Appendix G. Severity of Departures from Reference Condition Considering Multiple Resources

Terrestrial Departure

- PNVT is the Potential Natural Vegetation Type
- Mid-scale vegetation departure references the Ecological Sustainability Report, Appendix F. PNVT Departure from Historic Conditions.
- LANDFIRE Rapid Assessment Fire Regime Departure data is an assessment of current conditions for common PNVTs on the surrounding landscape referencing Ecological Sustainability Report, Table 6. Departure from Natural Fire Regimes by Subsection and Vegetation Type.
- Erosion Hazard percent severe information is from the Ecological Sustainability Report, Table 30 Erosion Hazard by PNVT
- Refined Soil condition percent impaired information is from the Ecological Sustainability Report, Table 31, Grassland-wide Soil Condition by PNVT.
- Soil Kiss-Soil Condition percent unsatisfactory information is derived from t the Ecological Sustainability Report, Table 32, Soil loss by PNVT
- Species information reference is the Species Diversity Section 3 of the Ecological Sustainability Report, Tables 36 through 39.

PNVT	Vegetation Mid-scale vegetation Departure	LANDFIRE % Departure	Soils Erosion Hazard (% severe)	Refined Soil Condition (% impaired)	Soil Loss-Soil Condition (% unsatisfactory)	Species Number of T&E, SOC, and SOI associated	Niche Contribution to sustainability
Mixed Grass Prairie	Within reference condition	21% - 40%	35% severe	7% impaired	0% unsatisfactory	4	High
Short Grass Prairie	Within reference condition	61% - 80%	29% severe	46% impaired	0% unsatisfactory	18	High
Shinnery oak	Within reference condition	61% - 80%	0 % severe	100% impaired	0% unsatisfactory	3	High
Piñon-juniper	Within reference condition	61% - 80%	47% severe	24% impaired	0% unsatisfactory	4	Moderate
Cottonwood willow	Within reference condition	81% - 100%	0 % severe	0% impaired	0% unsatisfactory	6	High
Mixed hardwood riparian	Within reference condition	41% - 60%	0 % severe	0% impaired	0% unsatisfactory	3	Moderate
Sandsage	Within reference condition	61% - 80%	0 % severe	74% impaired	0% unsatisfactory	8	High

Aquatic Departure

The majority of the Grasslands units fall within eight 5th code Hydrologic Unit Code watersheds, as displayed in Table 7 (page 15) and shown on the Watersheds map in Appendix A. Three of those watersheds have at least a 15% overlap with Grasslands units, as shown as bolded text in Table 7.

Table 2. Severity of Departures from Reference Condition Considering Multiple Resources.

	Aquatic Biota		**Water Quality**		**Riparian Condition**		**Wetland condition**	
5th Code HUC	**Departure of current conditions from Reference**	**Departure of future conditions from reference**	**Departure of current conditions from Reference**	**Departure of future conditions from Reference**	**Departure of current conditions from Reference**	**Departure of future conditions from reference**	**Departure of current conditions from Reference**	**Departure of future conditions from reference**
Headwaters Coldwater Creek (01)								
Sand Draw (02)								
Carrizo Creek-Canadian River (05)								

Surface Water

Over the past 20 years, water quality on the Grasslands has been relatively good. Stream and riparian condition analyses conducted during the environmental analysis process for continuation of current cattle grazing strategies, oil-gas operations and other authorized activities on Grasslands units have not indicated a significant impact or a risk to water quality or riparian conditions. In fact, most projects were specifically designed to improve water, riparian and soil conditions.

The water quality in the reservoirs on Black Kettle National Grasslands is not tested by the Forest Service, but none are on the impaired water lists for New Mexico, Oklahoma, or Texas. Dams now located on most stream channel throughout the Grasslands limit the potential for flooding and significantly reduce the peak flow of high intensity rainfall events. Likewise limiting the peak flow of floods reduces the sediment carrying capacity of streams and the floodplain deposition that historically occurred.

Reference Condition: Prior to the Dust Bowl era, water quality was very good except immediately after large fires, drought or bison grazing or during extreme flood events. Though there were no standards historically all streams would have met current water quality standards baring the rare events described above.

There were lower peak flow events, even on un-dammed reaches, compared to current conditions due to better watershed conditions. These conditions encouraged infiltration and groundwater recharge rather than fast runoff and overland flow. Higher ground water levels resulted in streams running longer into the growing season.

Projected Future Conditions and Trends and Comparison to Current and Reference Conditions: Climate patterns in this region have a pronounced affect on watershed conditions and trends. Extreme temperatures and heat stress events in the southern Great Plains are expected to increase (Joyce et al. 2001). Along with this change, water demand for irrigation of grass and grain crops is expected to increase at least 50 percent over current use.

Long-term impairments to watershed conditions are expected to occur as a result of the conversion of native grasslands to farming and ranching operations on private lands, including large irrigation and chemical applications. There are also risks associated with industrial livestock grazing and oil and gas

Over the past several decades watershed conditions have been dramatically improved, especially compared to the extremely degraded condition they were in during the 1940s and 50s following the Dust Bowl era. Conservation practices across the southern Great Plains, and notably in the McClellan Creek drainage, has resulted in a substantial increase in infiltration and groundwater recharge and a subsequent reduction in surface runoff and associated sedimentation.

Management trends are improving the Canadian River's water quality and riparian conditions. Over the past ten years the Forest Service initiated improvement actions along the River including closing off-road vehicle trails and moving camping units away from the floodplain, removing cattle grazing on the largest riparian unit and limiting grazing in other parts of the riparian area, allowing fallen trees to create pools in the stream, and proposing salt-cedar control treatments as part of the interagency Canadian River salt-cedar control program. There are currently 40-50 miles of road in riparian areas on the Grasslands, including unauthorized user-created roads. Thus, the main risk to water quality on Grasslands units is expected to be from those roads located along streams and in riparian areas. Additionally dams located on most drainages will limit flooding and the associated hydrologic processes.

1.1.1 Groundwater Quality/Quantity

Current Condition: Groundwater, which is stored in water-bearing underground formations called aquifers, is an important factor in contributing to social, economic, and ecological conditions. On Grasslands units, it is mostly used to provide water for livestock and wildlife, and on private lands it is additionally used for drinking water and irrigation. The High Plains aquifer system, commonly known as the Ogallala aquifer, covers the plains portions of eight states (CO, KS, NE, NM, OK, SD, TX and WY) and includes parts of all four Grasslands (McGuire 2004). Except for the Mills Canyon portion of Kiowa National Grassland, which is over the Canadian River aquifer, and a small portion of Black Kettle units over the Washita Alluvium aquifer the Grasslands lie over what is considered the Central High Plains aquifer which contains parts of New Mexico, Oklahoma, Texas, Colorado and Kansas (Becker et al. 2002).

In 1999 ground water quality was tested at 74 wells throughout the central High Plains aquifer. Over half of the samples showed signs of human-caused nitrate contamination and three of the wells had nitrate levels above the national standard of 10 milligrams per liter (Becker et al. 2002). A few samples also had concentrations of lead, manganese and uranium above the standards. These standards are known as the Maximum Contaminant Levels or Secondary Maximum Contaminant Levels. Nine samples contained detectable levels of volatile organic compounds and 18 samples contained one or more pesticide. None of the samples containing pesticides exceeded the standard and the samples containing pesticides were primarily taken from the Kansas portion of the aquifer (Becker et al. 2002).

Reference Condition: Prior to the Dust Bowl era, water quality was very good except immediately after large fires, drought or bison grazing or during extreme flood events. Though there were no standards historically all streams would have met current water quality standards baring the rare events described above.

There were lower peak flow events, even on un-dammed reaches, compared to current conditions due to better watershed conditions. These conditions encouraged infiltration and groundwater recharge rather than fast runoff and overland flow. Higher ground water levels resulted in streams running longer into the growing season.

Projected Future Conditions and Trends and Comparison to Current and Reference Conditions: Groundwater depletion and drawdown have been ongoing concerns in the prairie grasslands eco-region.

Within the Grasslands administrative boundary, approximately 1,500 water wells (80%) are on state and private land and 380 water wells (20%) are on Forest Service-managed land.

There is minimal data available on the conditions of the smaller aquifers, but data on the High Plains aquifer indicates that it has experienced extreme draw down over the last 50 years (McGuire 2004). Pumping water for irrigation, municipal water supplies and other uses far exceeds the recharge ability of the aquifer (McGuire 2004). This drawdown may cause some wells and springs used to manage livestock grazing and distribution to go dry. Also, the cost associated with drilling deeper wells is becoming a constraint to meeting the demand for water sources.

The continued reduction in available water is expected to impact wildlife populations and the ability of permittees to properly manage their livestock. While this situation impacts management on the Grasslands, management activities on the Grasslands contribute a minor amount to this problem because ground water use is limited primarily to livestock watering and drinking water at recreation sites. The predicted increase in water demand for irrigation (Joyce et al. 2001) and population growth will likely put additional strain on the ground water levels in the High Plains and other aquifers under the Grasslands.