the existing CMR Plan (Appendix B) prior to construction to include the additional mitigation measures to which they have agreed or that are mandated during final permit and easement negotiations.

Various state and federal agencies have expressed concerns and recommendations for compensatory mitigation of jurisdictional wetland losses. The requirements for compensatory mitigation would depend on final COE decisions on jurisdictional delineations. Recommendations for compensatory mitigation provided to DOS by the agencies include:

- Keystone should develop a plan to compensate for permanent wetland losses to include:
 - The type of mitigation to be used: creation of new wetlands, restoration of degraded wetlands, and/or preserving existing wetlands.
 - Identification of compensatory mitigation sites, preferably in areas adjacent or continuous to the project site.
 - Restoration or preservation of existing wetlands should apply a ratio of more than 2:1 (3:1 to 6:1), depending on the vegetation type and if mitigation would occur within the same watershed as the wetland loss.
 - Timing of compensatory mitigation should be specified, preferably prior to or concurrent with project construction.
 - Monitoring should be specified that documents mitigation success, noxious and invasive species, and provisions for corrective actions.
- Keystone should mitigate permanent wetland impacts, including loss of forested wetlands, at ratios of 6:1 to 2:1 for each affected acre (Larry Svoboda, USEPA May 3, 2007; John Cochnar, USFWS April 28, 2006; Michael G. McKenna, NDGFD May 4, 2006; Doyle Brown, Missouri Department of Conservation [MDC], April 27, 2007).

These additional measures are recommended by EPA and USFWS to individual permitting agencies for implementation for the Keystone Project. The actual level of required compensation and mitigation would ultimately be determined by COE regulatory offices with input from USFWS Environmental Services field offices and state fish and wildlife agencies.

Implementation of measures in Keystone's CMR Plan (Appendix B) would avoid or mitigate most impacts on wetlands associated with construction and operation activities, and would ensure that potential effects would be minor and short term. Impacts to forested wetlands in Missouri would not be considered minor, as this community is rapidly decreasing in area and is considered at risk by MDC, Missouri Department of Natural Resources, and others. Impacts to forested wetlands would be long-term and in Missouri typically would require a 6:1 compensatory mitigation for conversion and temporal loss (Doyle Brown, MDC, April 27, 2007). To mitigate wetland and stream impacts that cannot be avoided, the Missouri Department of Natural Resources would require that Keystone follow the guidelines set forth in the *Missouri Stream Mitigation Method* and the State of Missouri Aquatic Resources Mitigation Guidelines (H. Floyd Gilzow, Missouri Department of Natural Resources, April 27, 2007). In addition, USEPA suggests that DOS convene a meeting with the resource agencies and Keystone to discuss the recommended wetland mitigation measures in more detail to develop an appropriate set of measures.

3.4.3.1 Connected Actions

Power Lines and Substations. The primary impacts on wetlands from construction or modification of Western’s transmission lines to provide electrical power to pump stations would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. In general, transmission line construction impacts to wetlands would be minor as most lines would run alongside existing roadways. Trees in forested wetlands crossed by the transmission line ROW would be removed, and the ROW would be maintained free of woody vegetation. Approximately 4 miles of wetlands, primarily emergent wetlands in North Dakota and South Dakota, would be affected during construction and operation of Western’s new and upgraded transmission lines for the Keystone Project (Table 3.4.3-5).

TABLE 3.4.3-5 Estimated Impacts on Wetlands Crossed by Proposed Electric Transmission Lines for the Keystone Project								
	Miles of Wetland Type Crossed by Right-of-Way (acres)						Totals	
	ND	SD	NE	KS	OK	MO		IL
Mainline Project								
Freshwater emergent wetland	1.9 (12)	1.5 (9)	0.0			0.1 (1)	0.1 (1)	3.6 (23)
Freshwater forested/shrub wetland	0.0	0.0	0.0			<0.1 (1)	0.0	0.1 (1)
Freshwater pond	0.1 (1)	0.0	0.0			0.0	0.0	0.1 (1)
Riverine	0.0	0.1 (1)	<0.1 (1)			0.0	0.0	0.2 (2)
<i>Mainline Project subtotal</i>	<i>2.0 (13)</i>	<i>1.6 (10)</i>	<i><0.1 (1)</i>	<i>0.0</i>	<i>0.0</i>	<i>0.2 (2)</i>	<i>0.1 (1)</i>	<i>3.9 (27)</i>
Cushing Extension								
Freshwater emergent wetland								
Freshwater forested/shrub wetland								
Freshwater pond								
Riverine				0.1 (1)				0.1 (1)
<i>Cushing Extension subtotal</i>				<i>0.1 (1)</i>				<i>0.1 (1)</i>
Keystone Project								
Freshwater emergent wetland	1.9 (12)	1.5 (9)	0.0			0.1 (1)	0.1 (1)	3.6 (23)
Freshwater forested/shrub wetland	0.0	0.0	0.0			<0.1 (1)	0.0	0.1 (1)
Freshwater pond	0.1 (1)	0.0	0.0			0.0	0.0	0.1 (1)
Riverine	0.0	0.1 (1)	<0.1 (1)	0.1 (1)		0.0	0.0	0.2 (3)
<i>Keystone Project total</i>	<i>2.0 (13)</i>	<i>1.6 (10)</i>	<i><0.1 (1)</i>	<i>0.1 (1)</i>	<i>0.0</i>	<i>0.2 (2)</i>	<i>0.1 (1)</i>	<i>4.0 (28)</i>

Note: Length of wetland impacts calculated from USFWS National Wetlands Inventory mapping; the area of impact was estimated based on a maximum 50-foot right-of-way and proposed transmission line routes provided by Keystone.

Source: TransCanada 2007d, transmission line route sheets.

Measures listed below would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric transmission lines:

- ROW would be located to avoid sensitive vegetation conditions, including wetlands where practical, or—if they are linear—to cross them at the least sensitive feasible point.
- Clearing for the access roads would be limited to only those trees necessary to permit the passage of equipment.
- Water bars or small terraces would be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.
- Western or its contractor would exercise care to preserve the natural landscape and would conduct construction operations so as to prevent any unnecessary destruction, scarring, or

defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation would be preserved and would be protected from damage by construction operations and equipment.

- Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the site. The area would be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- Topsoil would be removed, stockpiled, and re-spread at all heavily disturbed areas not needed for maintenance access.
- All construction equipment and vehicles would be pressure-washed (especially the undercarriage) to remove foreign soil and debris that may introduce weeds into the Project area.
- On completion of the work, all work areas except access roads needed for maintenance would be scarified or left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, or defacing of the landscape resulting from Western or its contractor's operations would be repaired.
- If revegetation is required, regionally native plants would be used.

Wood River Refinery Expansion. No impacts related to wetlands are associated with the Wood River Refinery Expansion other than those evaluated as part of that project.

3.4.4 References

COE. See U.S. Army Corps of Engineers.

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USFWS. See U.S. Fish and Wildlife Service.