



Pre-Research Survey of Municipal NPDES Dischargers in the Arid and Semi-Arid West

Prepared For
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1.0 INTRODUCTION

The Arid West Water Quality Research Project (WQRP), as directed by Pima County Wastewater Management, is located in Pima County, Arizona. The project is funded by the Environmental Protection Agency (EPA) under Assistance/Agreement Amendment #XP999267-01-1. The WQRP is intended to provide funding for research that addresses issues relating to arid and semi-arid western water quality regulations that apply to effluent and stormwater discharges. The research is intended to produce results that will protect the species and habitats that are characteristic of effluent-dependent stream ecosystems. Effluent-dependent stream systems have not received appropriate attention in the development of national water quality criteria and a major objective of the WQRP is to begin addressing this issue.

An advisory arm of the WQRP is the Regulatory Working Group (RWG). The RWG was established to assist in the identification of regulatory issues that should be addressed by research, to evaluate research ideas for inclusion in the Research Agenda, and to provide comments on regulatory significance and implementation of research proposals. During the second meeting of the RWG, held in Phoenix, Arizona on 31 July 1997, the group sought clarification on where in the arid West target dischargers were located. They also asked about the nature of receiving waters and what species and/or habitats will be protected as a result of WQRP research.

In response to these queries, Ms. Kathleen Chavez, Deputy Director, Pima County Wastewater Management (PCWWM), indicated that Pima County would conduct a survey of dischargers in the arid West. The objectives of the survey would be to obtain information on issues and problems and to gather basic data such as discharge rates, designated beneficial uses of receiving waterways, and physical, chemical, and biological characteristics of receiving waters.

PCWWM retained Dames & Moore, Tucson, Arizona to conduct the survey. The following report summarizes the results of that survey and associated research. In addition to the summary report, the complete survey results are included as appendices. These appendices have been previously summarized and distributed in the form of a draft data report dated April 1999. The appendices include examples of survey questionnaires, a listing of questionnaire recipients, the core discharger group, and summaries of the data obtained from the core discharger group.

Since this information was compiled, Goodyear, Arizona and other dischargers have indicated that they are in the process of, or are considering, changing from discharging to recharging their effluent.

2.0 METHODS

EPA's Geographic Information System (GIS) database *Basins* for EPA Regions 6 through 10 were obtained. The database contains National Pollutant Discharge Elimination System (NPDES) permit numbers and mapped localities for each municipal permit holder within each EPA region. Maps showing both major and minor discharger locations in each of 17 contiguous arid and semi-arid states were printed. Contiguous states with arid or semi-arid areas include the following:

Arizona	Kansas	New Mexico	South Dakota	Wyoming
California	Montana	North Dakota	Texas	
Colorado	Nebraska	Oklahoma	Utah	
Idaho	Nevada	Oregon	Washington	

Major dischargers have discharges of one million gallons per day (1 MGD) or more, while minor dischargers have smaller discharges. For the purposes of the survey, only dischargers with a permitted discharge rate of 1 MGD or more that were located within semi-arid or arid portions of the 17 states were selected.

After identifying the target group of NPDES permits, Dames & Moore, in concert with PCWWM, developed a three-page questionnaire that was sent to each NPDES permit holder. The questionnaire is included in Appendix A.

As questionnaires were returned, the data were entered into a Microsoft Access database for storage and manipulation. For questionnaires that were not returned within about two weeks, follow-up telephone calls were conducted to ask dischargers to return their questionnaires and/or conduct telephone interviews to collect the information requested.

At the March 1998 meeting of the Western Coalition of Arid States (WESTCAS), participants from a number of states were queried about NPDES permit holders in their state. As a result, approximately 35 additional dischargers were identified to be recipients of questionnaires and/or interviews. Questionnaires were sent to this group of permit holders and additional telephone interviews were conducted.

Between March and November 1998, several additional permit holders were identified and were either sent questionnaires or were telephoned for interviews. Attempts to obtain information from non-respondent permit holders ceased around the middle of November 1998. Permit holders from whom information was not available are not included in this report.

A core group for this study was developed from the set of dischargers who either responded to the survey request or were interviewed on the telephone. This core group consists of dischargers whose effluent is discharged into watercourses that are normally dry or contain effluent dominated flows. Not included in the core group are wastewater treatment facilities that

discharge to perennial water bodies, facilities that recycle 100 percent of their effluent, facilities that discharge to lagoons, and facilities that recharge 100 percent of their effluent.

The information that was obtained from each discharger was synthesized in the form of a narrative. These dischargers were then asked to review their narratives for accuracy, as well as respond to a follow-up survey. An example of the second survey form is also included in Appendix A. The narratives were revised by incorporating comments and responses from the dischargers. (Not all dischargers provided comments on their narratives or responded to the second survey.) The narratives developed for each of the core dischargers are included in this report.

In order to identify any federally listed threatened or endangered species that might be associated with receiving waters or habitats supported by effluent discharge, data was downloaded from the Internet. The data obtained from the U.S. Fish & Wildlife Service's home page included county by county lists of endangered, threatened, proposed, and candidate species. These data were also entered into a Microsoft Access database.

To broadly categorize ecological units within the arid West, several sources were examined including Brown and Lowe's map "Biotic Communities of the Southwest" (1980), A.W. Kuchler's "Potential Natural Vegetation" map of the United States (1966, rev. 1985), and EPA's "Ecoregions of the Conterminous United States" (1987). EPA's ecoregion mapping was ultimately selected for use in this project. Ecoregions are quite functional in describing areas in which ecosystems are generally similar and help avoid the cumbersome problem of dealing with multiple vegetation types.

3.0 RESULTS

3.1 Arid West

According to Baumgartner and Smith, a major portion of the western United States can be classified as arid or semi-arid (Figure 1) (1993). Baumgartner and Smith state that some areas are typically hot and dry, while other areas are warm-to-cool and relatively dry. In all regions, aridity results, in part, from rain shadow effects caused by the Cascade and Sierra Nevada ranges and, in part, by the location of the western United States in relation to the major global weather-producing high and low pressure systems (1993). A total of 17 contiguous western states have portions included in the arid and semi-arid West and similar geographic and climatic conditions extend northward into Canada and southward into Mexico (Baumgartner and Smith 1993).

The arid West includes the Great American Desert, which contains parts of the Sonoran, Chihuahuan, Mojavian, and Great Basin provinces (Baumgartner and Smith 1993). Sonoran desertscrub is characterized as a tropical-subtropical desertland. Both the Chihuahuan and Mojavian desertscrub are classified as warm-temperate desertlands, while the Great Basin desertscrub is classified as a cold-temperate desertland (Brown 1982). The Great American Desert typically receives less than 15 inches (380mm) of annual precipitation (Baumgartner and Smith 1993). The Great American Desert includes the southwestern corner of Texas, the southern half of New Mexico, nearly all of Arizona except the northeastern corner and central plateaus, a small portion of western Colorado, the southern portions of Utah and Nevada, and a small portion of southern California east of the Sierra Nevada Mountains.

According to Baumgartner and Smith, the semi-arid portion of the western United States includes parts of the North American Prairies, which contain the northern halves of Nevada, Utah, and New Mexico; the northeastern corner of Arizona; most of Colorado, Wyoming, and Montana; and the western portions of North Dakota, South Dakota, Nebraska, Kansas, and Texas. Also included are very small portions of Idaho, Washington, and Oklahoma, and a large area in eastern Oregon (1993).

3.2 Ecoregions

Ecoregions represent patterns displayed by ecosystems and their components. Omernik (1986) defined ecoregions by examining factors that either cause regional variations in ecosystems or integrate causal factors. Integrative factors include land use, land surface form, potential natural vegetation, and soils. Ecoregions then are regions of relative homogeneity in ecological systems or in relationships between organisms and their environment. The primary function of an ecoregion map is to provide a geographic framework for organizing ecosystem resource information. The distribution of ecoregions within the arid West study area is illustrated in Figure 2.

Within each ecoregion, there may be several associations of potential natural vegetation. As stated above, these plant communities were used by Omernik, along with other factors, to determine ecoregion boundaries (1986).

The following text and tables describe the ecoregions in the arid West.

3.2.1 Southern and Central California Plains and Hills

This ecoregion is located in California. The primary distinguishing characteristic of this ecoregion is its Mediterranean climate of hot dry summers and cool moist winters, and associated vegetative cover comprising mainly chaparral and oak woodlands; grasslands occur in some lower elevations and patches of pine are found at higher elevations. Potential natural vegetation includes California oakwoods, chaparral (manzanita, ceanothus), and California steppe (needlegrass). Vertebrate species characteristic of these vegetation types are listed in Tables 1, 2, and 3. Most of the region consists of open low mountains or foothills, but there are areas of irregular plains in the south and near the border of the adjacent Central California Valley ecoregion. Much of this region is grazed by domestic livestock; very little land has been cultivated. Land use is grazed open woodland.

Table 1: Characteristic Vertebrate Species of California Oakwoods in the Southern and Central California Plains Ecoregion	
Mammals	
Western gray squirrel	<i>Sciurus griseus</i>
Raccoon	<i>Procyon lotor</i>
California mule deer	<i>Odocoileus hemionus californicus</i>
California ground squirrel	<i>Citellus beecheyi</i>
Western pocket gopher	<i>Thomomys bottae</i>
Birds	
Acorn woodpecker	<i>Melanerpes formicivorus</i>
Nuttall's woodpecker	<i>Picoides nuttallii</i>
Oak titmouse	<i>Baeolophus inornatus</i>
Western bluebird	<i>Sialia mexicana</i>
Reptiles	
Common kingsnake	<i>Lampropeltis getulus</i>
Gopher snake	<i>Pituophis melanoleucus</i>
Coast horned lizard	<i>Phrynosoma coronatum</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
Western toad	<i>Bufo boreas</i>
Amphibians	
Arboreal salamander	<i>Aneides lugubris</i>

Table 2: Characteristic Vertebrate Species of California Valley Grassland (Endemic Vertebrates) in the Southern and Central California Plains Ecoregion

Mammals	
Brush rabbit	<i>Sylvilagus bachmani</i>
California mouse	<i>Peromyscus californicus</i>
Merriam chipmunk	<i>Eutamias merriami</i>
Dusky-footed woodrat	<i>Neotoma fuscipes</i>
Nimble kangaroo rat	<i>Dipodomys agilis</i>
California pocket mouse	<i>Perognathus californicus</i>
Brush mouse	<i>Peromyscus boylii</i>
Birds	
Mountain quail	<i>Oreortyx pictus</i>
Wrentit	<i>Chamaea fasciata</i>
California thrasher	<i>Toxostoma redivivum</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>
Orange-crowned warbler	<i>Vermivora celata</i>
Bushtit	<i>Psaltriparus minimus</i>
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>
Brown towhee	<i>Pipilo fuscus</i>
Lazuli bunting	<i>Passerina amoena</i>
Black-chinned sparrow	<i>Spizella atrogularis</i>
Rufous-crowned sparrow	<i>Aimophila ruficeps</i>
Reptiles	
Alligator lizard	<i>Gerrhonotus multicarinatus webbi</i>
Granite night lizard	<i>Xantusia henshawi</i>
Striped racer	<i>Masticophis lateralis</i>
Coast horned lizard	<i>Phrynosoma coronatum</i>
Coastal rosy boa	<i>Lichanura trivirgata roseofusca</i>
Western patch-nosed snake	<i>Salvadora hexalepis</i>
Glossy snake	<i>Arizona elegans occidentalis</i>
Western black-headed snake	<i>Tantilla planiceps</i>
California lyre snake	<i>Trimorphodon biscutatus vandenburghi</i>
Red diamond rattlesnake	<i>Crotalus ruber</i>
Western rattlesnake	<i>Crotalus viridis helleri</i>

Table 3: Characteristic Vertebrate Species of California Valley Grassland (Endemic Vertebrates) in the Southern and Central California Plains and the Central California Valley Ecoregions	
Mammals	
Tule elk	<i>Cervus elaphus nannodes</i>
Birds	
Yellow-billed magpie	<i>Pica nuttalli</i>

3.2.2 Central California Valley

This ecoregion is located in central California. Flat, intensively farmed plains having long, hot dry summers and cool wet winters distinguish the Central California Valley from its neighboring ecoregions that are either hilly or mountainous, forest or shrub covered, or generally nonagricultural. Potential natural vegetation of this ecoregion includes California steppe (needlegrass) and tule marshes (bulrush, cattails). Vertebrate species characteristic of these vegetation types are listed in Tables 3 and 4. Nearly half of the region is in cropland, about three fourths of which is irrigated. Land is used for grazing. Environmental concerns in the region include salinity due to evaporation of irrigation water, groundwater contamination from heavy use of agricultural chemicals, wildlife habitat loss, and urban sprawl.

Table 4: Characteristic Vertebrate Species of Tule Marshes in the Central California Valley Ecoregion	
Mammals	
Migratory bats	
Muskrat	<i>Ondatra zibethicus</i>
Western jumping mouse	<i>Zapus princeps</i>
Mink	<i>Mustela vison</i>
Birds	
Mallard	<i>Anas platyrhynchos</i>
Pintail	<i>Anas acuta</i>
Cinnamon teal	<i>Anas cyanoptera</i>
Redhead	<i>Aythya americana</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
American bittern	<i>Botaurus lentiginosus</i>
Virginia rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
Common yellow throat	<i>Geothlypis trichas</i>
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>

Red-winged blackbird	<i>Agelaius phoeniceus</i>
Long-billed marsh wren	<i>Cistothorus palustris</i>
Reptiles	
Western garter snake	<i>Thamnophis elegans</i>
Amphibians	
Leopard frogs	<i>Rana pipiens</i> complex
Tiger salamander	<i>Ambystoma tigrinum</i>
Cricket frogs	<i>Acris</i> spp.

3.2.3 Columbia Basin

This ecoregion is located in eastern Washington, extending into Oregon and Idaho. This ecoregion is an arid sagebrush steppe and grassland surrounded on all sides by moister, predominantly forested mountainous ecological regions. The land-surface form in this area varies. There are irregular plains, tablelands with moderate to high relief, and open hills (excludes extremes). This region is underlain by lava rock up to two miles thick and is covered in some places by loess soils that have been extensively cultivated for wheat, particularly in the eastern portions of the region where precipitation amounts are greater. Potential natural vegetation is comprised of wheatgrass/bluegrass, fescue/wheatgrass, and sagebrush steppe (sagebrush, wheatgrass) associations. Vertebrate species characteristic of these vegetation types are listed in Table 5. This area is mostly cropland or cropland with grazing land.

Table 5: Characteristic Vertebrate Species of Sagebrush Dominated Habitats in the Columbia Basin, Snake River Basin/High Desert, and Northern Basin and Range Ecoregions	
Mammals	
Townsendís ground squirrel	<i>Spermophilus townsendi</i>
Dark kangaroo mouse	<i>Microdipodops megatownsendi</i>
Sagebrush vole	<i>Lagurus curtatus</i>
Pallid kangaroo mouse	<i>Microdipodops pallidus</i>
Chisel-toothed kangaroo rat	<i>Dipodomys microps</i>
Birds	
Sage thrasher	<i>Oreoscoptes montanus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage grouse	<i>Centrocercus urophasianus</i>
Reptiles	

Northern desert horned lizard	<i>Phrynosoma platyrhinos platyrhinos</i>
Great basin whiptail	<i>Cnemidophorus tigris tigris</i>
Northern whiptail	<i>Cnemidophorus tigris septentrionalis</i>
Great Basin gopher snake	<i>Pituophis melanoleucus deserticola</i>
Wandering garter snake	<i>Thamnophis elegans vagrans</i>
Great Basin rattlesnake	<i>Crotalus viridis luteosus</i>

3.2.4 Snake River Basin/High Desert

This ecoregion is located in the southeast corner of Oregon and southern Idaho, extending into California and Nevada. This ecoregion consists of xeric intermontane basins, arid tablelands, dissected lava plains, and widely scattered low mountains. Mostly because of the available water for irrigation, a large percent of the alluvial valleys bordering the Snake River are in agriculture, with sugar beets, potatoes, and vegetables being the principal crops. Cattle feedlots and dairy operations are also common in the river plain. Except for the scattered barren lava fields, the remainder of the plains and low hills in the ecoregion are now being used for cattle grazing. This ecoregion is drier and less suitable for agriculture than the Columbia Basin and it contains a lower density of mountain ranges than the adjacent Northern Basin and Range. The potential natural vegetation is sagebrush steppe (sagebrush, wheatgrass) and saltbush/greasewood. Vertebrate species characteristic of these vegetation types are listed in Table 5. This area is grazed desert shrubland with some irrigated agriculture.

3.2.5 Northern Basin and Range

This ecoregion is located in Nevada, western Utah, and partially in California and Idaho. This ecoregion is characterized by a mosaic of xeric basins, scattered low and high mountains, and salt flats. Compared to the Snake River Basin to the north, this region is hotter and contains higher and a greater density of mountains that have perennial streams and ponderosa pine forests at higher elevations. Also, there is less grassland and more shrubland. Great Basin sagebrush and saltbush/greasewood associations comprise the potential natural vegetation. Vertebrate species characteristic of these vegetation types are listed in Table 5. Land use is grazed desert shrubland. The region is not as hot as the Southern Basin and Range ecoregion, and it has a greater percent of land that is grazed.

3.2.6 Southern Basin and Range

This ecoregion is located in southern California and Nevada and southwestern Arizona. This ecoregion encompasses plains with low scattered mountains that are generally lower in elevation than those of the Northern Basin and Range. This region contains large tracts of federally owned land, and substantial areas are used for military training. Potential natural vegetation includes creosote bush, creosote bush/bursage, and paloverde/cactus shrub associations. Vertebrate species characteristic of these vegetation types are listed in Tables 6 and 7. Land use is grazed

and ungrazed desert shrubland. Heavy use of off-road vehicles and motorcycles in some areas has caused severe wind and water erosion problems.

Table 6: Characteristic Vertebrate Species of Creosote Bush and Creosote Bush/Bursage in the Southern Basin and Range Ecoregion	
Mammals	
Sonoran pronghorn	<i>Antilocapra americana sonoriensis</i>
Desert bighorn sheep	<i>Ovis canadensis nelsoni</i>
Round-tailed ground squirrel	<i>Spermophilus tereticaudus</i>
Kit fox	<i>Vulpes macrotis</i>
White-tailed antelope squirrel	<i>Ammospermophilus leucurus</i>
Desert pocket mouse	<i>Perognathus penicillatus</i>
Long-tailed pocket mouse	<i>Perognathus formosus</i>
Desert kangaroo rat	<i>Dipodomys deserti</i>
Merriam kangaroo rat	<i>Dipodomys merriami</i>
Birds	
LeConte's thrasher	<i>Toxostoma lecontei</i>
Reptiles	
Fringe-toed lizards	<i>Uma inornata</i> and <i>U. notata</i>
Flat-tailed horned lizard	<i>Phrynosoma mcallii</i>
Banded sand snake	<i>Chilomeniscus cinctus</i>
Sidewinder	<i>Crotalus cerastes</i>
Brush lizard	<i>Urosaurus graciosus</i>
Southern desert horned lizard	<i>Phrynosoma platyrhinus calidiarum</i>
Desert glossy snake	<i>Arizona elegans eburnata</i>
Western whiptail	<i>Cnemidophorus tigris tigris</i>

Table 7: Characteristic Vertebrate Species of Paloverde/Cactus Shrub in the Southern Basin and Range Ecoregion	
Mammals	
Desert mule deer	<i>Odocoileus hemionous crooki</i>
Javelina	<i>Dicotyles tajacu</i>
California leaf-nosed bat	<i>Macrotus californicus</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>

Desert cottontail	<i>Sylvilagus auduboni</i>
Arizona pocket mouse	<i>Perognathus amplus</i>
Bailey's pocket mouse	<i>Perognathus baileyi</i>
Cactus mouse	<i>Peromyscus eremicus</i>
White-throated wood rat	<i>Neotoma albigula</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
Harris antelope squirrel	<i>Ammospermophilus harrisi</i>
Birds	
Harris' hawk	<i>Parabuteo unicinctus</i>
White-winged dove	<i>Zenaida asiatica</i>
Elf owl	<i>Micrathene whitneyi</i>
Brown crested flycatcher	<i>Myiarchus tyrannulus</i>
Pyrrhuloxia	<i>Cardinalis sinuatus</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Gilded flicker	<i>Colaptes chrysoides</i>
Ladder-backed woodpecker	<i>Picoides scalaris</i>
Reptiles	
Regal horned lizard	<i>Phrynosoma solare</i>
Western whiptail	<i>Cnemidophorus tigris gracilis</i>
Gila monster	<i>Heloderma suspectum</i>
Tiger rattlesnake	<i>Crotalus tigris</i>
Arizona coral snake	<i>Micruroides euryxanthus</i>
Arizona glossy snake	<i>Arizona elegans noctivaga</i>

3.2.7 Montana Valley and Foothill Prairies

This ecoregion is located in western Montana. The Montana Valley and Foothill Prairies is a region characterized by shortgrass prairie. It is unlike other grassland-type ecoregions in the Great Plains because of the close proximity to nearby high forested mountains which feed the region with many perennial streams, resulting in a different mosaic of terrestrial and aquatic fauna. Foothills prairie (wheatgrass, fescue, needlegrass) is representative of the potential natural vegetation of this region. Vertebrate species characteristic of this vegetation type are listed in Table 8. Most of the region is farmed and many parts of the valleys have been irrigated. Lands in this area are characterized as subhumid grassland and semi-arid grazing land along with some irrigated land. Grazing of beef cattle and sheep is prevalent in the region, even in the forested parts of the foothills.

Table 8: Characteristic Vertebrate Species of Foothills Prairie in the Montana Valley and Foothill Prairies Ecoregion

Mammals	
Pronghorn antelope	<i>Antilocapra americana</i>
Bison	<i>Bison bison</i>
Prairie dogs	<i>Cynomys ludovicianus</i> and <i>C. gunnisoni</i>
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
Swift fox	<i>Vulpes velox</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Plains harvest mouse	<i>Reithrodontomys montanus</i>
Birds	
Prairie chicken*	<i>Tympanuchus pallidicinctus</i>
Bobwhite*	<i>Colinus virginianus</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Mountain plover	<i>Charadrius montana</i>
Lark bunting	<i>Calamospiza melanocorys</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Long-billed curlew	<i>Numenius americanus</i>
Meadowlarks	<i>Sturnella</i> spp.
Prairie falcon	<i>Falco mexicanus</i>
Burrowing owl	<i>Athene cunicularia</i>
Reptiles	
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Western plains milksnake	<i>Lampropeltis triangulum celaenops</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>
Plains toad	<i>Bufo cognatus</i>
Lesser earless lizard	<i>Holbrookia maculata</i>
Great plains skink	<i>Eumeces obsoletus</i>
Prairie-lined racerunner	<i>Cnemidophorus sexlineatus viridis</i>
Plains hognose snake	<i>Heterodon nasicus nasicus</i>

* Outer distributional limits

3.2.8 Wyoming Basin

This ecoregion is located in Wyoming and partially in Montana, Idaho, Utah, and Colorado. This ecoregion is a broad intermontane basin dominated by arid grasslands and shrublands and

interrupted by high hills and low mountains. Nearly surrounded by forest covered mountains, the region is somewhat drier than the Northwestern Great Plains to the northeast and does not have the extensive cover of pinyon-juniper woodland found in the Colorado Plateaus to the south. Much of the region is used for livestock grazing, although many areas lack sufficient vegetation to support this activity. There is also some irrigated agriculture. The region contains major producing natural gas and petroleum fields. Potential natural vegetation for this region is sagebrush steppe (sagebrush/wheatgrass), wheatgrass/needlegrass shrub-steppe, saltbush/greasewood, and juniper/pinyon woodland. Vertebrate species characteristic of these vegetation types are listed in Tables 9, 10, and 11.

Table 9: Characteristic Vertebrate Species of Sagebrush Steppe and Saltbush/Greasewood in the Wyoming Basin Ecoregion	
Mammals	
Townsend's ground squirrel	<i>Spermophilus townsendi</i>
Dark kangaroo mouse	<i>Microdipodops megacephalus</i>
Sagebrush vole	<i>Lagurus curtatus</i>
Pallid kangaroo mouse*	<i>Microdipodops pallidus</i>
Chisel-toothed kangaroo rat*	<i>Dipodomys microps</i>
Pronghorn antelope	<i>Antilocapra americana</i>
Birds	
Sage thrasher	<i>Oreoscoptes montanus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage grouse	<i>Centrocercus urophasianus</i>
Reptiles	
Sagebrush lizard	<i>Sceloporus graciosus</i>
Great Basin spadefoot toad	<i>Scaphiopus intermontanus</i>
Great Basin whiptail	<i>Cnemidophorus tigris tigris</i>
Northern whiptail	<i>Cnemidophorus tigris septentrionalis</i>
Great Basin fence lizard	<i>Sceloporus occidentalis biseriatus</i>
Northern plateau fence lizard	<i>Sceloporus undulatus elongatus</i>
Great Basin gopher snake	<i>Pituophis melanoleucus deserticola</i>
Wandering garter snake	<i>Thamnophis elegans vagrans</i>

* Mammals favoring the saltbush community

Table 10: Characteristic Vertebrate Species of Wheatgrass/Needlegrass Shrubsteppe in the Wyoming Basin Ecoregion

Mammals	
Pronghorn antelope	<i>Antilocapra americana</i>
Bison	<i>Bison bison</i>
Prairie dogs	<i>Cynomys ludovicianus</i> and <i>C. gunnisoni</i>
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
Swift fox	<i>Vulpes velox</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Plains harvest mouse	<i>Reithrodontomys montanus</i>
Birds	
Prairie chicken*	<i>Tympanuchus pallidicinctus</i>
Bobwhite*	<i>Colinus virginianus</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Mountain plover	<i>Chradrius montana</i>
Lark bunting	<i>Calamospiza melanocorys</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Long-billed curlew	<i>Numenius americanus</i>
Reptiles	
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Western coachwhip	<i>Masticophis flagellum testaceus</i>
Western plains milksnake	<i>Lampropeltis triangulum celaenops</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>
Great plains toad	<i>Bufo cognatus</i>
Lesser earless lizard	<i>Holbrookia maculata</i>
Great plains skink	<i>Eumeces obsoletus</i>
Prairie-lined racerunner	<i>Cnemidophorus sexlineatus viridis</i>
Western box turtle	<i>Terrapene ornata</i>
Plains hognose snake	<i>Heterodon nasicus nasicus</i>
Plains blackhead snake	<i>Tantilla nigriceps</i>

* Outer distributional limits

Table 11: Characteristic Vertebrate Species of Juniper/Pinyon Woodland in the Wyoming Basin Ecoregion	
Mammals	
Pinyon mouse	<i>Peromyscus truei</i>
Bushy-tailed woodrat	<i>Neotoma cinerea arizonae</i>

Rocky Mountain elk*	<i>Cervus elaphus</i>
Mule deer*	<i>Odocoileus hemionus</i>
Birds	
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Gray flycatcher	<i>Empidonax wrightii</i>
Gray vireo	<i>Vireo vicinior</i>
Black-throated gray warbler	<i>Dendroica nigrescens</i>
Scott's oriole	<i>Icterus parisorum</i>
Reptiles	
Plateau whiptail	<i>Cnemidophorus velox</i>

* Community provides seasonal habitat

3.2.9 Colorado Plateau

This ecoregion is located in the southeastern half of Utah, eastern Colorado, and northern Arizona. Rugged tableland topography is typical of the Colorado Plateau ecoregion. Precipitous sidewalls mark abrupt changes in local relief, often from 300 to 600 meters. The region is more elevated than the Wyoming Basin to the north and therefore contains a far greater extent of pinyon-juniper woodlands. However, the region also has large low lying areas containing saltbrush-greasewood (typical of hotter drier areas), which are generally not found in the higher Arizona/New Mexico Plateau to the south where grasslands are common. The potential natural vegetation is saltbush/greasewood, blackbush, juniper/pinyon woodland, and Great Basin sagebrush associations. Vertebrate species characteristic of these vegetation types are listed in Tables 12 and 13. The area is comprised of grazed open woodlands, grazed desert shrubland, and some irrigated agriculture.

Table 12: Characteristic Vertebrate Species of Great Basin Sagebrush Associations, Saltbush/Greasewood, Blackbush in the Colorado Plateaus Ecoregion

Mammals	
Townsend's ground squirrel	<i>Spermophilus townsendi</i>
Dark kangaroo mouse	<i>Microdipodops megacephalus</i>
Sagebrush vole	<i>Lagurus curtatus</i>
Pallid kangaroo mouse*	<i>Microdipodops pallidus</i>
Chisel-toothed kangaroo rat*	<i>Dipodops microps</i>
Pronghorn antelope	<i>Antilocapra americana</i>
Birds	
Sage thrasher	<i>Oreoscoptes montanus</i>

Sage sparrow	<i>Amphispiza belli</i>
Sage grouse	<i>Centrocercus urophasianus</i>
Reptiles	
Sagebrush lizard	<i>Sceloporus graciosus</i>
Great Basin spadefoot toad	<i>Scaphiopus intermontanus</i>
Northern desert horned lizard	<i>Phrynosoma platyrhinos platyrhinos</i>
Painted desert whiptail	<i>Cnemidophorus tigris septentrionalis</i>
Northern plateau fence lizard	<i>Sceloporus undulatus elongatus</i>
Great Basin gopher snake	<i>Pituophis melanoleucus deserticola</i>
Wandering garter snake	<i>Thamnophis elegans vagrans</i>
Midget faded rattlesnake	<i>Crotalus viridus concolor</i>

* Mammals favoring the saltbush community

Table 13: Characteristic Vertebrate Species of Juniper/Pinyon Woodland in the Colorado Plateaus Ecoregion	
Mammals	
Pinyon mouse	<i>Peromyscus truei</i>
Bushy-tailed woodrat	<i>Neotoma cinerea arizonae</i>
Rocky Mountain elk*	<i>Cervus elaphus</i>
Mule deer*	<i>Odocoileus hemionus</i>
Birds	
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Gray flycatcher	<i>Empidonax wrightii</i>
Gray vireo	<i>Vireo vicinior</i>
Black-throated gray warbler	<i>Dendroica nigrescens</i>
Scott's oriole	<i>Icterus parisorum</i>
Reptiles	
Plateau whiptail	<i>Cnemidophorus velox</i>

* Community provides seasonal habitat

3.2.10 Arizona/New Mexico Plateau

This ecoregion is located in the northern portions of Arizona and New Mexico, and partially in southern Colorado. The Arizona/New Mexico Plateau represents a large transitional region between the semi-arid grasslands and low relief tablelands of the Southwestern Tablelands ecoregion in the east, the drier shrubland and woodland covered higher relief tablelands of the Colorado Plateau in the north, and the lower, hotter, less vegetated Southern Basin and Range in

the west and Southern Deserts in the south. Higher, more forest-covered, mountainous ecoregions border the region on the northeast and southwest. Local relief in the region varies from a few meters on plains and mesa tops to well over 300 meters along tableland side slopes. The potential natural vegetation is grama/galleta steppe, Great Basin sagebrush, and saltbush/greasewood. Vertebrate species characteristic of these vegetation types are listed in Tables 14 and 15. Land use is subhumid grassland and semi-arid grazing land along with grazed desert shrubland. Soils are Aridisols and Entisols.

Table 14: Characteristic Vertebrate Species of Grama/Galleta Steppe in the Arizona/New Mexico Plateau Ecoregion	
Mammals	
Pronghorn antelope	<i>Antilocapra americana</i>
Whitetail prairie dogs	<i>Cynomys gunnisoni</i>
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
Swift fox	<i>Vulpes velox</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Plains harvest mouse	<i>Reithrodontomys montanus</i>
Birds	
Meadowlarks	<i>Sturnella</i> spp.
Prairie falcon	<i>Falco mexicanus</i>
Burrowing owl	<i>Athene cunicularia</i>
Upland Sandpiper*	<i>Bartramia longicauda</i>
Mountain plover*	<i>Charadrius montana</i>
Lark bunting*	<i>Calamospiza melanocorys</i>
Grasshopper sparrow*	<i>Ammodramus savannarum</i>
Long-billed curlew*	<i>Numenius americanus</i>
Reptiles	
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Sonoran gopher snake	<i>Pituophis melanoleucus affinis</i>
Corn snake	<i>Elaphe guttata</i>
Western coachwhip	<i>Masticophis flagellum testaceus</i>
New Mexico milksnake	<i>Lampropeltis triangulum celaenops</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>

* Peripheral nesting species

Table 15: Characteristic Vertebrate Species of Great Basin Sagebrush and Saltbush/Greasewood in the Arizona/New Mexico Plateau Ecoregion

Mammals	
Pronghorn antelope	<i>Antilocapra americana</i>
Birds	
Sage thrasher	<i>Oreoscoptes montanus</i>
Sage sparrow	<i>Amphispiza belli</i>
Reptiles	
Sagebrush lizard	<i>Sceloporus graciosus</i>
Southern plateau fence lizard	<i>Sceloporus undulatus tristichus</i>
Sonoran gopher snake	<i>Pituophis melanoleucus affinis</i>
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Wandering garter snake	<i>Thamnophis elegans vagrans</i>
Arizona black rattlesnake	<i>Crotalus viridis cerberus</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>

3.2.11 Arizona/New Mexico Mountains

This ecoregion is located in central Arizona eastward into New Mexico. The Arizona/New Mexico Mountains are distinguished from neighboring mountainous ecoregions by lower elevations and associated vegetation indicative of drier, warmer environments, which is also due in part to the region's more southerly location. Forests of spruce, fir, and Douglas fir that are common in the Southern Rockies and the Uinta and Wasatch Mountains, are only found in a few high elevation parts of this region. Chaparral is common on the lower elevations, pinyon-juniper, and oak woodlands are found on lower and middle elevations, and the higher elevations are mostly covered with open to dense ponderosa pine forests. Potential natural vegetation is pine/Douglas-fir, juniper/pinyon woodland, southwestern spruce/fir, and Arizona pine. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. Land use is grazed forest and woodland and grazed open woodland.

3.2.12 Southern Deserts

This ecoregion is located in southeastern Arizona, southern New Mexico, and western Texas. This region comprises broad basins and valleys bordered by sloping alluvial fans and terraces. Isolated mesas and mountains are located in the central parts of the region. The mountains have medium to high local relief, typically 1,000 to 1,500 meters. Potential natural vegetation includes grama/tobosa shrub steppe and Trans-Pecos shrub savanna (tarbush, creosote bush) Vertebrate species characteristic of these vegetation types are listed in Tables 16 and 17. Land use is grazed desert shrubland.

Table 16: Characteristic Vertebrate Species of Grama/Tobosa Shrub Steppe in the Southern Deserts Ecoregion

Mammals	
Black-tailed jackrabbit	<i>Lepus californicus</i>
Spotted ground squirrel	<i>Spermophilus spilosoma</i>
Hispid pocket mouse	<i>Perognathus hispidus</i>
Ordís kangaroo rat	<i>Dipodomys ordii</i>
Banner-tailed kangaroo rat	<i>Dipodomys spectabilis</i>
Merriam kangaroo rat	<i>Dipodomys merriami</i>
White-footed mouse	<i>Peromyscus leucopus</i>
Cotton rats	<i>Sigmodon hispidus</i> and <i>S. fluviventer</i>
Southern grasshopper mouse	<i>Onychomys torridus</i>
Southern plains wood rat	<i>Neotoma micropus</i>
White-throated wood rat	<i>Neotoma albigula</i>
Badger	<i>Taxidea taxus</i>
Coyote	<i>Canis latrans</i>
Birds	
Swainson's hawk	<i>Buteo swainsoni</i>
Prairie falcon	<i>Falco mexicanus</i>
Kestrel	<i>Falco sparverius</i>
Scaled quail	<i>Callipepla squamata</i>
Roadrunner	<i>Geococcyx californianus</i>
Burrowing owl	<i>Athene cunicularia</i>
Poor-will	<i>Phalaenoptilus nuttallii</i>
Western kingbird	<i>Tyrannus verticalis</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
Say's phoebe	<i>Sayornis saya</i>
Horned lark	<i>Eremophila alpestris</i>
Barn swallow	<i>Hirundo rustica</i>
Chihuahuan raven	<i>Corvus cryptoleucus</i>
Verdin	<i>Auriparus flaviceps</i>
Cactus wren	<i>Campylorhynchus brunneicapillus</i>
Mockingbird	<i>Mimus polyglottos</i>
Curve-billed thrasher	<i>Toxostoma curvirostre</i>
Black-tailed gnatcatcher	<i>Polioptila melanura</i>

Loggerhead shrike	<i>Lanius ludovicianus</i>
Meadow lark	<i>Sturnella magna</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Scott's oriole	<i>Icterus parisorum</i>
House finch	<i>Carpodacus mexicanus</i>
Lark sparrow	<i>Chondestes grammacus</i>
Cassin's sparrow	<i>Aimophila cassinii</i>
Reptiles	
Western yellow box turtle	<i>Terrapene ornata luteola</i>
Desert-grassland hognose snake	<i>Heterodon nasicus kennerlyi</i>
Western hooknose snake	<i>Ficimia cana</i>
Desert-grassland whiptail	<i>Cnemidophorus uniparens</i>
Southwestern earless lizard	<i>Holbrookia texana scitula</i>
Western green toad	<i>Bufo debilis insidiosus</i>

Table 17: Characteristic Vertebrate Species of Trans-Pecos Shrub Savanna in the Southern Deserts Ecoregion

Mammals	
Desert pocket gopher	<i>Geomys arenarius</i>
Yellow-faced pocket gopher	<i>Pappogeomys castanops</i>
Nelson's kangaroo rat	<i>Dipodomys nelsoni</i>
Nelson's pocket mouse	<i>Perognathus nelsoni</i>
Desert pocket mouse	<i>Perognathus penicillatus</i>
Southern grasshopper mouse	<i>Onychomys torridus</i>
Goldman's woodrat	<i>Neotoma goldmani</i>
Texas antelope squirrel	<i>Ammospermophilus interpres</i>
Birds	
Scaled quail	<i>Callipepla squamata</i>
Chihuahuan raven	<i>Corvus cryptoleucus</i>
Reptiles	
Texas banded gecko	<i>Coleonyx brevis</i>
Reticulated gecko	<i>Coleonyx reticulatus</i>
Greater earless lizard	<i>Cophosaurus texanus</i>
Round-tail horned lizard	<i>Phrynosoma modestum</i>
Spiny lizards	<i>Sceloporus cautus, S. maculosus, S.</i>

	<i>merriami</i> , <i>S. ornatus</i> , <i>S. poinsetti</i> , and <i>S. magister bimaculosus</i>
Fringe-footed lizard	<i>Uma exsul</i>
Little striped whiptail	<i>Cnemidophorus inornatus</i>
Marbled whiptail	<i>Cnemidophorus tigris marmoratus</i>
Female parthenogenic whiptail clones	<i>Cnemidophorus neomexicanus</i> and <i>C. tessellatus</i>
Trans-Pecos ratsnake	<i>Elaphe subocularis</i>
Western hooknose snake	<i>Gyalopion canum</i>
Texas black-headed snake	<i>Tantilla atriceps</i>
Whipsnakes	<i>Masticophis taeniatus</i> and <i>M. flagellum lineatus</i>
Mojave rattlesnake	<i>Crotalus scutulatus</i>
Western diamondback	<i>Crotalus atrox</i>

3.2.13 Western High Plains

This ecoregion is located in eastern New Mexico and western Texas and up into the panhandle of Oklahoma, eastern Kansas and Nebraska, Colorado, and southeastern Wyoming. Higher and drier than the Central Great Plains to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains to the north, much of the Western High Plains comprises smooth to slightly irregular plains having a high percentage of cropland. The Western High Plains are used for cropland, cropland with grazing land, and irrigated agriculture. Grama/buffalo grass is the potential natural vegetation in this region as compared to mostly wheatgrass/needlegrass to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. Vertebrate species characteristic of the grama/buffalo grass community are listed in Table 18. The northern boundary of this ecoregion is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat.

Table 18: Characteristic Vertebrate Species of Grama/Buffalo Grass, Bluestem/Grama Prairie, and Other Grasslands in the Western High Plains Ecoregion, Southwestern Tablelands, and Central Great Plains Ecoregions	
Mammals	
Pronghorn antelope	<i>Antilocapra americana</i>
Bison	<i>Bison bison</i>
Prairie dogs	<i>Cynomys ludovicianus</i> and <i>C. gunnisoni</i>
Thirteen-lined ground squirrels	<i>Spermophilus tridecemlineatus</i>

Swift fox	<i>Vulpes velox</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Plains harvest mouse	<i>Reithrodontomys montanus</i>
Birds	
Meadowlarks	<i>Sturnella</i> spp.
Prairie falcon	<i>Falco mexicanus</i>
Burrowing owl	<i>Athene cunicularia</i>
Prairie chicken*	<i>Tympanuchus pallidicinctus</i>
Upland sandpiper*	<i>Bartramia longicauda</i>
Mountain plover*	<i>Charadrius montana</i>
Lark bunting*	<i>Calamospiza melanocorys</i>
Grasshopper sparrow*	<i>Ammodramus savannarum</i>
Long-billed curlew*	<i>Numenius americanus</i>
Reptiles	
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Corn snake	<i>Elaphe guttata</i>
Western coachwhip	<i>Masticophis flagellum testaceus</i>
Western plains milksnake	<i>Lampropeltis triangulum celaenops</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>
Great plains toad	<i>Bufo cognatus</i>
Lesser earless lizard	<i>Holbrookia maculata</i>
Southern prairie lizard	<i>Sceloporus undulatus consobrinus</i>
Great plains skink	<i>Eumeces obsoletus</i>
Prairie-lined racerunner	<i>Cnemidophorus sexlineatus viridis</i>
Western box turtle	<i>Terrapene ornata</i>
Plains hognose snake	<i>Heterodon nasicus nasicus</i>
Prairie ringneck snake	<i>Diadophis punctatus arnyi</i>
Great Plains ground snake	<i>Sonora episcopa episcopa</i>
Plains blackhead snake	<i>Tantilla nigriceps</i>

* Peripheral nesting species

3.2.14 Southwestern Tablelands

This ecoregion is located in Colorado, New Mexico, Texas, and partially in Oklahoma and Kansas. Unlike most adjacent Great Plains ecological regions, little of Southwestern Tablelands is in cropland. Much of this elevated tableland is in subhumid grassland and semi-arid grazing land and some cropland with grazing land. This ecoregion is characterized as tablelands with

moderate to considerable relief. The potential natural vegetation in this region is grama-buffalo grass with some mesquite-buffalo grass in the southeast and shinnery (midgrass prairie with open low and shrubs) along the Canadian River. Shinnery includes sandsage/bluestem and bluestem/grama prairies. Vertebrate species characteristic of these vegetation types are listed in Tables 18 and 19.

Table 19: Characteristic Vertebrate Species of Mesquite/Buffalo Grass in the Southwestern Tablelands Ecoregion	
Mammals	
Black-tailed jackrabbit	<i>Lepus californicus</i>
Spotted ground squirrel	<i>Spermophilus spilosoma</i>
Hispid pocket mouse	<i>Perognathus hispidus</i>
Ord's kangaroo rat	<i>Dipodomys ordii</i>
Banner-tailed kangaroo rat	<i>Dipodomys spectabilis</i>
Merriam's kangaroo rat	<i>Dipodomys merriami</i>
White-footed mouse	<i>Peromyscus leucopus</i>
Cotton rats	<i>Sigmodon hispidus</i> and <i>S. fluviventer</i>
Southern grasshopper mouse	<i>Onychomys torridus</i>
Southern plains woodrat	<i>Neotoma micropus</i>
White-throated woodrat	<i>Neotoma albigula</i>
Badger	<i>Taxidea taxus</i>
Coyote	<i>Canis latrans</i>
Birds	
Swainson's hawk	<i>Buteo swainsoni</i>
Prairie falcon	<i>Falco mexicanus</i>
Kestrel	<i>Falco sparverius</i>
Scaled quail	<i>Callipepla squamata</i>
Roadrunner	<i>Geococcyx californianus</i>
Burrowing owl	<i>Athene cunicularia</i>
Poor-will	<i>Phalaenoptilus nuttallii</i>
Ladder-backed woodpecker	<i>Picoides scalaris</i>
Western kingbird	<i>Tyrannus verticalis</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
Say's phoebe	<i>Sayornis saya</i>
Horned lark	<i>Eremophila alpestris</i>
Barn swallow	<i>Hirundo rustica</i>

White-necked raven	<i>Corvus cryptoleucus</i>
Verdin	<i>Auriparus flaviceps</i>
Cactus wren	<i>Campylorhynchus brunneicapillus</i>
Mockingbird	<i>Mimus polyglottos</i>
Curve-billed thrasher	<i>Toxostoma curvirostre</i>
Black-tailed gnatcatcher	<i>Polioptila melanura</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Meadow lark	<i>Sturnella magna</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Scott's oriole	<i>Icterus parisorum</i>
House finch	<i>Carpodacus mexicanus</i>
Lark sparrow	<i>Chondestes grammacus</i>
Cassin's sparrow	<i>Aimophila cassinii</i>
Reptiles	
Western yellow box turtle	<i>Terrapene ornata luteola</i>
Desert-grassland hognose snake	<i>Heterodon nasicus kennerlyi</i>
Western hooknose snake	<i>Ficimia cana</i>
Desert-grassland whiptail	<i>Cnemidophorus uniparens</i>
Southwestern earless lizard	<i>Holbrookia texana scitula</i>
Western green toad	<i>Bufo debilis insidior</i>

3.2.15 Central Great Plains

This ecoregion is located in Nebraska, Kansas, Oklahoma, and Texas. The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the Western High Plains to the west. Once a grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland, the eastern boundary of the region marking the eastern limits of the major winter wheat growing area of the United States. The potential natural vegetation includes bluestem/grama prairie, bluestem prairie, and buffalo grass. Vertebrate species characteristic of these vegetation types are listed in Table 18. This ecoregion is used for cropland, cropland with grazing land, and some irrigated agriculture.

3.2.16 Central Texas Plateau

This ecoregion is located in central Texas. This ecoregion is largely a dissected plateau that is more hilly in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. The land-surface forms for this ecoregion are varied. They include tablelands with moderate relief, plains with high hills, and open high hills. The region contains a sparse network of perennial streams, but they are relatively clear and cool compared to those of

surrounding areas. Originally covered by juniper-oak savanna and mesquite-oak savanna, most of the region is used for grazing beef cattle, sheep, goats, and wildlife. Vertebrate species characteristic of the savanna communities are listed in Table 20. Hunting leases are a major source of income. Land is utilized for grazed open woodland, grazed forest and woodland, and some subhumid grassland and semi-arid grazing land.

Table 20: Characteristic Vertebrate Species of Juniper/Oak Savanna in the Central Texas Plateau Ecoregion	
Mammals	
Opossum	<i>Didelphis marsupialis</i>
Leafchin bat	<i>Mormoops megalophylla</i>
Eastern pipistrel	<i>Pipistrellus subflavus</i>
Evening bat	<i>Nycticeius humeralis</i>
Hognose skunk	<i>Conepatus mesoleucus</i>
Mexican ground squirrel	<i>Spermophilus mexicanus</i>
Plains pocket gopher	<i>Geomys bursarius</i>
Fulvous harvest mouse	<i>Reithrodontomys fulvescens</i>
White-ankled mouse	<i>Peromyscus pectoralis</i>
Pygmy mouse	<i>Baiomys taylori</i>
Armadillo	<i>Dasyus novemcinctus</i>
Birds	
Mississippi kite	<i>Ictinia mississippiensis</i>
Merlin	<i>Falco columbarius</i>
Northern bobwhite	<i>Colinus virginianus</i>
Golden-fronted woodpecker	<i>Melanerpes aurifrons</i>
Northern flicker	<i>Colaptes auratus</i>
Eastern kingbird	<i>Tyrannus tyrannus</i>
Scissor-tailed flycatcher	<i>Tyrannus forficatus</i>
Cave swallow	<i>Hirundo fulva</i>
Carolina chickadee	<i>Parus carolinensis</i>
Black-capped vireo	<i>Vireo atricapillus</i>
Yellow-throated warbler	<i>Dendroica dominica</i>
Cassin's sparrow	<i>Aimophila cassinii</i>
Field sparrow	<i>Spizella pusilla</i>
Reptiles	
Barred tiger salamander	<i>Ambystoma tigrinum mavortium</i>

Eastern barking frog	<i>Hylactophryne augusti latrans</i>
Plains narrow-mouthed toad	<i>Gastrophryne olivacea olivacea</i>
Texas toad	<i>Bufo speciosus</i>
Green toad	<i>Bufo debilis</i>
Ornate box turtle	<i>Terrapene ornata ornata</i>
Red-eared slider	<i>Pseudemys scripta elegans</i>
Texas banded gecko	<i>Coleonyx brevis</i>
Texas earless lizard	<i>Cophosaurus texanus texanus</i>
Crevice spiny lizard	<i>Sceloporus poinsettii</i>
Southern prairie lizard	<i>Sceloporus undulatus consobrinus</i>
Texas spotted whiptail	<i>Cnemidophorus gularis</i>
Dusty hognose snake	<i>Heterodon nasicus gloydi</i>
Prairie ringneck snake	<i>Diadophis punctatus arnyi</i>
Central coachwhip	<i>Masticophis flagellum testaceus</i>
Trans-pecos rat snake	<i>Elaphe subocularis</i>
Texas long-nosed snake	<i>Rhinocheilus lecontei tessellatus</i>
Plain-bellied water snake	<i>Nerodia erythrogaster</i>
Chihuahuan hook-nosed snake	<i>Gyalopian canum</i>
Rock rattlesnake	<i>Crotalus lepidus</i>
Western diamondback rattlesnake	<i>Crotalus atrox</i>

3.2.17 Southern Texas Plains

This ecoregion is located in southern Texas. This rolling to moderately dissected plain was once covered with grassland and savanna vegetation including mesquite/acacia savanna (bluestem, bristlegrass) and mesquite/live oak savanna (bluestem). Vertebrate species characteristic of these vegetation types are listed in Table 21. Having been subject to long continued grazing, thorny bush is now the predominant vegetation type. This "brush community," as it is called locally, has its greatest extent in Mexico and contains a greater and more distinct diversity of animal life than that found elsewhere in Texas. This ecoregion is characterized by smooth to irregular plains. Open woodland grazing, and subhumid grassland and semi-arid grazing are typical land uses for this area.

Table 21: Characteristic Vertebrate Species of Mesquite/Acacia and Mesquite/Live Oak Savannas in the Southern Texas Plains Ecoregion

Mammals

Least Shrew	<i>Cryptotis parva</i>
Leafchin bat	<i>Mormoops megalophylla</i>
Eastern pipistrel	<i>Pipistrellus subflavus</i>
Evening bat	<i>Nycticeius humeralis</i>
Hognose skunk	<i>Conepatus mesoleucus</i>
Mexican ground squirrel	<i>Spermophilus mexicanus</i>
South Texas pocket gopher	<i>Geomys personatus</i>
Fulvous harvest mouse	<i>Reithrodontomys fulvescens</i>
Pygmy mouse	<i>Baiomys taylori</i>
Southern plains woodrat	<i>Neotoma micropus</i>
Armadillo	<i>Dasybus novemcinctus</i>
Birds	
Mississippi kite	<i>Ictinia mississippiensis</i>
Black-shouldered kite	<i>Elanus caeruleus</i>
Harris hawk	<i>Parabuteo unicinctus</i>
Crested caracara	<i>Polyborus plancus</i>
Northern bobwhite	<i>Colinus virginianus</i>
Scaled quail	<i>Callipepla squamata</i>
Plain chachalaca	<i>Ortalis vetula</i>
Common ground-dove	<i>Columbina passerina</i>
Inca dove	<i>Columbina inca</i>
Groove-billed ani	<i>Crotophaga sulcirostris</i>
Ferruginous pygmy owl	<i>Glaucidium brasilianum</i>
Ringed kingfisher	<i>Ceryle torquata</i>
Green kingfisher	<i>Chloroceryle americana</i>
Golden-fronted woodpecker	<i>Melanerpes aurifrons</i>
Couchís kingbird	<i>Tyrannus couchii</i>
Scissor-tailed flycatcher	<i>Tyrannus forficatus</i>
Great kiskadee	<i>Pitangus sulphuratus</i>
Brown-crested flycatcher	<i>Myiarchus tyrannulus</i>
Chihuahuan raven	<i>Corvus cryptoleucus</i>
Verdin	<i>Auriparus flaviceps</i>
Black-tailed gnatcatcher	<i>Polioptila melanura</i>
Long-billed thrasher	<i>Toxostoma longirostre</i>
Sprague's pipit	<i>Anthus spragueii</i>
Varied bunting	<i>Passerina versicolor</i>

Botteri's sparrow	<i>Aimophila botterii</i>
Cassin's sparrow	<i>Aimophila cassinii</i>
Bronzed cowbird	<i>Molothrus aeneus</i>
Hooded oriole	<i>Icterus cucullatus</i>
Altamira oriole	<i>Icterus gularis</i>
Reptiles	
Barred tiger salamander	<i>Ambystoma tigrinum mavortium</i>
Plains narrow-mouthed toad	<i>Gastrophryne olivacea olivacea</i>
Texas toad	<i>Bufo speciosus</i>
Green toad	<i>Bufo debilis</i>
Rio Grande leopard frog	<i>Rana berlandieri</i>
Ornate box turtle	<i>Terrapene ornata ornata</i>
Yellow mud turtle	<i>Kinosternon flavescens</i>
Red-eared slider	<i>Pseudemys scripta elegans</i>
Texas spiny softshell	<i>Trionyx spiniferus emoryi</i>
Texas banded gecko	<i>Coleonyx brevis</i>
Texas earless lizard	<i>Cophosaurus texanus texanus</i>
Southern prairie lizard	<i>Sceloporus undulatus consobrinus</i>
Texas-spotted whiptail	<i>Cnemidophorus gularis</i>
Mexican hognose snake	<i>Heterodon nasicus kennerlyi</i>
Central coachwhip	<i>Masticophis flagellum testaceus</i>
Desert kingsnake	<i>Lampropeltis getulus splendida</i>
Texas long-nosed snake	<i>Rhinocheilus lecontei tessellatus</i>

3.2.18 Western Gulf Coastal Plain

This ecoregion is located along the southeastern border of Texas. The principal distinguishing characteristics of the Western Gulf Coastal Plain are its relatively flat coastal plain topography and mainly grassland potential natural vegetation. Potential natural vegetation is bluestem/sacahuista prairie (bluestem, cordgrass). Inland from this region the plains are more irregular and have mostly forest or savanna-type vegetation potentials. Largely because of these characteristics, a higher percentage of the land is in cropland than in bordering ecological regions. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. Recent urbanization and industrialization have become concerns in this region. This ecoregion is mostly used for cropland. However there is some cropland with grazing land.

3.2.19 Northern Montana Glaciated Plains

This ecoregion is located in northern Montana. Irregular plains characterize this ecoregion. The potential natural vegetation is grama/needlegrass/wheatgrass. Vertebrate species characteristic of these grasslands are listed in Table 22. Land uses include cropland and cropland with grazing land.

Table 22: Characteristic Vertebrate Species of Grama/Needlegrass/Wheatgrass in the Northern Montana Glaciated Plains Ecoregion	
Mammals	
Merriam Shrew	<i>Sorex merriami</i>
Long-legged myotis	<i>Myotis volans</i>
Western big-eared bat	<i>Plecotus townsendi</i>
Least weasel	<i>Mustela rixosa</i>
Black-footed ferret	<i>Mustela nigripes</i>
Swift fox	<i>Vulpes velox</i>
Blacktail prairie dog	<i>Cynomys ludovicianus</i>
Richardson ground squirrel	<i>Citellus richardsoni</i>
Thirteen-lined ground squirrel	<i>Citellus tridecemlineatus</i>
Wyoming pocket mouse	<i>Perognathus fasciatus</i>
Whitetail jackrabbit	<i>Lepus townsendi</i>
Pronghorn	<i>Antilocapra americana</i>
Birds	
Swainson's hawk	<i>Buteo swainsoni</i>
Ferruginous hawk	<i>Buteo regalis</i>
Prairie falcon	<i>Falco mexicanus</i>
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>
Gray partridge	<i>Perdix perdix</i>
Rock wren	<i>Salpinctes obsoletus</i>
Sprague's pipit	<i>Anthus spragueii</i>
Baird's sparrow	<i>Ammodramus bairdii</i>
McCown's longspur	<i>Calcarius mccownii</i>
Lark bunting	<i>Calamospiza melanocorys</i>
Reptiles	
Blotched tiger salamander	<i>Ambystoma tigrinum melanostictum</i>
Plains spadefoot	<i>Scaphiopus bombifrons</i>
Canadian toad	<i>Bufo hemiophrys</i>
Great plains toad	<i>Bufo cognatus</i>

Northern leopard frog	<i>Rana pipiens</i>
Short-horned lizard	<i>Phrynosoma douglassii</i>
Plains hognose snake	<i>Heterodon nasicus nasicus</i>
Eastern yellow-bellied racer	<i>Coluber constrictor flaviventris</i>
Bullsnake	<i>Pituophis melanoleucus sayi</i>
Red-sided garter snake	<i>Thamnophis sirtalis parietalis</i>
Plains garter snake	<i>Thamnophis radix</i>
Wandering garter snake	<i>Thamnophis elegans vagrans</i>
Prairie rattlesnake	<i>Crotalus viridis viridis</i>

3.2.20 Northwestern Glaciated Plains

This ecoregion is located in northeastern Montana, South Dakota and North Dakota. This ecoregion is comprised of irregular plains, plains with hills, and tablelands with moderate relief. The Northwestern Glaciated Plains ecoregion is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, drier, Northwestern Great Plains to the southwest. The southwestern boundary roughly coincides with the limits of continental glaciation. Scattered across this ecoregion is a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to as prairie potholes. The potential natural vegetation is wheatgrass/needlegrass. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. Land in this region is used for cropland or cropland with grazing land.

3.2.21 Northwestern Great Plains

This ecoregion is located in Montana, North Dakota, South Dakota, and Wyoming. The Northwestern Great Plains ecoregion encompasses the Missouri Plateau section of the Great Plains. This ecoregion encompasses plains with low to high hills, tablelands with moderate relief, and open low to high hills. It is a semi-arid rolling plain of shale and sandstone punctuated by occasional buttes. Potential natural vegetation includes wheatgrass/needlegrass, grama/needlegrass/wheatgrass, and wheatgrass/grama/buffalo grass. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. Native grasslands, largely replaced on level ground by spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation. Land uses include subhumid grassland and semi-arid grazing land.

3.2.22 Nebraska Sandhills

This ecoregion is located in Nebraska and South Dakota. The Nebraska Sandhills comprise one of the most distinct and homogenous ecoregions in North America. One of the largest areas of grass-stabilized sand dunes in the world, this region is generally devoid of cropland agriculture, and except for some riparian areas in the north and east, the region is treeless. Large portions of this ecoregion contain numerous lakes and wetlands and have a lack of streams. Open hills are

the dominant land-surface form for this ecoregion. Nebraska sand hills prairie (bluestem, sand reed) is the potential natural vegetation. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. Land uses include subhumid grassland and semi-arid grazing land.

3.2.23 Northeastern Great Plains

This ecoregion is located in central South Dakota, extending into North Dakota and Nebraska. This ecoregion includes smooth to irregular plains and tablelands with moderate relief. The potential natural vegetation is wheatgrass/needlegrass. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. The primary land use is cropland with grazing land.

3.2.24 Northern Glaciated Plains

This ecoregion is located in North Dakota, South Dakota, and Nebraska. The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial till. The subhumid conditions foster a transitional grassland containing tallgrass and shortgrass prairie. Wheatgrass/bluestem/needlegrass and bluestem prairie (bluestem, panic, indiagrass) are the two potential natural vegetation types. Vertebrate species in this area have not been identified because this ecoregion is not representative of arid or semi-arid climates. High concentrations of temporary and seasonal wetlands create favorable conditions for waterfowl nesting and migration. Though the till soils are very fertile, agricultural success is subject to annual climatic fluctuations. Cropland is the primary land use for this ecoregion.

3.3 Important Unmapped Units

Wetland areas, which are too small to be mapped at the scale of the Level III Ecoregion Map, are integral to the ecosystems that comprise these ecoregions. Emergent and riparian wetlands support unique communities of plants and animals. In addition, these areas provide travel corridors for larger species of wildlife. Birds utilize these areas as stopover points during migration and for breeding grounds.

Many wetlands are dependent upon effluent to support the vegetation and aquatic life that make them so distinct. Typical riparian vegetation may include sycamore, cottonwood, willow, seep willow, salt cedar, ash, and walnut. Emergent wetlands such as marshes support different types of vegetation. Vegetation components of these communities include sedges, rushes, cattails, and salt cedar.

4.0 ARID WEST DISCHARGERS

The *Basins* database provided NPDES permit numbers and locations of 4,515 permits within the 17 states. Of these, 1,001 were major municipal dischargers. Of the 1,001 major dischargers, 251 were identified in arid and semi-arid portions of the 17 states. This group of 251 permit holders received the initial mailing of questionnaires. Appendix B contains a listing of NPDES permit holders who received questionnaires.

Completed questionnaires were received or telephone interviews were conducted with 71 permit holders who discharge to ephemeral, intermittent, or effluent-dependent streams. This set of dischargers represents the core of the database and has been used for additional analysis. These 71 permit holders represent 76 NPDES permits and 78 wastewater discharge sites. Several permit holders have either two NPDES permits, one for each facility, or they have two facilities on one NPDES permit. Information was not available from an additional 37 permit holders that probably discharge to one of these stream types. The remaining 143 major dischargers in the database discharge to perennial streams, recycle all effluent, or otherwise do not discharge to intermittent, ephemeral, or effluent-dependent streams.

The core group of dischargers is distributed among 14 states. Although it is likely that there are dischargers among the 37 non-respondents in Oregon, Idaho, and Oklahoma that discharge to ephemeral, intermittent, or effluent-dependent stream reaches, information was not forthcoming from any discharger in those states. Table 23 summarizes the distribution of core group discharge sites among the 14 states according to EPA discharge permit limits.

Table 23: Distribution of Core Group Discharge Sites Among the Western States By EPA Discharge Permit Limits				
State	1-25 MGD	25-49 MGD	50-200 MGD	> 200 MGD
Arizona	12	0	4	0
California	11	2	0	0
Colorado	2	0	1	0
Kansas	2	0	0	0
Montana	2	0	0	0
North Dakota	0	1	1	0
Nebraska	1	0	0	0
New Mexico	10	0	0	0
Nevada	1	0	2	1
South Dakota	2	0	0	0
Texas	12	0	0	0
Utah	5	1	0	0
Washington	1	0	0	0

Wyoming	4	0	0	0
Totals	65	4	8	1

It is clear from examination of Table 23 and Figure 2 that the majority of wastewater treatment facilities in the arid West that discharge to ephemeral, intermittent, or effluent-dependent water courses are located in eastern California, Arizona, New Mexico, and west Texas. These four states are collectively home to 65 percent of the core group discharge sites. While these four states contain 65 percent of the core group, it is clear that dischargers that could fit into the core group are distributed throughout the arid West including in the states of Idaho, Oregon, and Oklahoma, none of whom responded to the survey. The largest actual dischargers in this group are located in Arizona, Colorado, and Nevada (Appendix C).

The core group of 71 NPDES permit holders along with questionnaire/interview data from each is included as Appendix C. Figure 2 illustrates the distribution of these permits in the arid West. It should be pointed out that there was considerable variability in the quality of responses to the questionnaire. Some respondents spent a considerable amount of time filling out the questionnaire, while others responded to a particular question with a single word. Not all respondents answered every question. Follow-up telephone interviews were conducted with a number of dischargers who did not return their questionnaires and a similar variability was found.

Also of note in Appendix C is the fact that not all dischargers indicated a discharge rate of 1 MGD or higher. Most of the discharge rates presented in Appendix C are reported rates as opposed to the permitted design discharges shown in Table 23. It should also be pointed out that some of the data collected for Appendix C in 1998 is no longer valid in 1999 and that some of the data that is valid in 1999 may not be valid in 2000. This is due to changes in discharge parameters at a number of wastewater facilities. For example, the original data indicated that the city of Goodyear, Arizona was discharging to the Agua Fria River at a rate of 1.5 MGD. However, in 1999 the city ceased discharging entirely. While this change is reflected in the information contained in Appendix C, it is highly likely that other dischargers have made similar changes of which we were not notified. Such changes can and do occur over very short periods of time and are often driven by the complex issues of water use, economies, and the regulatory climate in the western United States.

Appendix D is a summary of the type of receiving water for each of 14 states that includes one or more of the 71 core dischargers. Arizona, California, New Mexico, and Texas all have 10 or more permit holders that discharge to ephemeral, intermittent, or effluent-dependent streams. The following definitions were used to characterize receiving waters:

- **Watercourse** A natural or man-made channel, segment of channel, or reach of channel through which water flows. For the WQRP study purposes, watercourse will also include vegetation adjoining the channel.
- **Reach** A length of watercourse relatively uniform with respect to discharge, depth, width, and slope.

- **Segment** A part of a watercourse bounded by tributary junctions or discontinuities, such as major waterfalls, landform features, significant changes in gradient, or point source discharges.
- **Ephemeral** A watercourse that flows only at certain times of the year when it receives water from precipitation-derived surface water sources such as hyetal events and/or melting snow from mountainous areas. The watercourse does not come into contact with ground water, either spatially or temporally.
- **Intermittent** A watercourse that flows only at certain times of the year when it receives water from ground water and from precipitation-derived surface water sources such as hyetal events and/or melting snow from mountainous areas. The watercourse "intermittently" comes into contact with ground water, either spatially or temporally.
- **Perennial** A watercourse that flows continuously.
- **Effluent-Dependent** An ephemeral watercourse receiving effluent. A watercourse "relying" or "dependent" on effluent to maintain an aquatic ecosystem.
- **Effluent Dominant** A natural perennial or intermittent watercourse receiving the majority of its discharge from effluent. The watercourse is not "dependent" on effluent to maintain an aquatic ecosystem but effluent exerts ecological dominance over natural ambient discharge.

It is likely there was some confusion on the part of respondents as to the nature of their receiving waters. For example, there are several dischargers whose effluent goes into normally dry washes. When responding to the questionnaire, these dischargers indicated that their receiving water was effluent-dependent, not ephemeral. The relatively large number of respondents who indicated that their receiving water was effluent-dependent may be a reflection of this confusion. In many cases an effort was made during the narrative write-up phase of this study to clear up any confusion about receiving waters. This was accomplished primarily through telephone calls to the various dischargers in question on this issue. In some cases, however, two different answers were received from two different people at the same facility.

State designated beneficial uses of receiving waters were derived mostly from state 305b reports (Appendix E). If the information was unavailable in those reports, the designated beneficial uses were taken from the dischargers' responses to the questionnaire. Full or partial body contact, recreation, wildlife, and irrigation are three most frequently cited designated beneficial uses followed by aquatic life and livestock. Eight permit holders indicated that one designated beneficial use of their receiving water was threatened or endangered species.

Issues identified were also variable (Appendix F). Of current issues, twenty-three respondents indicated that nitrogen (NH_3 , NO_3 , TIN, and NH_4) was an issue, making nitrogen the only issue with any regional unanimity. Chlorine was the second most common issue, and it was identified by 13 respondents. Pesticides were identified by 10 respondents, followed by TMDL. Toxicity and biological criteria were the fifth most common issues identified. In responding to the question about potential future issues, nitrogen (mostly ammonia) was the most common concern. Metals was second, and dissolved solids and toxicity were third (Appendix F).

A large number of threatened, endangered, or otherwise sensitive species of plants and animals occur in counties where dischargers are located (Appendix G). It is likely that some of these

species are influenced by effluent discharge. Aquatic forms such as fish, amphibians, and some invertebrate species may be directly affected. Other forms including birds, bats and other small mammals, reptiles, and terrestrial invertebrates may be indirectly affected. The most significant indirect effect is related to habitats that may be supported by effluent. In some cases, riparian woodlands and emergent aquatic communities would not be present were it not for effluent discharge. Such habitats, especially in arid regions, can be of immense importance to resident and migratory wildlife, including state and/or federally listed species.

4.1 State by State Discharger Information

The narratives below were derived primarily from information provided on questionnaires completed by selected arid West wastewater dischargers and from telephone interviews with dischargers. In addition, some information was gleaned from state 305b reports and data contained within the EPA *Basins* database. In some cases, we received additional, updated information from dischargers following their review of the narratives Dames & Moore or the University of Arizona had prepared. Generally the material in each narrative is representative of information submitted to Dames & Moore Inc. The ecoregion information is taken from Omernik (1986). The issues of concern are taken directly from the questionnaires.

4.1.1 Arizona

Little Colorado River Watershed

Winslow

The Navajo County Public Works Wastewater Treatment Plant (WWTP) (AZ0023833) discharges into the Little Colorado River which is ephemeral above the WWTP discharge and within Little Colorado River Watershed. Discharge rates are unknown. From October to April effluent is discharged into the Little Colorado River, but during the growing season, effluent is utilized for crop irrigation. The WWTP might switch to land application year around. This reach of the Little Colorado River reach is within the Arizona/New Mexico Plateau Ecoregion (Omernik, 1986). The reach has natural channel banks with some riparian vegetation (salt cedar, cottonwoods, and willows). The channel is sandy and a half-mile wide. There is a rip-rap levee on the south side of river at the city limits. The discharger reported that land uses along the flood plain are cattle ranching and irrigated agriculture. Threatened and endangered species that may occur in Navajo County include the bald eagle (*Haliaeetus leucocephalus*), Parish's alkali grass (*Puccinellia parishii*) and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality has designated beneficial uses on the Little Colorado River as aquatic and wildlife for warm waters (A&Ww), full body contact (FBC), fish consumption (FC), agricultural livestock and irrigation (AgL & AgI), and drinking water (1996). An issue of concern identified by the WWTP is that permit limitations are severe given the current technology.

Little Colorado River Watershed (Canyon Diablo Sub-Watershed)

Flagstaff

The City of Flagstaff's Wildcat and Rio Reclamation WWTP (AZ0020427 and AZ0023639, respectively) discharge into the Rio de Flag. Rio de Flag is ephemeral above the effluent discharges and is within the Canyon Diablo Sub-Watershed of the Little Colorado River Watershed. Rio de Flag is located in Coconino County and is within the Arizona/New Mexico Mountains Ecoregion (Omernik, 1986). Discharges from the treatment facilities total about 5.5 MGD. The discharger indicated that this river reach has a natural channel, riparian vegetation, but no known threatened, endangered, or otherwise sensitive wildlife or plant species. The discharger reported that land uses along the flood plain are cattle ranching, recreation, and rural residential. Threatened and endangered species which may occur in the Coconino County include the bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), Parish's alkali grass (*Puccinellia parishii*) and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality reported that designated beneficial uses below the effluent discharge points are aquatic and wildlife for effluent-dependent waters (A&Wedw) and full body contact (FBC) (1996).

Verde River Watershed

Jerome

The Town of Jerome WWTP (AZ0021804) discharges wastewater into an unnamed wash that is a tributary to Bitter Creek. This unnamed wash is ephemeral above the discharge point and is within the Verde River Watershed. Discharge from the facility is about 0.04 to 0.06 MGD. Effluent discharge from the plant is not visible within 1.5 miles below the discharge point. The plant and receiving water are located in Yavapai County and are within the Arizona/New Mexico Mountain Ecoregion (Omernik, 1986). The wash has a natural channel with a heavy growth of blackberries. The discharger reported that land uses along the flood plain are wildlife habitat, rural, and residential. Threatened and endangered species which may occur in Yavapai County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) and the southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality (ADEQ) reported that designated beneficial uses for 2.5 miles below the treatment facility discharge point on Bitter Creek are aquatic and wildlife for effluent-dependent waters (A&Wedw) and partial body contact (PBC) (1996). Designated beneficial uses on Bitter Creek above the effluent discharge point are aquatic and wildlife for warm waters (A&Ww), partial body contact (PBC), and agricultural livestock (AgL) (ADEQ, 1996). The discharger reported that chlorine will be a concern until the plant is upgraded to UV disinfection. According to the discharger, the plant is experiencing difficulty meeting the new standards for BOD and BOD percent removal as well as for suspended solids and suspended solids percent removal. As a result of these new and higher standards, the plant is in the process of being upgraded. The discharger identified support of migrating birds and wildlife as well as the protection of riparian habitat as concerns of the community.

Payson

The City of Payson WWTP (AZ0020117) discharges wastewater into American Gulch which is within the Verde River Watershed. American Gulch is an intermittent stream above the treatment facility. There are no other water sources except springs and storm events. Discharge from the

treatment facility is about 1.25 MGD, and about seventy-five percent is reused or recycled during the summer. American Gulch is located in Gila County and is within the Arizona/New Mexico Mountain Ecoregion (Omernik, 1986). American Gulch has a natural channel with riparian vegetation (cattails, willows, etc.). Oak and walnut trees and brush predominate on the flood plain. The discharger indicated that land uses along the flood plain are wildlife habitat, recreation, and ranching. Threatened and endangered species that occur in Gila County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) and the southwestern willow flycatcher (*Empidonax traillii extimus*). The discharger indicated that no threatened, endangered or otherwise sensitive species of plants or animals are known to be present within the vicinity of the waterway used for discharge. The Arizona Department of Environmental Quality (ADEQ) reported that designated beneficial uses below the effluent discharge point are aquatic and wildlife for effluent-dependent waters (A&Wedw) and full body contact (FBC) (1996). Designated beneficial uses on American Gulch above the effluent discharge point are aquatic and wildlife for warm waters (A&Ww), full body contact (FBC), fish consumption (FC), and agricultural livestock and irrigation (AgL & AgI) (ADEQ, 1996). The discharger reported that issues of concern include water conservation, reuse, dependence on ground water, and recharge.

Salt River Watershed

City of Globe

The City of Globe WWTP (AZ0020249) discharges wastewater into Pinal Creek. Pinal Creek is ephemeral above the discharge point and is within the Salt River Watershed. Discharge from the treatment facility is about .65 MGD. Effluent discharge is visible for about 1.5 miles below the discharge point, then it disappears underground. Pinal Creek is located in Gila County and is within the Arizona/New Mexico Mountains Ecoregion (Omernik, 1986). Pinal Creek has a natural channel with riparian vegetation (cottonwood, willows, and salt cedar). There is also grass that is being affected by grazing. The discharger indicated that land uses along the flood plain include cattle ranching, rural residential, and mining. Threatened and endangered species which may occur in Gila County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) and the southwestern willow flycatcher (*Empidonax traillii extimus*). However, the discharger reports that no threatened, endangered, or otherwise sensitive plants or animals are known to be present in the vicinity of the waterway used for discharge. The Arizona Department of Environmental Quality (ADEQ) reported that designated beneficial uses below the effluent discharge point are aquatic and wildlife for effluent-dependent waters (A&Wedw) and partial body contact (PBC) (1996). Designated beneficial uses above the effluent discharge point are aquatic and wildlife for ephemeral waters (A&We), partial body contact (PBC), and agricultural irrigation and livestock (AgL and AgI) (ADEQ, 1996). The discharger reported that the Arizona Department of Transportation uses some wastewater for road construction and that ADEQ is using this reach for a Biocriteria Development Program. An issue of concern for the discharger is the anticipated nitrogen removal requirement in the future.

Middle Gila River Watershed (Salt River Sub-Watershed)

Mesa

The Northwest Water Reclamation WWTP (AZ0024031) discharges effluent into the Salt River. The Salt River is ephemeral above the discharge point by virtue of upstream dams and diversions. The Salt River is in the Salt River Sub-Watershed of Middle Gila Watershed. Discharge from the treatment facility is about 8.0 MGD. Seventy percent of the effluent is discharged to the Salt River, and thirty percent is discharged to percolation ponds. By the year 2000, all effluent will be diverted to percolation ponds and reused. The Salt River is within the Southern Basin and Range Ecoregion (Omernik, 1986). The City of Mesa is located in Maricopa County. The discharger reported that the Salt River at this location has a confined channel, no riparian vegetation, and no known sensitive plant or animal species. According to the discharger, land use along the flood plain is mostly urban residential. The City of Mesa is required by the Maricopa County Flood Control District to maintain the channel free of vegetation. Threatened and endangered species which may occur in Maricopa County include the bald eagle (*Haliaeetus leucocephalus*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), Yuma clapper rail (*Rallus longirostris yumanensis*), and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality reported that designated beneficial uses for this reach of the Salt River are aquatic and wildlife for ephemeral waters (A&We) and partial body contact (PBC) (1996). The only issue of concern identified by the City of Mesa is chlorination. Mesa will be using UV disinfection in the near future.

Phoenix

The City of Phoenix has two WWTPs. One is at 91st Ave. (AZ0020524), and the other is at 23rd Ave. (AZ0020559). Both plants discharge effluent into the Salt River. The 91st Ave. WWTP also discharges 25 to 50 MGD to the Palo Verde Nuclear Generating Station. The 23rd Ave. WWTP also discharges to the Roosevelt irrigation ditch and an unnamed ditch to a farm at 43rd Ave. The Salt River is ephemeral above both treatment facilities. This reach is within the Salt River Sub-Watershed of the Middle Gila Watershed. The Salt River is in the Southern Basin and Range Ecoregion (Omernik, 1986). Combined discharge from the two treatment facilities ranges from about 60 to 155 MGD. The 91st Ave. WWTP discharges about 60 to 105 MGD to the Salt River, and the 23rd Ave. WWTP discharges about 50 MGD for only three months of the year. Below the 23rd Ave. WWTP, effluent percolates into the alluvium within a few hundred yards. Nearly all flow below the 91st Ave. WWTP is diverted for irrigation about six miles downstream. At both WWTPs there is scarce vegetation in or near the channel at the discharge point. However, substantial riparian and emergent vegetation has developed further downstream. The river bed is dry except for storm-induced or heavy spring runoff. Bass, catfish, carp, shiners, *Gambusia*, *Talapia*, and other exotic fish are present in the river channel downstream of the 91st Avenue plant. The discharger reported that land uses along the flood plain are farming, sand and gravel mining, and auto recycling. The discharger reported that no sensitive species have been identified in the vicinity of the discharges. However, endangered species, including Yuma clapper rail, have been known to occur in riparian and emergent plant communities downstream of the 91st Avenue plant. The City of Phoenix is located in Maricopa County. Other threatened and endangered species which may occur in Maricopa County include the bald eagle (*Haliaeetus leucocephalus*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality (ADEQ)

reported that designated beneficial uses for this reach of Salt River are aquatic and wildlife for effluent-dependent waters (A&Wedw), fish consumption (FC), partial body contact (PBC), and agricultural irrigation and livestock (AgL and AgI) (1996). Concerns and issues identified by the permit holder include: lack of reference reaches for bioassessments; new criteria for bioaccumulative substances; minimum flows; Section 7 (USFWS) consultation process; increases in numbers of permit parameters; uncertainty over TMDLs and Waste Load Allocations; uncertainty over anti-degradation implementation; SSO enforcement policy implementation; and State water quality permitting and enforcement issues. The discharger identified protection of riparian habitat, support of migrating birds and wildlife, protection of endangered species, recreational activities, vectors, subsistence fishing, and groundwater contamination as concerns of the community.

Tolleson

The City of Tolleson WWTP (AZ0020338) discharges wastewater into the Salt River. The Salt River is effluent-dependent above the discharge point and is within the Salt River Sub-Watershed of the Middle Gila Watershed. The Salt River is within the Southern Basin and Range Ecoregion (Omernik, 1986). Discharge from the facility is about 4-5 MGD. At this location, the Salt River has a natural bank and channel with wildlife habitat and trees. The discharger indicated that land uses along the flood plain are farming, ranching, and residential. The City of Tolleson is located in Maricopa County. Threatened and endangered species which may be found in Maricopa County include the bald eagle (*Haliaeetus leucocephalus*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), southwestern willow flycatcher (*Empidonax traillii extimus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). The Arizona Department of Environmental Quality reported that designated beneficial uses for this reach of the Salt River are aquatic and wildlife for effluent-dependent waters (A&Wedw), fish consumption (FC), partial body contact (PBC), and agricultural irrigation and livestock (AgL and AgI) (1996). The only issue of concern identified by the discharger related to the quality of water for reuse.

Middle Gila Watershed (Agua Fria River Sub-Watershed)

Prescott Valley

The Prescott Valley WWTP (AZ0023761) discharges effluent into the Agua Fria River which is ephemeral above the discharge point. The Agua Fria River is within the Agua Fria River Sub-Watershed of the Middle Gila River Watershed. This reach of the Agua Fria River is within the Arizona/New Mexico Mountains Ecoregion (Omernik, 1986). Discharge from the facility is about 1.45 MGD. The river reach has a natural channel. According to the discharger, land uses on the flood plain are cattle ranching and rural residential. Prescott Valley is located in Yavapai County. Threatened and endangered species which may occur in Yavapai County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) and the southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality reported that designated beneficial uses above and below the effluent discharge point are aquatic and wildlife for warm waters (A&Ww), partial body contact (PBC), and agricultural irrigation and livestock (AgI and AgL) (1996). Issues of concern identified by the discharger include:

development of new sources of potable water supplies, providing quality wastewater suitable for groundwater recharge, and land application and disposal of solids.

Avondale

The Avondale WWTP (AZ0023281) discharges into the Agua Fria River which is effluent-dependent above the discharge point. The Agua Fria River is within the Agua Fria River Sub-Watershed of Middle Gila River Watershed and is also within the Southern Basin and Range Ecoregion (Omernik, 1986). Avondale is located in Maricopa County. Discharge from the facility is about 1.8 MGD. The river has natural banks with scrub oak and cattails. Minnows of unknown species are present in the river channel. The discharger reported that the land use on the flood plain is farming for livestock feed. Threatened and endangered species which may occur in Maricopa County include the bald eagle (*Haliaeetus leucocephalus*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), Yuma clapper rail (*Rallus longirostris yumanensis*), and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality reported that designated beneficial uses below the treatment facility are aquatic and wildlife for effluent-dependent waters (A&Wedw) and partial body contact (PBC) (1996). Avondale is satisfied with water quality standards.

Goodyear

The Goodyear WWTP (AZ0022357) discharges into the Agua Fria River which is ephemeral above the discharge point. The Agua Fria River is within the Agua Fria River Sub-Watershed of the Middle Gila River Watershed and the Southern Basin and Range Ecoregion (Omernik, 1986). Goodyear is located in Maricopa County. Discharge from this treatment facility is 0 MGD until a new permit is approved. Until recently, the WWTP discharged 1.5 MGD continuously. The river has rip-rap on the south bank and soil berm on the north bank with salt cedar. Land uses on the flood plain are rural and agriculture. The discharger indicated that the presence of threatened or endangered species is unknown but beaver, bobcat, javelina, herons, and others are present. Threatened and endangered species which may occur in Maricopa County include the bald eagle (*Haliaeetus leucocephalus*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), Yuma clapper rail (*Rallus longirostris yumanensis*), and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality reported that designated beneficial uses below the treatment facility are aquatic and wildlife for effluent-dependent water (A&Wedw) and partial body contact (PBC) (1996). Issues of concern for the treatment plant are: the parameters are too stringent, water quality requirements are above that of drinking water, the costs associated with unnecessary treatment, the need to base parameters on science, and pressure from environmental groups to reduce chlorination.

Santa Cruz River Watershed

Nogales

The Nogales International WWTP (AZ0020150) discharges into the Nogales Wash. The wash is an ephemeral tributary to an intermittent reach of the Santa Cruz River and is within the Southern Deserts Ecoregion (Omernik, 1986). Nogales Wash, above the discharge point, has low flows that are undesignated. The Nogales International WWTP services the cities of Nogales, Arizona and Nogales, Sonora, Mexico. The City of Nogales, Arizona is located in Santa Cruz County. Discharge from the treatment facility is about 15 MGD. The Santa Cruz River single flow channel is not incised. The channel is lined with a riparian (cottonwood, mesquite, paloverde, hemlock) corridor up to Tubac. The discharger reported that land uses on the flood plain are rural residential, recreation (Anza Trail), and agriculture. Longfin dace and Gila topminnow are present. Threatened and endangered species that may be found in Santa Cruz County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), Canelo Hills ladies' tresses (*Spiranthes delitescens*), Huachuca water umbel (*Lilaeopsis schaffneriana recurva*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) and southwestern willow flycatcher (*Empidonax traillii extimus*). The Arizona Department of Environmental Quality (ADEQ) reported that designated beneficial uses for the 9.3 miles of the Santa Cruz River below the WWTP effluent discharge are aquatic and wildlife for effluent-dependent waters (A&Wedw) and partial body contact (PBC) (1996). Designated beneficial uses above the WWTP discharge are aquatic and wildlife for warm waters (A&Ww), full body contact (FBC), drinking water supply (DWS) and agricultural irrigation and livestock (AgL and AgI) (ADEQ, 1996). The reach of the Santa Cruz River below Josephine Canyon to Sopori has two sets of designated beneficial uses; aquatic and wildlife for effluent-dependent water (A&Wedw) and partial body contact (PBC) for the first 5 miles and aquatic and wildlife for warm water (A&Ww), partial body contact (PBC), and agricultural livestock (AgL) for the last 8.6 miles. Issues of concern for the discharger are nutrient concentrations and impacts on the groundwater.

Tucson

Pima County is the regionally designated agency to provide public sanitary sewer service to all areas of Pima County. Currently, the Department provides wastewater collection and treatment service to the Tucson metropolitan area and to nine separate outlying service areas located in the eastern portion of the County. The Tucson metropolitan area consists of the cities of Tucson and South Tucson, the Town of Oro Valley, portions of the Town of Marana, and the unincorporated areas in proximity to these communities.

The Tucson metropolitan area is served by the Roger Road WWTP and the Ina Road Water Pollution Control Facility (WPCF). Both treatment facilities are located in Pima County. The Roger Road WWTP has a capacity of 41 MGD and produces disinfected/dechlorinated secondary effluent. Approximately 26 percent of the effluent is reused for golf course irrigation and in the City of Tucson's Reclaimed Water System (R-0011-10). The remaining 74 percent of the effluent is discharged into the Santa Cruz River channel (AZ0020923 and AZR00A368). The Roger Road WWTP has also been issued a draft APP permit (P-100655).

The Arizona Department of Environmental Quality has reported that designated beneficial uses of the river upstream of the Roger Road WWTP are aquatic and wildlife for ephemeral waters (A & We) and partial body contact (PBC) (1996). Designated beneficial uses below the Roger Road

WWTP are aquatic and wildlife for effluent-dependent waters (A & Wedw) and partial body contact (PBC).

The Ina Road WPCF has a current treatment capacity of 25 MGD and produces disinfected/dechlorinated secondary effluent. A major expansion and upgrade to the Ina Road WPCF was begun in 1998. This will add an additional 12.5 MGD of treatment capacity and a nitrification/denitrification process. Approximately 19 percent of the effluent is reused for turf or agricultural irrigation. The remaining 81 percent of the effluent is discharged into the Santa Cruz River channel (AZ0020001). An APP application has been submitted to ADEQ (P100630).

Designated beneficial uses above and below the Ina Road WPCF are aquatic and wildlife for effluent-dependent waters (A & Wedw) and partial body contact (PBC) (ADEQ, 1996). The discharger reported that issues of concern are nitrogen, concept of toxicity, narrative standards implementation, and SDWA source water protection.

Together, the two facilities have a combined treatment capacity of 66 MGD. Currently, wastewater flows to the metropolitan facilities are approximately 62 MGD. Wastewater Management has contracted a consultant to examine the Ina Road WPCF service area for additional potential reuse sites for the tertiary effluent to be produced by the expanded facility when completed.

The Santa Cruz River reach is within the Southern Basin and Range Ecoregion (Omernik, 1986). The discharger reported that land uses along the banks of the river are urban residential, recreation, sand and gravel mining, and some agriculture. The channel bottom consists mainly of sand. The single flow channel is moderately incised with steep, eroded or soil cemented banks. Bank protection (soil cement) extends from the Roger Road WWTP to downstream of Cortaro Road. Vegetation along the river is sparse and is predominantly riparian scrub woodland, occasional cottonwood seedlings, and mosquitofish. Threatened and endangered species which may occur in Pima County include the cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), Huachuca water umbel (*Lilaeopsis schaffneriana recurva*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*), and masked bobwhite (*Colinus virginianus ridgwayi*).

4.1.2 California

Southern California Coastal Basins Subregion

Riverside-Riverside County

The Riverside Regional Water Quality Control Plant (RWQCP) (CA0105350) discharges into the Santa Ana River. The stream is effluent-dependent above the RWQCP effluent discharge and is within the Southern and Central California Plains and Hills Ecoregion (Omernik, 1986). Discharge from the treatment plant is approximately 31 MGD. Upstream base discharge is fairly constant at about 25 MGD. The Santa Ana River is a shallow stream (6-18 in. deep) with a sand channel. Dissolved solids have ranged from 600-700 mg/L. Generally, there has been no acute or chronic toxicity. The discharger indicated that the downstream reach of the Santa Ana River is managed to maximize groundwater recharge that could be used as a water supply by the Orange

County Water District. Downstream land uses are wildlife habitat and residential. Giant cane (*Arundo* sp.) is predominant, but it is being removed and replaced with willows and cottonwoods. Large numbers of waterfowl inhabit the constructed wetlands. The discharger reported that the wetlands support the endangered least Bell's vireo (*Vireo bellii pusillus*) and soon to be listed Santa Ana sucker (*Catostomus santaanae*). Other threatened and endangered species which may occur in Riverside County include the bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Polioptila californica*), California red-legged frog (*Rana aurora draytonii*), Nevin's barberry (*Berberis nevinii*), western snowy plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumansis*). The California State Water Resources Control Board (CSWRCB) reported that designated beneficial uses for this reach of the Santa Ana River are groundwater recharge (GWR), water contact recreation (REC-1), non-contact water recreation (REC-2), warm freshwater habitat (WARM), wildlife habitat (WILD), and rare, threatened, and endangered species (RARE) (1996). Significant water quality concerns of the discharger include inappropriate aquatic toxic criteria; chronic WET limits; dissolved solids and their effects on water reuse; endangered species considerations; control of pesticides; Total Maximum Daily Load (TMDL) process; nitrates; compliance with criteria values below detection levels; and potential changes in mercury, selenium, and radiochemical criteria. Anticipated water quality permit issues are: the use of TMDLs to reduce permit limits, requirement of a greater level of monitoring, WET and other biomonitoring requirements, increased use of anti-degradation rules to decrease discharge, and increased enforcement to fund agencies. The discharger identified water reuse and ownership, protection of riparian habitat, protection of endangered species, and support of migrating birds and wildlife as concerns of the community.

Chino Basin Municipal Water District

Chino Basin Municipal Water District has two wastewater treatment facilities, Regional Plant No. 1 (RP-1) and Regional Plant No. 4 (RP-4) (CA0105279). Chino Basin Municipal Water District Regional Plant No. 1 has two discharge points. For the first discharge point (DP-001), effluent flows through a seven-mile 30 inch pipeline, discharges into a lake, and then flows over a spillway and enters Chino Creek which eventually discharges to the Santa Ana River via the Prado Dam flood-control basin. DP-002, a combined discharge point for RP-1 and RP-4, flows into the concrete-lined Cucamonga Flood Control Channel to Mill Creek and then to Chino Creek, which eventually discharges to the Santa Ana River via the Prado Dam flood-control basin. The Santa Ana River basin is within the Southern and Central California Plains and Hills Ecoregion (Omernik, 1986). Chino Basin is located in Riverside County. Average daily dry-weather effluent discharge from RP-1 and RP-4 is 19 MGD for DP-001 and 18 MGD for DP-002, respectively. The Santa Ana River is naturally an ephemeral stream. The river is now perennial due to the large number of WWTPs that discharge into it, therefore, this river is classified as effluent-dependent. In the Cucamonga Flood Control Channel, the dry-weather discharge is less than 1 MGD and storm discharge is between 500 and 4,500 MGD. In the summer, "nuisance water" results from storm-water runoff and irrigation. The Santa Ana River is a natural river with a sandy channel, occasional rip-rap, concrete, and natural banks. The downstream reach of the Santa Ana River is managed to maximize ground-water recharge that could be used for a water supply by the Orange County Water District. The discharger reported that downstream land uses include: wildlife habitat, two hunt clubs, a dog training kennel, golf course, and two regional

parks. Along the Santa Ana River, downstream of Prado Dam, there are mobile-home parks, residential developments, and a golf course. Threatened and endangered species which may occur in Riverside County include the arroyo southwestern toad (*Bufo microscaphus californicus*), bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Polioptila californica*), California red-legged frog (*Rana aurora draytonii*), Delhi sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*), Gambel's watercress (*Rorippa gambellii*), least Bell's vireo (*Vireo bellii pusillus*), Nevin's barberry (*Berberis nevinii*), western snowy plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). The California State Water Resources Control Board (CSWRCB) reported that designated beneficial uses for this reach of the Santa Ana River are municipal and domestic supply (MUN); water-contact recreation (REC-1); non-contact water recreation (REC-2); wildlife habitat (WILD); and rare, threatened, and endangered species (RARE) (1996). Significant water quality concerns of the discharger include ammonia, total-inorganic nitrogen, toxicity (pesticides, chlorine, etc.), chlorides, dissolved solids, and toxic metals. Among these concerns are a large dairy preserve with contaminated groundwater containing large nitrate concentrations, citrus-grove fertilizer runoff, and salts. An anticipated water quality/permit issue is dissolved solids.

San Bernardino

The Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority's Rapid Infiltration and Extraction (RIX) Facility (CA8000304) provides tertiary equivalent treatment for secondary effluents generated by the cities of Colton and San Bernardino, including the separate outlying service areas located in San Bernardino County. This also includes unincorporated areas of the County in proximity to these communities.

The cities of Colton and San Bernardino each have secondary wastewater treatment facilities with the capacity of 6.4 and 33 MGD, respectively. The un-disinfected effluent from these facilities is conveyed to the RIX facility for tertiary filtration and disinfection prior to discharge into Reach 4 of the Santa Ana River. The discharge is regulated by Order No. 93-45, NPDES No. CA8000304, as amended by Order No. 97-47 issued by the California Regional Water Quality Control Board, Santa Ana Region. The Santa Ana River is intermittent in this reach and is within the Southern and Central California Plains and Hills Ecoregion (Omernik, 1986).

Effluent that includes some groundwater is discharged continuously in the range of about 36-46 MGD. Reach 4 is a mix of highly channelized segments interspersed with short segments of relatively undisturbed, natural channels. Stream substrate ranges from shifting sand to cobble to concrete. Riparian vegetation is generally lacking and the absence of off-channel refugia limits fish populations in the area. Threatened and endangered species which may occur in San Bernardino County include the arroyo southwestern toad (*Bufo microscaphus californicus*), bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Polioptila californica*), California red-legged frog (*Rana aurora draytonii*), Delhi sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*), Gambel's watercress (*Rorippa gambellii*), least Bell's vireo (*Vireo bellii pusillus*), Nevin's barberry (*Berberis nevinii*), western snowy plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumanensis*).

The California State Water Resources Control Board reported that designated beneficial uses for Reach 4 are groundwater recharge (GWR), water contact recreation (REC-1), non-contact recreation (REC-2), warm freshwater habitat (WARM), wildlife habitat (WILD), and rare, threatened, and endangered species (RARE) (1996). The designated beneficial uses for upstream and downstream reaches include those listed for Reach 4 as well as agricultural use (AGR). Reach 5, upstream, also has municipal and domestic supply (MUN) as a beneficial use.

Issues of concern for the discharger are: the weak relationship of WET testing; unavailability of dilution credits to arid West dischargers; and regulation of nitrogen, total dissolved solids and pathogens. Anticipated water quality/permit issues are toxicity, non-point pollution remediation performance and by-products of disinfection, ever lowering permit limitations as detection limits are lowered, mis-application of Title 22 requirements, disinfection markers, and lack of recognition for reasonable potential analyses. The discharger identified recreational activities, protection of endangered species, and protection of riparian habitat as concerns of the community.

Yucaipa Valley

The Yucaipa Valley Water District's Henry N. Wockholtz WWTF (CA0105619) discharges to the San Timoteo Creek. San Timoteo Creek is an ephemeral stream above the treatment facility and is within the Southern and Central California Plains and Hills Ecoregion (Omernik, 1986). Yucaipa Valley is located in San Bernadino County. Effluent is discharged at about 3 MGD. San Timoteo Creek is a natural stream with a sandy, unconfined channel with associated riparian vegetation. The discharger indicated that downstream land uses include wildlife habitat and rural residential. Threatened and endangered species which may occur in San Bernadino County include the arroyo southwestern toad (*Bufo microscaphus californicus*), bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Polioptila californica*), California red-legged frog (*Rana aurora draytonii*), Delhi sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*), Gambel's watercress (*Rorippa gambellii*), least Bell's vireo (*Vireo bellii pusillus*), Nevin's barberry (*Berberis nevinii*), western snowy plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). The California State Water Resources Control Board reported that designated beneficial uses for this reach of the San Timoteo Creek are municipal and domestic supply (MUN), agricultural supply (AGR), industrial process supply (PRO), and industrial service supply (IND) (1996). Significant water quality concerns of the discharger are chlorine and salts. An anticipated water quality/permit issue is salt removal.

Tulare-Buena Vista Lakes Basins Subregion

City of Taft, Taft Heights, and Ford City Sanitation District Joint Sewage Treatment Facility and Taft Federal Prison Wastewater Treatment Plant

The City of Taft, Taft Heights, and Ford City Sanitation District Joint Sewage Treatment Facility (CA0080161) and the Taft Federal Prison WWTP (CA0083755) discharge to Sandy Creek which is within the Central California Valley Ecoregion (Omernik, 1986). The WWTPs are located in Kern County. The Joint Sewage Treatment Facility has a design capacity of 1.2 MGD and serves the Greater Taft metropolitan area. The flows are domestic/commercial in nature. There are no

major industrial contributors. The Taft Federal Prison WWTP serves a prison population of 3,000 and has a design capacity of 0.46 MGD.

Upstream of the treatment facilities, Sandy Creek is an intermittent stream in a natural channel that is dry most of the year. Except under unusual conditions, effluent from the Joint Sewage Treatment Facility is discharged to fallow land for percolation/evaporation. Effluent from the Taft Prison WWTP is discharged exclusively to Sandy Creek. The maximum design discharges to Sandy Creek are 1.2 MGD from the municipal plant and 0.46 MGD from the Taft Federal Prison WWTP. Downstream land use is rural and agriculture.

Endangered species present include kit fox (*Vulpes macrotis*) and blunt-nose leopard lizard (*Gambelia silus*). Other threatened and endangered species which may occur in Kern County include the giant garter snake (*Thamnophis gigas*), Kern Canyon slender salamander (*Batrachoseps simatus*), San Joaquin woollythreads (*Lembertia congdonii*), Techachapi slender salamander (*Batrachoseps stebbinsi*), western snowy plover (*Charadrius alexandrinus nivosus*), and yellow-blotched salamander (*Ensatina eschscholtzii croceator*). The California State Water Resources Control Board reported that designated beneficial uses for this reach of the Sandy Creek are non-contact water recreation (REC-2), wildlife habitat (WILD), preservation of rare and endangered species (RARE), and groundwater recharge (GWR) (1996). The discharger reported that since there are no flows during the dry season, Sandy Creek does not support fish life. Therefore, effluent and receiving water limitations designed to protect only fish are omitted from the permit. The discharger indicated that an anticipated water quality/permit issue is the expansion of the municipal WWTP in the near future. Other issues the plant is facing include secondary treatment regulations for BOD, TSS, settleable solids, total coliform organisms, and pII and EC based on 40 CFR 133 California Tulare Lake Basin Plan and California Inland Surface Waters Plan.

Visalia

The City of Visalia WWTP (CA0079189) discharges to Mill Creek at a rate of about 10 MGD. Mill Creek is ephemeral above the treatment plant and is within the Central California Valley Ecoregion (Omernik, 1986). Mill Creek has natural banks along a riparian corridor. Effluent from the creek is used for irrigation of non-edible crops and walnuts and is stored in ponds for groundwater recharge. The discharger reported that downstream land use is primarily agricultural. The City of Visalia is located in Tulare County. Threatened and endangered species which may be found in Tulare County include the blunt nosed leopard lizard (*Gambelia silus*), Kern canyon slender salamander (*Batrachoseps simatus*), little Kern golden trout (*Oncorhynchus mykiss whitei*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and western snowy plover (*Charadrius alexandrinus nivosus*). The California State Water Resources Control Board has not designated beneficial uses for this reach of Mill Creek (1996). The discharger is not aware of any threatened or endangered species in the area. A significant water quality concern of the discharger is the impact of industrial waste, specifically salts from olive brine (high conductivity and lye). There are also concerns about nitrates. Anticipated water quality/permit issues are surface-water and groundwater degradation by salts.

Lower Colorado River/Salton Sea Basins

Coachella Valley Water District

The Coachella Valley Water District (CVWD) operates six Wastewater Reclamation Plants (WRPs) within the Coachella Valley of southern California. Three of the plants provide recycled water to golf courses and greenbelts. Two others in remote areas discharge to evaporation ponds. The sixth WRP is the only one that discharges to a water body. Wastewater Reclamation Plant 4, officially called the Mid-Valley Water Reclamation Facility, is covered by NPDES Permit CA 0104973 and California Regional Water Quality Control Board (CRWQCB) Region 7 Order No. 95-026, and discharges to the Coachella Valley Stormwater Channel (CVSC), an effluent-dependent stream which is dominated by agricultural drainage. This plant is located in Riverside County, and is within the Southern Basin and Range Ecoregion (Omernik, 1986). WRP 4 has a current capacity of 5.8 MGD and operates at approximately 56 percent of design flow. Treatment is by aerated lagoon and polishing pond, and prior to discharge to the CVSC the effluent is chlorinated and dechlorinated.

The CVSC is a 24-mile extension of the Whitewater River, an ephemeral stream. It was created prior to 1950 to direct the flow of flood waters from the northwest section of the Coachella Valley as well as from canyons surrounding the southeast portion. It was immediately put to use for irrigation drainage as well because its terminus was the Salton Sea, which had been declared an agricultural sump in the 1930ís by presidential proclamation. The channel averages approximately 100 feet in width and in most places has a sand bottom. Bank protection is in place in the upper reaches. Threatened and endangered species which may occur in Riverside County include the bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Polioptila californica*), California red-legged frog (*Rana aurora draytonii*), least Bell's vireo (*Vireo bellii pusillus*), Nevin's barberry (*Berberis nevinii*), western snow plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumansis*).

The designated beneficial uses for the CVSC are fresh water replenishment for the Salton Sea (FRSH) (CVSC contributes approximately 10 percent of the annual flows to the Sea.); water contact recreation (REC-1); non-contact water recreation (REC-2); warm water habitat (WARM); wildlife habitat (WILD); and preservation of rare, endangered, or threatened species (RARE) (CRWQCB, 1996). However, because this is an effluent-dependent stream, CVWD has objected to these classifications. Of particular concern to the discharger are the recreation use designations because they involve trespass and would not be available at all if not for the continued flow of agricultural drainage.

Valley Sanitary District

The Valley Sanitary District WWTP (CA0104477) discharges to the Coachella Valley Storm Channel which drains into the Salton Sea. The storm channel is effluent-dependent below the outfall and is within the Southern Basin and Range Ecoregion (Omernik, 1986). The WWTP is located in Riverside County. Average monthly discharge is 3.5 to 4.8 MGD and daily discharge ranges from near zero to 5.2 MGD. In general, there is no flow upstream of the discharge point, therefore the receiving water is classified as ephemeral. During storm events, storm-water discharge can range from very small to substantial. The duration of storm events is usually a few days or less. The majority of the channel below the discharge point is an earthen ditch, cleared of

vegetation on an annual basis with the exception of the pilot channel. The pilot channel cannot be dredged or have the vegetation mechanically disturbed, but it can be sprayed with herbicide. Salinity at the point of discharge is equivalent to the treatment plant discharge as are other chemical parameters. Discharge can be characterized by dissolved solids of 500 mg/l, a pH of 6.8-7.2, a carbonaceous biological-oxygen demand of 3-24 mg/l, and total-suspended solids of 4-26 mg/l. The discharger reported that downstream land uses are wildlife habitat, irrigated agriculture, and rural residential. Threatened and endangered species which may occur in Riverside County include the bald eagle (*Haliaeetus leucocephalus*), California gnatcatcher (*Poliophtila californica*), California red-legged frog (*Rana aurora draytonii*), least Bell's vireo (*Vireo bellii pusillus*), Nevin's barberry (*Berberis nevinii*), western snowy plover (*Charadrius alexandrinus nivosus*), and Yuma clapper rail (*Rallus longirostris yumansis*). The California State Water Resources Control Board reported that designated beneficial uses for this reach are fresh-water replenishment for the Salton Sea (FRSH); water-contact recreation (REC I); non-contact water recreation (REC II); warm-water habitat (WARM); wildlife habitat (WILD); and rare, endangered, or threatened species (RARE) (1996). Significant water quality concerns for the discharger are toxicity compliance resulting from effluent-dominated streams not having dilution allowance and ammonia toxicity. Anticipated water quality/permit issues are ammonia limit and dissolved solids due to increasing salinity in the Salton Sea.

Calexico

The City of Calexico has two wastewater treatment facilities (CA0104418), Wastewater Treatment Plant No. 1 (WTP-1) and Wastewater Treatment Plant No. 2 (WTP-2). Both WTP-1 & WTP-2 discharge to the New River which is within the Southern Basin and Range Ecoregion (Omernik, 1986). The combined discharge of the two plants is about 2.4 MGD. The New River above the treatment facilities is perennial (effluent-dependent) with a discharge ranging from 20 to 200 MGD and originating in Mexico. The New River has a non-reinforced soil channel and banks with associated riparian vegetation and aquatic and terrestrial wildlife. The turbidity is very high. The discharger indicated that downstream land uses are rural/urban residential and wildlife habitat. The Calexico wastewater treatment plants are located in Imperial County. Threatened and endangered species which potentially occur in Imperial County include the California black rail (*Laterallus jamaicensis coturniculus*), Colorado squawfish (*Ptychocheilus lucius*), desert pupfish (*Cyprindon macularius*), razorback sucker (*Xyrauchen texanus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). The California State Water Resources Control Board reported that designated beneficial uses for this reach are fresh-water replenishment for Salton Sea (FRSH); water-contact recreation (REC I); non-contact water recreation (REC II); warm-water habitat (WARM); wildlife habitat (WILD); and rare, endangered, or threatened species (RARE) (1996). Significant water quality concerns for the discharger are pesticides, metals, used oil, and gasoline. There are no anticipated water quality/permit issues.

Calipatria

The City of Calipatria WWTP (CA0105015) discharges to a drainage ditch that leads to the Alamo River, and ultimately to the Salton Sea. The Alamo River is effluent-dependent upstream of the plant and is within the Southern Basin and Range Ecoregion (Omernik, 1986). Discharge

is 1 MGD. The Alamo River bed is dirt down to a depth of 13 feet. Along the river there is salt cedar, bamboo, weeds, reeds, water grasses, but no trees, fish, or birds. The discharger indicated that downstream land use is agriculture. The Calipatria WWTP is located in Imperial County. Threatened and endangered species which potentially occur in Imperial County include the California black rail (*Laterallus jamaicensis coturniculus*), Colorado squawfish (*Ptychocheilus lucius*), desert pupfish (*Cyprinodon macularius*), razorback sucker (*Xyrauchen texanus*), and Yuma clapper rail (*Rallus longirostris yumanensis*). The California State Water Resources Control Board reported that designated beneficial uses of the water are irrigation (AgI) and marine habitat (1996).

4.1.3 Colorado

Unidentified Watershed

City of Colorado Springs

The City of Colorado Springs Security Sanitation District WWTF (CO0024392) discharges 1.5 MGD to Fountain Creek. This facility is located within the Southwestern Tablelands Ecoregion (Omernik, 1986). Above the WWTP effluent discharge, Fountain Creek is an effluent-dependent creek that runs mostly during spring runoff. Below the WWTP discharge, the Creek is effluent-dependent. It is predominantly effluent during the summer. Fountain Creek has a natural slate bed and does not have reinforced banks. Erosion has occurred. The terrestrial landscape is prairie with 20 to 30 year old cottonwood trees present. The creek is characterized as having very little vegetation. Wildlife species present include: fox, deer, skunk, raccoon, bald eagle, and snails. The discharger reported that downstream land use is residential, industrial, and wildlife refuges. The City of Colorado Springs WWTP is located in El Paso County. Threatened and endangered species which may occur in El Paso County include the Arkansas darter (*Etheostoma cragini*), Mexican spotted owl (*Strix occidentalis lucida*), Preble's meadow jumping mouse (*Zapus hudsonius preblei*), and Ute ladies' tresses (*Spiranthes diluvialis*). The discharger indicated that agriculture is the designated beneficial use of the receiving waterways. According to the discharger, Fountain Creek does not pass WET testing. Both erosion control and ammonia-nitrate removal are significant water quality concerns for this facility. There are no anticipated water quality/permit issues.

Colorado Springs

The Colorado Springs Utilities Las Vegas WWTF (CO0026735) discharges an unknown amount to Fountain Creek, which is effluent-dependent above the discharge point. This facility is located within the Southwestern Tablelands Ecoregion (Omernik, 1986). The discharger reported that designated beneficial uses of the receiving waterways include: warm water aquatic life class 2, water supply, recreation class 2, and agriculture. Downstream uses are predominantly rangeland, small suburban/urban areas, and limited irrigated agriculture along the stream margin. Recreation is limited to hiking and watchable wildlife on public lands.

Colorado Springs is located within a transition zone between montane and plains ecosystems. Upstream conditions are characterized by a mixture of high gradient streams flowing through

granite and low gradient streams incised in sand and shale. Downstream conditions are characterized by an incised channel within aeolian sand with severe lateral channel extension. Turbidity and suspended sediment concentrations are high throughout much of the watershed. Bottom substrate is predominantly shifting sand and fine gravel. Pools and undercut banks are extremely rare.

Salinity in the creek is low in montane reaches and increases with the distance downstream. The water is alkaline with a pH of approximately 8. Metal concentrations are generally below water quality standards, except for selenium, which is enriched in the plains reaches. Organics are generally below levels of detection except for some pesticides and PAHs during storm events.

Riparian vegetation consists of a narrow thread of willow and cottonwood. Aquatic organisms found in the creek include midges, worms and some mayflies. Fish found in the creek are predominantly minnows (Cyprinidae). Waterfowl, songbirds, reptiles, amphibians, and some beavers are present. The state endangered fish (Arkansas darter) is found in the creek's small tributaries. The Colorado Springs Utilities Las Vegas WWTP is located in El Paso County. Other threatened and endangered species which may occur in El Paso County include the Mexican spotted owl (*Strix occidentalis lucida*), Preble's meadow jumping mouse (*Zapus hudsonius preblei*), and Ute ladies' tresses (*Spiranthes diluvialis*).

Specific water quality concerns for this facility include: ammonia, food web bioaccumulation of selenium, selenium toxicity to wildlife, the adequacy of existing methodologies of biological assessment and bio-criteria, and the reliability of and relevance of whole effluent toxicity testing in stream. A general concern is that chemical criteria and whole effluent toxicity testing tend to drive regulatory decisions regardless of whether low-level toxicity is a major factor governing the structure of in-stream communities. Habitat limitations are far more significant than chemical exposure for this facility. Anticipated quality/permit issues include: possible TMDLs for selenium, sulfate, manganese, iron and ammonia; adoption of state guidance for assessing compliance with a narrative standard for sediment deposition; and public fishing in effluent fed irrigation reservoirs (water quality standards for water and fish ingestion).

Denver

The Metro Wastewater Reclamation District's central treatment plant (CO0026638) discharges to the South Platte River, Segment 15 (COSPUS15), which is located within the Western High Plains Ecoregion (Omernik, 1986). The annual average effluent discharge is 140 to 150 MGD. Discharge is continuous with a daily variation of 60 MGD to 190 MGD. The discharger reported that designated beneficial uses of the receiving waterways are recreation class 2, warm water aquatic life class 2, and water supply and agriculture. Uses of downstream areas include rural/agriculture, gravel mining and water storage, residential, recreation, and limited developed urban areas.

The river is ephemeral. There are irrigation diversions and no on-stream reservoirs. For a "normal" water year the following would be the typical river pattern (not including the district's effluent):

Spring Runoff Season (April July)	400-1,500 cfs
Agricultural Irrigation Season (July September)	200-400 cfs
Winter Season (September April)	10-100 cfs

During the winter season an upstream irrigation company has senior water rights and typically diverts all flow from the river above the district's discharge. For the purposes of this survey, if the flow of the receiving water is regulated and is predominantly effluent, but the watercourse is not in contact with the water table and periodically dries out due to agricultural diversions or dams, the receiving water is considered to be ephemeral.

The annual "average" flows for the South Platte are relatively high because of the spring runoff and periodic thunderstorm/wet weather events. These annual averages are uncharacteristic of the stream and should not be used for analysis. The geometric mean of upstream flow is less than 50 cfs; this is more appropriate to use as a characteristic upstream flow.

The river channel is fairly broad in some areas and confined in others. Typically it is bounded within earth/sand berms with dumped concrete rubble to resist erosion (particularly of agricultural lands). It is also characteristic to have engineered reinforcement (placed large rock and grade control structures) near man-made structures (roads/bridges, utilities, irrigation diversions, water storage, etc.). In the first 5 miles downstream of the discharge the bottom tends to be sandy/cobble. Past 5 miles downstream the bottom is predominantly a shifting sand bottom. High flow events (especially high runoff years) will shift the low-flow channel significantly from year to year.

Riparian vegetation is minimal and consists of a few overhanging trees, old cottonwood stands, and some areas of willow growth. Deer, raccoon, muskrat, red fox, beaver, coyotes, and other similar agricultural/urban species are present. Migratory birds, including ducks (especially during winter), are found at the river. At least 26 species of fish are found in the river. Threatened and endangered species present include Preble's meadow jumping mouse (*Zapus hudsonius preblei*), Ute ladies' tresses orchid (*Spiranthes diluvialis*), and the bald eagle (*Haliaeetus leucocephalus*).

A significant water quality concern for this facility is bioaccumulation of constituents into fish and second level species. This includes selenium, mercury, and probably organics that have not been identified. Of most concern are naturally occurring constituents, airborne constituents, and constituents that are ubiquitous in POTW effluent. Another issue is the ammonia standard. There are proposed revisions to the criteria document, and other direct proposals have been made for ammonia control. This facility is also concerned with "generic" control of nitrogen and phosphorus compounds without consideration of whether there is a specific harm to a classified use. Biological criteria is another issue. The discharger feels that this is especially true when considering criteria written by the EPA for East Coast streams without considering the arid West, effluent-dependent streams. Immediate permit issues that are being addressed are: dissolved oxygen in stream, pH, disinfection/fecal coliform issues, and copper TMDL.

4.1.4 Kansas

Unidentified Watershed

Garden City

The Garden City WWTP (KS0038962) discharges 2.0 MGD to an unclassified tributary of the Arkansas River that is ephemeral above the discharge point. The facility is located within the Western High Plains Ecoregion (Omernik, 1986). Uses of downstream areas are wildlife habitat, rural, and agriculture. The receiving water is generally dry and has natural banks and a riparian corridor. Deer and other wildlife are present. The discharger reported that there are no threatened or endangered species present in the area. Garden City is located in Finney County. Threatened and endangered species potentially occurring in Finney County include the bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), gray bat (*Myotis grisescens*), Neosho madtom (*Noturus placidus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), and whooping crane (*Grus americana*). The discharger indicated that the designated beneficial uses of the river are unclassified. A significant water quality concern of this facility is pesticides from agriculture. The facility reported that an anticipated water quality issue is the potential presence of ammonia and fecal coliforms due to a proposed upstream hog farm.

Liberal

The City of Liberal WWTP (KS0080870) discharges 2.5 MGD to a tributary of the Cimmaron River Basin. The receiving waterway is generally dry and is ephemeral above the discharge point. This facility is located within the Western High Plains Ecoregion (Omernik, 1986). Downstream areas are used for rural and agriculture. The receiving waterway has natural banks and riparian vegetation. Deer and other terrestrial wildlife are present. The discharger reported that there are no threatened or endangered species present in the area. The City of Liberal is located in Seward County. Threatened and endangered species potentially occurring in Seward County include the bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), gray bat (*Myotis grisescens*), Neosho madtom (*Noturus placidus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), and whooping crane (*Grus americana*). The discharger indicated that the designated beneficial uses of the receiving water are unclassified. A significant water quality concern for this facility is chlorinating effluent for downstream irrigation uses.

4.1.5 Montana

Unidentified Watershed

Conrad

The City of Conrad WWTP (MT0020079) discharges into a dry fork of the Marias River which is effluent-dependent above the WWTP discharge as a result of irrigation return flows. Discharge from the treatment facility is about 0.4 MGD. The WWTP is located within the Northern Montana Glaciated Plains Ecoregion (Omernik, 1986). There are cattails and wetland plants along the river. The discharger indicated that downstream land use is agriculture and ranching.

The City of Conrad is located in Pondera County. Threatened and endangered species which may occur in Pondera County include bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), peregrine falcon (*Falco peregrinus*), Ute ladies' tresses (*Spiranthes diluvialis*), and water howellia (*Howellia aquatilis*). The discharger reported that the designated beneficial use of the Marias River is irrigation (AgI). The only water quality/permit issue for the facility is that the lagoon may have to be cleaned in the near future.

Helena

The City of Helena WWTP (MT0022641) discharges into a channel that flows into Prickley Pear Creek. Prickley Pear Creek is intermittent above the WWTP. Discharge from the treatment facility totals 3-4 MGD. This facility is located in the Montana Valley and Foothill Prairies Ecoregion (Omernik, 1986). This river reach has a natural channel with riparian vegetation and pastures. According to the discharger, deer are present in this reach, but no threatened or endangered species are present along the river. Land use downstream is solely agricultural during the summer. The discharger reported that Prickley Pear Creek has not been designated for any uses. An issue of concern identified by the discharger was ammonia. This facility is spending \$10 million to upgrade, and the receiving water is not classified as a fishery. The reclassification of the creek as a fishery is one of the permitting issues this plant may face in the future.

4.1.6 Nebraska

South Platte River Basin

Sidney

The City of Sidney WWTP (NE0023884) discharges 0.7 MGD to Lodgepole Creek, an intermittent stream located in the South Platte River Basin. This facility is located within the Western High Plains Ecoregion (Omernik, 1986). Use of downstream areas is agriculture. Lodgepole Creek has natural banks. The terrestrial environment is characterized as native grassland. Terrestrial and aquatic wildlife present include deer and minnows. The City of Sidney is located in Cheyenne County. Threatened and endangered species which may be found in Cheyenne County include the bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), pallid sturgeon (*Scaphirhynchus albus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), Ute ladies' tresses (*Spiranthes diluvialis*), western prairie fringed orchid (*Platanthera praeclara*), and whooping crane (*Grus americana*). The State of Nebraska Department of Environmental Quality (1996) reported that designated uses for Lodgepole Creek include aquatic life, water supply (agriculture), and aesthetics. A significant water quality concern of the facility is fecal coliforms which result from runoff from feedlots, pesticides, and fertilizers. Anticipated water quality/permit issues are ammonia standards and stricter toxicity standards.

4.1.7 Nevada

Stream-segment classifications and beneficial use designations are those identified in the State of Nevada, Nevada Administrative Code (NAC), (1998). For Lake Mead and the Colorado River,

both the States of Nevada and Arizona have selective bi-lateral purview over water quality standards. Lake Mead and the Colorado River are divided along the center line of the channel (political boundary) and the States only have purview over their respective political dominion.

Lower Colorado River Basin

Boulder City

The Boulder City WWTP (NV0021288) discharges into a lagoon system which discharges into an unnamed natural wash that flows into Lake Mead. The wash is ephemeral above the WWTP discharge point and is within the lower Colorado River Watershed and the Southern Basin and Range Ecoregion (Omernik, 1986). Discharge from the treatment facility is about 1.1 to 1.4 MGD. The receiving water has natural banks and channel with desert scrub vegetation along the flood plain. The discharger reported that land uses along the flood plain are open desert with some sand and gravel operations. The Boulder City WWTP is located in Clark County.

Threatened and endangered species which may be present in Clark County include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and Independence Valley speckled dace (*Rhinichthys osculus lethoporus*). The State of Arizona designated beneficial uses for Lake Mead are aquatic and wildlife for cold waters (A&Wc), full body contact (FBC), fish consumption (FC), domestic water supply (DWS) and agricultural livestock and irrigation (AgL & AgI) (ADEQ, 1996). Issues of concern for the discharger are acquiring a State of Nevada permit instead of a federal permit and algal problems in the lagoons. WWTP personnel noted that regulations are perceived to be fair. Changes in the new permit in regards to the reuse of water are anticipated.

Clark County

The Clark County Sanitation District provides services to the unincorporated areas of Clark County specific to the Las Vegas area. The Clark County Sanitation District works in conjunction with the Nevada Division of Environmental Protection (Permit #NV0021261) to discharge treated sewage into the Las Vegas Wash. Las Vegas Wash is a tributary to Lake Mead that flows into Las Vegas Bay. Discharge from the treatment facility is currently averaging about 65 MGD with another 8 MGD of reclaimed water being reused by Nevada Power and several golf courses.

The Las Vegas Wash is an effluent-dependent waterway upstream and downstream of the Districts discharge point. Las Vegas Wash is within the Lower Colorado River Watershed and the Southern Basin and Range Ecoregion (Omernik, 1986). Total effluent discharge to Las Vegas Wash from all dischargers (Clark County Sanitation District, City of Las Vegas Water Pollution Control Facility, and Henderson) is about 150 MGD with about 10 MGD of continuous flow from urban runoff (lawns and golf courses). Land uses of the downstream areas are primarily wetlands and recreation with surrounding areas of urban residential and industrial. Las Vegas Wash has scoured soil banks with desert riparian and wetland areas. The discharger reported that resident and migratory waterfowl and small animals are present. Threatened and endangered species which may be present in Clark County include the bald eagle (*Haliaeetus*

leucocephalus), peregrine falcon (*Falco peregrinus*), and Independence Valley speckled dace (*Rhinichthys osculus lethoporus*).

The State of Nevada's designated beneficial uses for Las Vegas Wash are propagation of aquatic life (excluding fish), propagation of wildlife, irrigation, watering of livestock, recreation not involving contact with water, and maintenance of a freshwater marsh (1998). Designated beneficial uses of the Las Vegas Bay are the same as for Las Vegas Wash with the exception of maintenance of a freshwater marsh and the addition of industrial supply and propagation of aquatic life (including a warm water fishery) (NAC, 1998). Clark County's water quality concerns are chlorophyll-a, nutrient loading, suspended sediment, estrogens (including treatment), and bacteria in storm water. Anticipated permit issues for the facility include more stringent requirements regarding total nitrogen, metals, dissolved solids, pathogens and possible chronic toxicity testing.

Henderson

The Henderson Water Reclamation Facility (NV0022098) discharges to Las Vegas Wash, a tributary to Lake Mead that flows into Las Vegas Bay. Depending on reuse demands, discharge from the facility varies from 5 to 13 MGD. Las Vegas Wash is effluent-dependent above the effluent discharge point and is within the Lower Colorado River Watershed and the Southern Basin and Range Ecoregion (Omernik, 1986). Total effluent discharge to Las Vegas Wash from all dischargers (Clark Co., Las Vegas, and Henderson) is about 150 MGD with about 10 MGD of continuous flow from urban runoff (lawns and golf courses). Las Vegas Wash has soil banks and wetland areas with cottonwoods, bullrush, cattail, and salt cedar. The discharger reported that there is one threatened or endangered fish in the wash. Land uses of downstream areas are warm water fishery, wildlife propagation, agriculture, livestock watering, drinking water supply, bathing, water contact sports, and industrial supply. Henderson is located in Clark County. Threatened and endangered species that may be present in Clark County include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and Independence Valley speckled dace (*Rhinichthys osculus lethoporus*). The State of Nevada's designated beneficial uses for Las Vegas Wash are propagation of aquatic life (excluding fish), propagation of wildlife, irrigation, watering of livestock, recreation not involving contact with water, and maintenance of a freshwater marsh (1998). Designated beneficial uses of the Las Vegas Bay are the same as for Las Vegas Wash with the exception of maintenance of a freshwater marsh and the addition of industrial supply and propagation of aquatic life (including a warm water fishery) (NAC, 1998). The State of Arizona designated beneficial uses for Lake Mead are aquatic and wildlife for cold waters (A&Wc), full body contact (FBC), fish consumption (FC), domestic water supply (DWS) and agricultural livestock and irrigation (AgL & AgI) (ADEQ, 1996). Issues of concern identified by the discharger are total inorganic nitrogen, estrogenic compounds, erosion of receiving water streambed, and chlorine. Anticipated permit issues are nitrates, total inorganic nitrogen, and *E. coli*.

Las Vegas

The City of Las Vegas WPCF (NV0020133) discharges into Las Vegas Wash, a tributary to Lake Mead, that flows into Las Vegas Bay. Discharge from the treatment facility is about 66

MGD. Las Vegas Wash is effluent-dependent above the effluent discharge point and is within the Lower Colorado River Watershed and the Southern Basin and Range Ecoregion (Omernik, 1986). Total effluent discharge to Las Vegas Wash from all dischargers (Clark Co., Las Vegas, and Henderson) is about 150 MGD with about 10 MGD of continuous flow from urban runoff (lawns and golf courses). Las Vegas Wash has scoured dirt banks with desert riparian and wetland areas. The discharger reported that resident and migratory waterfowl and small animals are present. The City of Las Vegas is located in Clark County. Threatened and endangered species which may be present in Clark County include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and Independence Valley speckled dace (*Rhinichthys osculus lethoporus*). The State of Nevada's designated beneficial uses for Las Vegas Wash are propagation of aquatic life (excluding fish), propagation of wildlife, irrigation, watering of livestock, recreation not involving contact with water, and maintenance of a freshwater marsh (NAC, 1998). Designated beneficial uses of the Las Vegas Bay are the same as for Las Vegas Wash with the exception of maintenance of a freshwater marsh and the addition of industrial supply and propagation of aquatic life (including a warm water fishery) (NAC, 1998). The State of Arizona designated beneficial uses for Lake Mead are aquatic and wildlife for cold waters (A&Wc), full body contact (FBC), fish consumption (FC), domestic water supply (DWS) and agricultural livestock and irrigation (AgL & AgI) (ADEQ, 1996). Water quality concerns for the facility are chlorophyll-a, nutrient loading, suspended sediments, estrogens (including treatment), and bacteria in storm water. Anticipated permit issues identified by the discharger include more stringent requirements regarding total nitrogen, metals, dissolved solids, and pathogens.

4.1.8 New Mexico

Upper Rio Grande Sub-Watershed (Santa Fe Sub-Basin)

Santa Fe

The Santa Fe WWTP (NM0022292) discharges into the Santa Fe River which is ephemeral above the WWTP discharge point. The Santa Fe River is within the Upper Rio Grande Watershed and is within the Arizona/New Mexico Plateau Ecoregion (Omernik, 1986). Discharge from the facility is about 4.5-6.5 MGD of which 4.6 MGD is reused. This river reach has natural banks and channel with desert and brush on flood plain and wildlife habitat along the channel that is enhanced by discharge. The Santa Fe WWTP is located in Santa Fe County. Threatened or endangered species that may be present in Santa Fe County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses along this reach of river are irrigation (IRR), marginal cold-water fishery (MCWF), warm-water fishery (WWF), wildlife habitat (WH), livestock watering (LW), and secondary contact (SC) (1996). Santa Fe WWTP personnel, however, felt that the marginal cold-water fishery designation was inappropriate. There were no issues of concern reported because effluent quality was reported as very good.

Middle Rio Grande Sub-Watershed

Belen

The Belen WWTP (NM0020150) discharges to the Bosque Drain, an agricultural drain that is a tributary to the Rio Grande. Discharge from the treatment facility is about 1.2 MGD. The agricultural drain is effluent-dependent above the effluent discharge point and is within the Middle Rio Grande Sub-Watershed of Rio Grande Watershed and the Arizona/New Mexico Plateau Ecoregion (Omernik, 1986). Land use along the drain is irrigated agriculture. The drain supports a warm-water fishery. The discharger reported that carp, small minnows, catfish, bullfrogs, and streamside brush are present downstream from WWTP discharge point. The Belen WWTP is located in Valencia County. Threatened and endangered species which may occur in Valencia County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses on the Rio Grande are irrigation (IRR), limited warm-water fishery (LWWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (1996). Issues of concern reported by the discharger are ammonia and chlorine. UV radiation is the preferred disinfection treatment for the future.

Socorro

The Socorro WWTP (NM0028835) discharges to the Luis Lopez Drain, which flows into the Riverside Drain and, ultimately, to the Rio Grande. The Rio Grande is dry in mid to late summer because of agricultural diversions. Discharge from the facility is about 1.0 MGD. The ditch is ephemeral above the effluent discharge point and is within the Middle Rio Grande Sub-Watershed of Rio Grande Watershed and the Arizona/New Mexico Plateau Ecoregion (Omernik, 1986). The drainage ditch has natural banks. The discharger reported that land uses in the area are irrigated agriculture and rural residential. The Socorro WWTP is located in Socorro County. Threatened and endangered species which may be found in Socorro County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum*), Mexican spotted owl (*Strix occidentalis lucida*), piping plover (*Charadrius melodus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses on the reach are irrigation (IRR), limited warm-water fishery (LWWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (1996). Water quality concerns reported by the discharger are pesticides, sludge, and reconstruction of the treatment facility.

Lower Rio Grande Sub-Watershed

Truth or Consequences

The Truth or Consequences WWTP (NM0020681) discharges directly to the Rio Grande below Elephant Butte Reservoir. Discharge from the facility is about 0.85 MGD. The facility is within the Lower Rio Grande Sub-Watershed of Rio Grande Watershed and the Southern Deserts Ecoregion (Omernik, 1986). The flow on the Rio Grande below Elephant Butte Reservoir is

dependent on the depth of Elephant Butte and the demand from agricultural activities. This reach of the Rio Grande is ephemeral and is dry in middle to late summer because of agricultural diversions. Also, the Rio Grande is shut off by Elephant Butte Reservoir to practically zero flow during the months of November through February. Land uses in the area are irrigated agriculture and rural. This reach has natural banks and riparian vegetation within the flood plain. The Truth or Consequences WWTP is located in Sierra County. Threatened and endangered species potentially occurring in Sierra County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), Chiricahua leopard frog (*Rana chiricahuensis*), Gila trout (*Oncorhynchus gilae*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses on the Rio Grande are fish culture (FC), irrigation (IRR), marginal cold-water fishery (MCWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (1996). The presence of dissolved solids and nitrates are issues of concern identified by the discharger.

Las Cruces

The City of Las Cruces Jacob H. Hands WWTP (NM0023311) discharges to the Rio Grande. Discharge from the facility is about 7.7 MGD. The Rio Grande has a regulated perennial flow above the effluent discharge point. Elephant Butte Reservoir regulates the flow for irrigation. For the purposes of this survey, if the flow of the receiving water is regulated and is predominantly effluent, but the watercourse is not in contact with the water table and periodically dries out due to agricultural diversions or dams, the receiving water is considered to be ephemeral. The Rio Grande is within the Lower Rio Grande Sub-Watershed of the Rio Grande Watershed and the Southern Deserts Ecoregion (Omernik, 1986). The discharger reported that land uses along the Rio Grande below the treatment facility are the same as designated beneficial uses. El Paso, Texas uses the Rio Grande as a source of drinking water. In 1990, a Use Attainability Analysis (UAA) confirmed a warm-water fishery. According to the discharger, unstable habitat and low flow during the winter months limits aquatic life and precludes game fish from establishing self-sustaining populations. Benthic macro invertebrates and periphyton are present. Riparian vegetation is minimal to nonexistent because the International Boundary and Water Commission (IBWC) bulldozes vegetation on the river banks for flood control. The stream reach is channelized with earthen banks/levees and a sandy bottom. Water in the channel can be highly turbid due to runoff from storm events (seasonal thunderstorms).

Las Cruces is located in Dona Ana County. Threatened and endangered species which potentially occur in the County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses on this Rio Grande reach are irrigation (IRR), limited warm-water fishery (LWWF), livestock watering (LW), wildlife habitat (WH), and primary contact (PC) (1996).

Issues of concern identified by the discharger include: pesticides (diazinon), NOEC limits for chronic toxicity in WET testing, and treatment for chronically toxic organic compounds or

metals. Technically valid Tribal WQS are a major concern for municipal dischargers along the upper Rio Grande in New Mexico. A concern for the lower Rio Grande is that designation of the reach (Segment 2101) as a source of drinking water may result in 303 (d) listing and more stringent permit limits. Expansion of wastewater treatment at the Jacob H. Hands WWTP has significantly reduced ammonia discharge and eliminated it as a concern or possible source of impairment.

Permit issues of concern identified by the discharger are reemergence of Total Maximum Daily Loads (TMDLs) if the Rio Grande reach was listed on 303 (d) and designation of the Rio Grande reach as a drinking water source. If designation as a drinking water source resulted in 303 (d) listing, TMDLs and more stringent permit limits would be of concern relating to the NPDES permit. Permit concerns also include present limits for metals (Al and Cu) and costs of developing metal translators to translate "dissolved" stream standards to "total recoverable" limits in NPDES permits. The discharger identified restoration of riparian habitat, support of migrating birds and wildlife, and recreational activities as concern of the community.

Pecos River Watershed

Roswell

The Roswell WWTP (NM0020311) discharges to the Rio Hondo which is a tributary of the Pecos River. Discharge from the treatment facility is about 4.1 MGD with the majority of effluent being used for irrigation. The effluent diversion period runs from February through November. During the winter months, effluent is discharged to the Rio Hondo which diverts to the Pecos River. The Rio Hondo is intermittent above the effluent discharge point and is within the Pecos River Watershed and the Southern Deserts Ecoregion (Omernik, 1986). Base flow of the Rio Hondo is approximately 2.0 MGD. Most recently, flow has been continuous but has been known to cease. The stream has soil banks and is used for flood water diversion. The discharger reported that land uses along the Rio Hondo below the treatment facility are irrigation and wildlife habitat. The Roswell WWTP is located in Chaves County. Threatened and endangered species which potentially occur in Chaves County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum*), Arkansas River shiner (*Notropis girardi*), and Pecos pupfish (*Cyprinodon pecosensis*). The New Mexico Water Quality Control Commission (NMWQCC) reported that designated beneficial uses on the Rio Hondo above the treatment facility are fish culture (FC), irrigation (IRR), cold-water fishery (CWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (1996). Designated beneficial uses on the Pecos River below its confluence with the Rio Hondo are irrigation (IRR), warm-water fishery (WWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (NMWQCC, 1996). An issue of concern identified by the discharger is dechlorination. The discharger reported that dechlorination has cost communities large amounts of money. A new permit is in the process of being negotiated, and the discharger is concerned that limits on a few metals will be set at unattainable levels. The discharger feels that the only solution will be to have zero discharge to the receiving stream.

Southwestern Closed Watershed

Silver City

The Silver City WWTP (NM0020109) discharges to the San Vincent Arroyo. Maximum discharge from treatment facility is about 1.3 MGD. San Vincent Arroyo is ephemeral above the effluent discharge point and is within Southwestern Closed Watershed and the Southern Deserts Ecoregion (Omernik, 1986). Land use along San Vincent Arroyo below the treatment facility is natural desert. The discharger reported that the local stream is characterized by natural banks and rip-rap. Silver City is located in Grant County. Threatened and endangered species which may occur in Grant County include the arctic peregrine falcon (*Falco peregrinus tundrius*), Chiricahua leopard frog (*Rana chiricahuensis*), Gila springsnail (*Fontelicella gilae*), Mexican spotted owl (*Strix occidentalis lucida*), New Mexico hot spring snail (*Fontelicella thermalis*), Parish's alkali grass (*Puccinellia parishii*), southwestern willow flycatcher (*Empidonax traillii extimus*), and whooping crane (*Grus americana*). Designated beneficial uses on San Vincent Arroyo above the treatment facility are not designated by the State of New Mexico (NMWQCC, 1996). Effluent reuse is a significant issue of concern for the facility. The discharger reported that, because of a lawsuit with EPA, chlorine has been removed from the parameter list. The Silver City WWTP personnel also feel that vanadium monitoring is not necessary.

Lower Colorado River Watershed

Gallup

The Gallup WWTP (NM0020672) discharges to the Rio Puerco of the West, which is a tributary of the Little Colorado River. During winter months, discharge from the facility is about 3.0 MGD. During the irrigation season, discharge from the treatment facility is about 2.5 MGD. The Rio Puerco is intermittent above the effluent discharge point and is within the lower Colorado River Watershed and the Arizona/New Mexico Plateau Ecoregion (Omernik, 1986). Land use for twenty miles along the Rio Puerco River below the treatment facility is undisturbed natural habitat. The local stream has natural banks. Salt cedar, coyotes, bear, deer, and birds are present. The Gallup WWTP is located in McKinley County. Threatened and endangered species which may occur in McKinley County include the arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), Parish's alkali grass (*Puccinellia parishii*), and southwestern willow flycatcher (*Empidonax traillii extimus*). The discharger reported that designated beneficial uses on the Rio Puerco above the treatment facility are livestock watering (LW) and wildlife habitat (WH). The New Mexico Water Quality Control Commission (1996) does not list any designated beneficial uses for any streams in the Lower Colorado Watershed. Issues of concern reported by the discharger are dechlorination, ammonia, dissolved solids, and difficulty in establishing new industry.

Arkansas White-Red Watershed

Raton

The Raton WWTP (NM0020273) discharges to Doggett Creek which then enters Raton Creek, the Chicorica River and, finally the Canadian River. During the summer, most of the treated water is reused by parks and golf courses. During winter, about 0.8 MGD of treated effluent is

discharged. Doggett Creek is intermittent above the effluent discharge point and is within the Arkansas White-Red River Watershed and the Southwestern Tablelands Ecoregion (Omernik, 1986). The local stream is characterized by natural banks with some reinforcement. There is natural vegetation along the stream. The discharger reported that land use below the facility is ranching. The Raton WWTP is located in Colfax County. Threatened and endangered species which may be found in Colfax County include the arctic peregrine falcon (*Falco peregrinus tundrius*), Arkansas River shiner (*Notropis girardi*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), piping plover (*Charadrius melodus*), and southwestern willow flycatcher (*Empidonax traillii extimus*). Beneficial uses on Doggett Creek above the treatment facility are not designated by State of New Mexico (NMWQCC, 1996). The discharger reported that issues of concern are managing watershed, maintaining virgin watershed, and controlling development.

Tucumcari

The Tucumcari WWTP (NM0020711) discharges into an unnamed creek that is a tributary of Pajarito Creek, a tributary of the Canadian River which discharges into the Ute Reservoir. The treatment facility discharges about 0.73 MGD. The receiving water is intermittent above the effluent discharge point and is within the Arkansas White-Red River Watershed and the semi-arid Southwestern Tablelands Ecoregion (Omernik, 1986). The local stream has natural banks. The discharger reported that land use below the treatment facility is recreationally oriented. The Tucumcari WWTP is located in Quay County. Threatened and endangered species potentially occurring in Quay county include the arctic peregrine falcon (*Falco peregrinus tundrius*), Arkansas River shiner (*Notropis girardi*), bald eagle (*Haliaeetus leucocephalus*), Colorado squawfish (*Ptychocheilus lucius*), interior least tern (*Sterna antillarum*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*) and whooping crane (*Grus americana*). The New Mexico Water Quality Control Commission reported that designated beneficial uses on the main stem of the Canadian River are irrigation (IRR), limited warm-water fishery (LWWF), livestock watering (LW), wildlife habitat (WH), and secondary contact (SC) (1996). Designated beneficial uses on the Ute Reservoir segment of the Canadian River are warm-water fishery (WWF), livestock watering (LW), wildlife habitat (WH), municipal and industrial water supply (DWS) and primary contact (PC) (NMWQCC, 1996). Issues of concern for the facility are salt buildup in the Ute reservoir and potential use of the reservoir as a drinking-water source.

4.1.9 North Dakota

Unidentified Watershed

Minot Air Force Base

The Minot Air Force Base WWTP (ND0020486) discharges into an unnamed channel which flows into Egg Creek, and eventually into North Lake. The unnamed channel is intermittent above the WWTP. This facility is located within the Northern Glaciated Plains Ecoregion (Omernik, 1986). Discharge from the treatment facility is approximately 8 MGD for one week in each summer month. The uses of downstream areas are agriculture and stock watering. This

reach of the river has a natural channel with limited riparian vegetation and wildlife habitat. The discharger reported that there are no threatened or endangered species on the Air Force Base. The Minot Air Force Base is located in Ward County. Threatened and endangered species which may occur in Ward County include the bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), western prairie fringed orchid (*Platanthera praeclara*), and whooping crane (*Grus americana*). Water quality concerns for this plant include ammonia because of the nitrogen presence when the ice melts. The only water quality/permit issue reported by the discharger is that there is some variability in WET test reliability.

City of Minot

The City of Minot WWTP (ND0022896) discharges into the Souris River, which is intermittent above the WWTP. This facility is located within the Northwestern Glaciated Plains Ecoregion (Omernik, 1986). Discharge from the treatment facility totals 4 MGD, but this is only seasonal. Land use downstream is agricultural and rural. This treatment plant discharges into a natural channel that provides wildlife with a riparian corridor. The discharger reported that there are no threatened or endangered species in this reach of the river. The City of Minot is located in Ward County. Threatened and endangered species which may occur in Ward County include the bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), western prairie fringed orchid (*Platanthera praeclara*), and whooping crane (*Grus americana*). The discharger reported that the designated beneficial use of the receiving water is irrigation (IRR). Issues of concern identified by the discharger include pesticides and herbicides. The water quality/permit issue this plant may face in the future is that storm water regulations are vague and broad based.

4.1.10 South Dakota

Belle Fourche River Basin

Sturgis

The City of Sturgis WWTP (SD0020052) discharges 0.5 to 0.8 MGD to lagoons which flow into Bear Butte Creek, an ephemeral waterway located in the Belle Fourche River Basin. Although the receiving waterways are classified as a cold water fishery no fish are present. Bear Butte Creek is dry for 10 months of the year and receives water from snow melt for 2 months. It is a natural channel with rock lined banks. The terrestrial environment is characterized as grassland with sparse trees lining the creek. The discharger reported that uses of downstream areas are rural and agriculture. The Sturgis Wastewater Treatment Plant is located in Meade County and is within the Northwestern Great Plains Ecoregion (Omernik, 1986). Threatened or endangered species which may be present in Meade County include the American burying beetle (*Nicrophorus americanus*), bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), least tern (*Sterna antillarum*), pallid sturgeon (*Scaphirhynchus albus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), and whooping crane (*Grus americana*). A concern of this facility is the inappropriate classification of the creek as a cold water fishery. One concern of the facility for the future is attempting to regain its discharge permit.

Belle Fourche

The City of Belle Fourche WWTP (SD0021628) discharges 0.5 MGD to the Crow River. The Crow River is ephemeral and is designated as a cold water fishery. The only downstream land use is agriculture. The channel has natural banks with a deep cut of 5-20 feet. The channel is banked by agricultural lands. The discharger reported that there are no threatened or endangered species present. The City of Belle Fourche is located in Butte County and is within the Northwestern Great Plains Ecoregion. Threatened and endangered species which may be found in Butte County include the American burying beetle (*Nichrophorus americanus*), bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), least tern (*Sterna antillarum*), pallid sturgeon (*Scaphirhynchus albus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*) and whooping crane (*Grus americana*). A significant issue of concern for the WWTP is the inappropriate classification of Crow Creek as a cold water fishery. The plant is no longer discharging into the creek, so it is dry for 10 or more months out of the year.

4.1.11 Texas

Nueces-Rio Grande Coastal Basin

Donna

The City of Donna WWTP (TX0024660) discharges into an unnamed drainage canal that drains into Arroyo Colorado Above Tidal, which eventually drains into the Laguna Madre. Laguna Madre is approximately 70 miles to the east. Discharge from the treatment plant is approximately 1.0 MGD. The unnamed drainage canal is effluent-dependent above the WWTP effluent discharge and is within the Western Gulf Coastal Plain Ecoregion (Omernik, 1986). Downstream land uses are agricultural and rural residential. The unnamed drainage canal has natural banks with predominately mesquite riparian vegetation. The discharger reported that this area does not support threatened or endangered species. The City of Donna WWTP is located in Hidalgo County. Threatened and endangered species potentially occurring in Hidalgo County include the arctic peregrine falcon (*Falco peregrinus tundrius*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), jaguarundi (*Felis yagouaroundi cacomitli*), and ocelot (*Felis pardalis*). The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for this reach of the unnamed drainage canal (1997). For Laguna Madre, the TNRCC has designated the beneficial uses as Contact Recreation (CR) and Exceptional/Oysters Aquatic Life (E/O) (1997). The discharger did not report any significant water quality concerns. It was reported that the WWTP is meeting metal standards. The discharger indicated that the water coming into the WWTP is from urban sources that are pretty clean; therefore, there are no problems with contaminants. Anticipated water quality permit issues for the facility are additional biomonitoring requirements and tighter regulations.

Mercedes

The City of Mercedes WWTP (TX0021547) discharges into an unnamed drainage canal that drains to Arroyo Colorado Above Tidal. Discharge from the treatment plant is approximately 1.2 MGD. The unnamed drainage canal is intermittent above the effluent discharge and is within the

Western Gulf Coastal Plain Ecoregion (Omernik, 1986). The unnamed drainage canal has natural vegetated banks with predominately mesquite trees and grasses. The discharger indicated that downstream land uses are rural. The City of Donna WWTP is located in Hidalgo County. Threatened and endangered species potentially occurring in Hidalgo County include the arctic peregrine falcon (*Falco peregrinus tundrius*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), jaguarundi (*Felis yagouaroundi cacomitli*), and ocelot (*Felis pardalis*). The Texas Natural Resource Conservation Commission has not designated beneficial uses for this reach of the unnamed drainage canal (1997). The discharger reported that a significant water quality concern is the garbage that is being dumped into waterways. An anticipated water quality permit issue is tighter regulations.

Pharr

The City of Pharr WWTP (TX0062219) discharges into an unnamed drainage canal that drains to Arroyo Colorado Above Tidal. The unnamed drainage canal is effluent-dependent above the WWTP effluent discharge and is within the Southern Texas Plains Ecoregion (Omernik, 1986). Discharge from the treatment plant is approximately 3.3 MGD. The unnamed drainage canal has natural soil banks with riparian trees or common vegetation. The discharger reported that the downstream land use is a storm water drainage conveyance channel. The Pharr WWTP is located in Hidalgo County. Threatened and endangered species potentially occurring in Hidalgo County include the arctic peregrine falcon (*Falco peregrinus tundrius*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), jaguarundi (*Felis yagouaroundi cacomitli*), and ocelot (*Felis pardalis*). The Texas Natural Resource Conservation Commission has not designated beneficial uses for this reach of the unnamed drainage canal (1997). Significant water quality concerns for the facility are oil, grease, ammonia, and pesticides. Anticipated water quality permit issues are stricter effluent requirements (e.g., CBOD, TSS, Ammonia) and greater testing frequency.

Nueces River Basin

Carrizo Springs

The City of Carrizo Springs WWTP (TX0025976) discharges to Carrizo Creek, which is within the Southern Texas Plains Ecoregion (Omernik, 1986). Above the WWTP effluent discharge, Carrizo Creek is an ephemeral stream in a natural channel that is dry approximately fifty percent of the year. Discharge from the treatment plant is approximately 0.55 MGD. Downstream land use is agricultural. Carrizo Creek has natural soil banks with riparian trees. The discharger reported that there are no known threatened or endangered species. Carrizo Springs is located in Dimmitt County. The only endangered species listed as occurring in this county are the jaguarundi (*Felis yagouaroundi cacomitli*) and the ocelot (*Felis pardalis*). The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for this reach of Carrizo Creek (1997). TNRCC has designated beneficial uses for Reach 2105 of the Nueces River above Holland Dam as High Aquatic Life (H), Public Water Supply (PS), and Contact Recreation (CR) (1997). The discharger indicated that there are no reported significant water quality concerns or anticipated water quality/permit issues for this facility.

Canadian River Basin

Amarillo

The City of Amarillo has two WWTPs (TX0025801 River Road and TX0025810 Hollywood Road). Permit TX0025801 discharges 0.17 MGD to East Amarillo Creek, tributary to the Canadian River. Above the WWTP effluent discharges, East Amarillo Creek is an intermittent stream in a natural channel associated with typical west Texas high plains habitat. The creek is within the Western High Plains Ecoregion (Omernik, 1986) and is located in Potter County. The discharger reported that downstream land uses are ranching and agriculture. Threatened and endangered species which may be found in Potter County include the Arkansas river shiner (*Notropis girardi*), bald eagle (*Haliaeetus leucocephalus*), and interior least tern (*Sterna antillarum*). No threatened or endangered species have been reported in the vicinity of waterways used for discharge. The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for this reach of East Amarillo Creek (1997). TNRCC has designated beneficial uses for Reach 0103 of the Canadian River as High Aquatic Life (H) and Contact Recreation (CR) (1997). Significant water quality concerns for the facility are biomonitoring, ammonia, total loading, and pesticides. There are no anticipated water quality/permit issues.

Permit TX0025810 discharges 7.33 MGD to Lake Tanglewood and Prairie Dog Town Fork of the Red River. Upstream of the treatment plant, Prairie Dog Town Fork of the Red River is classified as an intermittent waterway in a natural canyon with clear pools. These pool support significant aquatic and terrestrial wildlife. The discharger reported that downstream land uses include ranchland and Palo Duro Canyon State Park. The designated beneficial uses of Segment 0229 of Prairie Dog Town Fork are Contact Recreation and High Aquatic Use (TNRCC, 1997). Some significant water quality concerns for this facility are biomonitoring, ammonia, pesticides, and total loadings. There are no anticipated water quality/permit issues.

Borger

The City of Borger Rock Creek WWTP (TX0047031) discharges to an unnamed tributary to Rock Creek which is tributary to the Canadian River. Above the WWTP effluent discharge, the unnamed tributary to Rock Creek is an intermittent stream in a natural channel that receives approximately 35 percent groundwater. The source of this stream is a spring and flow above the discharge point is characterized as a "trickle." The unnamed tributary to Rock Creek is within the Southwestern Tablelands Ecoregion (Omernik, 1986). Rough, hilly, steep slopes with outcrops of dolomite outline the watershed. The terrestrial landscape consists of native vegetation or buffalo grass with occasional mesquite trees. The streambed is primarily Burson Soil Series with intermittent rocks from side slopes. Some erosion from intense flooding has occurred. Aquatic organisms found in the unnamed tributary to Rock Creek include minnows, small fish, crustaceans, nematodes, arthropods, waterbears, and *Ceriodaphnia pulex* and *dubia*. Discharge from the treatment plant is approximately 1.4 MGD. The City of Borger's Rock Creek WWTP is located in Hutchinson County. Threatened and endangered species potentially occurring in Hutchinson County include the Arkansas River shiner (*Notropis girardi*), bald eagle (*Haliaeetus leucocephalus*), and interior least tern (*Sterna antillarum*). The Texas Natural Resource

Conservation Commission (TNRCC) has not designated beneficial uses for this reach of the unnamed tributary to Rock Creek (1997). TNRCC has designated beneficial uses for Reach 0101 of the Canadian River as High Aquatic Life (H) and Contact Recreation (CR) (1997). A significant water quality concern for the facility is chloride. Anticipated water quality/permit issues are water reuse and phosphorus limitations.

Pampa

The City of Pampa WWTP (TX0027618) discharges to a creek that is a tributary to the Canadian River. Above the WWTP effluent discharge, the creek is an ephemeral stream in a natural channel and is within the Southwestern Tablelands Ecoregion (Omernik, 1986). Discharge from the treatment plant is approximately 3.0 MGD. The discharger reported that downstream land use is rural. The City of Pampa's WWTP is located in Gray County. Threatened and endangered species which may be present in Gray County include the bald eagle (*Haliaeetus leucocephalus*), and interior least tern (*Sterna antillarum*). The wastewater from the WWTP recharges into the ground and usually does not reach the Canadian River. The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for this reach of the creek (1997). TNRCC has designated beneficial uses for Reach 0101 of the Canadian River as High Aquatic Life (H) and Contact Recreation (CR) (1997). The discharger did not identify any significant water quality concerns or anticipated water quality/permit issues.

Brazos River Basin

Lubbock

The City of Lubbock Southeast Water Reclamation Plant (WRP) (TX0106071) discharges to an unnamed tributary of the North Fork Double Mountain Fork Brazos River. Above the WRP effluent discharge, the unnamed tributary of the North Fork Double Mountain Fork Brazos River is an intermittent stream and is within the Western High Plains Ecoregion (Omernik, 1986). Water in the stream is turbid, carries a large sediment load, and is colored from natural sources. The receiving water is influenced by oil field activities, urban runoff, and septic systems. One bank has been rip-rapped. The dominant vegetation consists of riparian vegetation including mesquite trees, bermuda grass, sand bar willow, elm, salt cedar, cattails, and forbs. The City of Lubbock's Southeast Water Reclamation Plant is permitted to discharge 9 MGD from plant #4. However, the City of Lubbock has never discharged and reuses all treated effluent for industrial cooling tower water and irrigation. The discharger reported that the downstream land use is ranching. The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for this reach of the unnamed tributary to North Fork Double Mountain Fork Brazos River (1997). TNRCC has designated beneficial uses for Reach 1241 of the North Fork Double Mountain Fork Brazos River as High Aquatic Life (H) and Contact Recreation (CR) (1997). Significant water quality concerns identified by the discharger are dissolved oxygen and upstream dischargers. An anticipated water quality/permit issue is fluoride.

Plainview

The City of Plainview WRP (TX0047571) discharges to Running Water Draw, a tributary to the White River. Above the WRP effluent discharge, Running Water Draw is an intermittent stream in a natural channel with soil banks and is within the Western High Plains Ecoregion (Omernik, 1986). Discharge from the treatment plant is approximately 2.2 MGD. The downstream land use is irrigated agriculture. Vegetation along the waterway consists of grasses on the flood plain and cattails in the streambed. Minnows can be found in the stream. Other animals that can be found are prairie dogs, foxes, coyotes, rabbits, skunks, opossums, badgers, horses, cows, and sheep. Owls, red-winged blackbirds, ducks, Canadian geese, and sandhill cranes can also be found. The discharger reported that there are no known threatened or endangered species present in the area. The City of Plainview is located in Hale County. The bald eagle (*Haliaeetus leucocephalus*) is the only threatened species found in Hale County. The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for Running Water Draw (1997). TNRCC (1997) has designated beneficial uses for Reach 1240 of the White River as High Aquatic Life (H), Public Water Supply (PS), and Contact Recreation (CR). Significant water quality concerns for the facility are ammonia, chlorination, de-chlorination, and salinity. An anticipated water quality/permit issue is nutrient removal.

Colorado River Basin

Odessa

The City of Odessa Bob Derrington WRP (TX0072800) discharges to Monahans Draw. Above the WRP effluent discharge, Monahans Draw is an intermittent stream in a natural channel with soil banks and is within the Western High Plains Ecoregion (Omernik, 1986). Discharge from the treatment plant is approximately 4.0 MGD. Downstream land uses are irrigated agriculture, wildlife habitat, rural residential, and ranching. Monahans Draw is broad and shallow with no well-defined flow channel in some areas. The vegetation consists of grasses and shrubs on the flood plain and mesquite trees and salt cedar along the stream. Small fish can be found up and down the draw in pooled areas and include killifish, carp, and bullhead catfish. Other animals that may be present are deer, turkey, quail, foxes, coyotes, rabbits, and small rodents. The discharger reported that there are no known threatened or endangered species present. The Bob Derrington WRP is located in Ector County, and there are no threatened or endangered species listed as occurring in Ector County. The Texas Natural Resource Conservation Commission has not designated beneficial uses for Monahans Draw (1997). The discharger indicated that there are no reported significant water quality concerns or anticipated water quality/permit issues. The facility may reduce or cease discharging due to 100 percent reuse possibilities within two years.

Guadalupe River Basin

Kerrville

The City of Kerrville WWTP (TX0047333) discharges to Third Creek which is a tributary to the Guadalupe River, 1.4 miles downstream. Discharge from the treatment plant is approximately 2.3 MGD. Downstream land uses are agriculture and rural residential. Above the WWTP effluent discharge, Third Creek is an intermittent stream in a natural channel with soil banks and riparian corridor. The discharger reported that deer and turtles are present, but there are no threatened or

endangered species. The WWTP is within the Central Texas Plateau Ecoregion (Omernik, 1986) and is in Kerr County. The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened and may occur in Kerr County. The Texas Natural Resource Conservation Commission (TNRCC) has not designated beneficial uses for Third Creek (1997). TNRCC has designated beneficial uses for Reach 1806 of the Guadalupe River as Exceptional Aquatic Life (E), Public Water Supply (PS), and Contact Recreation (CR) (1997). Significant water quality concerns identified by the discharger are nutrient loading, phosphorus, and fecal coliform. Anticipated water quality/permit issues are water quantity, water reuse, and ground-water source during summer.

4.1.12 Utah

Weber River Watershed

North Davis County Sewer District

The North Davis County Sewer District WWTP (UT0021741) discharges into an unnamed ditch that discharges into the Great Salt Lake. The unnamed ditch carries intermittent flows in addition to the WWTP discharge and is within the Weber River Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Discharge in the ditch above the treatment facility is variable because the ditch carries agricultural irrigation return water and storm runoff. The average discharge from the treatment facility is about 20.0 MGD. The unnamed ditch has earthen banks and the flow is turbid. The discharger reported that downstream land uses along flood plain are wildlife habitat with a little recreational use. Threatened and endangered species which may be present in Davis County include the bald eagle (*Haliaeetus leucocephalus*), Barneby reed-mustard (*Schoenocrambe barnebyi*), clay reed-mustard (*Schoenocrambe argillacea*), last chance townsendia (*Townsendia aprica*), Mexican spotted owl (*Strix occidentalis lucida*), peregrine falcon (*Falco peregrinus*), shrubby reed-mustard (*Schoenocrambe suffrutescens*), Ute ladies'-tresses (*Spiranthes diluvialis*), and whooping crane (*Grus americana*). The Utah Division of Water Quality has assigned this reach of the Weber River and tributaries the following designated beneficial uses: secondary contact recreation (2B), non-game fish and other aquatic life (3C), waterfowl, shore birds and other water-oriented wildlife (3D), and agricultural uses (4) (1997). Significant water quality concerns identified by the discharger are metals and nutrients. Anticipated water quality/permit issues are metals, nitrogen, and phosphorous limits.

Utah Lake/Jordan River Watershed

Payson City Corporation

The City of Payson WWTP (UT0020427) discharges into Unnamed Ditch that discharges into Beer Creek which discharges to Benjamin Slough and then into the Great Salt Lake. Unnamed Ditch is intermittent above the WWTP discharge point and is within the Utah Lake/Jordan River Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Discharge in the ditch below the WWTP is 99.9% effluent. Discharge from the treatment facility is about 1.2 MGD. This unnamed ditch has earthen banks with trees and pasture on the flood plain. The discharger reported that downstream land uses along the flood plain are irrigated agriculture and ranching. The City of Payson WWTP is located in Utah County. There are no threatened or endangered

species listed for this county. The Utah Division of Water Quality has assigned this reach of Beer Creek the following designated beneficial uses: secondary-contact recreation (2B), non-game fish and other aquatic life (3C), and agricultural uses (4) with a special numeric criteria for chlorine (1997). The discharger did not identify any significant water quality concerns or anticipated permit issues.

Provo

The City of Provo WWTP (UT0021717) discharges into Mill Race Creek which is a diversion from the Provo River. Mill Race Creek is effluent-dependent above the WWTP discharge point and is within the Utah Lake/Jordan River Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Discharge in the ditch is from storm water, irrigation effluent, and wastewater effluent. The amount of discharge from the treatment facility is unknown. The discharger reported that downstream land uses along the flood plain are irrigated agriculture and recreation. The City of Provo WWTP is located in Utah County. There are no threatened or endangered species listed for this county. The Utah Division of Water Quality has assigned this reach of Mill Race Creek the following designated beneficial uses: secondary-contact recreation (2B), warm-water game fish and other warm-water aquatic life (3B), and agricultural uses (4) with a special numeric criteria for chlorine (1997). Significant water quality concerns identified by the discharger are stringent limits on chlorine, a sewer study to rehabilitate processes, infiltration of treated effluent, and increases in hydrologic loading from dilute waste streams. The discharger did not report any anticipated water quality/permit issues.

Salt Lake City

The Salt Lake City WWTP (UT0021725) discharges into an unnamed drain that discharges into the Great Salt Lake. In the past, an oil refinery used this canal for discharging effluent. Above the WWTP discharge, the unnamed drain is effluent-dependent and runs all year. The plant is within the Jordan River Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Discharge in the drain above the treatment facility is from storm runoff. Discharge from the treatment facility is about 36.5 MGD. The drainage has dirt banks with some vegetation. This unnamed drain discharges into duck ponds. The ponds have some vegetation but no fish. The Salt Lake City WWTP is located in Davis County. Threatened and endangered species which may be present in Davis County include the bald eagle (*Haliaeetus leucocephalus*), Barneby reed-mustard (*Schoenocrambe barnebyi*), clay reed-mustard (*Schoenocrambe argillacea*), last chance townsendia (*Townsendia aprica*), Mexican spotted owl (*Strix occidentalis lucida*), peregrine falcon (*Falco peregrinus*), shrubby reed-mustard (*Schoenocrambe suffrutescens*), Ute ladies'-tresses (*Spiranthes diluvialis*), and whooping crane (*Grus americana*). The discharger did not identify any significant water quality concerns or anticipated permit issues.

Spanish Fork City Corporation

The City of Spanish Fork WWTP (UT0020109) discharges into Dry Creek. Dry Creek is intermittent above the WWTP discharge and is within the Utah Lake/Jordan River Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Discharge from the treatment facility is about 3.1 MGD. Dry Creek has man-made earthen banks with sagebrush and salt grass

in the flood plain. A few ducks and carp are present, but there are no threatened or endangered species. The discharger reported that downstream land uses along the flood plain are irrigated agriculture and livestock ranching. The City of Spanish Fork WWTP is located in Utah County. There are no threatened or endangered species listed for this county. The Utah Division of Water Quality has assigned this reach of Dry Creek the following designated beneficial uses: secondary-contact recreation (2B), non-game fish and other aquatic life (3C), and agricultural uses (4) (1997). A significant water quality concern and an anticipated permit issue of concern identified by the discharger is that regulations do not reflect reality. For example, chlorine is to be removed for fish, however fish do not exist.

Great Salt Lake Desert Watershed

Tooele

The Tooele City WWTP (UT0022217) discharges to an unnamed irrigation ditch. The unnamed irrigation ditch is effluent-dependent above the WWTP discharge and is within the Great Salt Lake Desert Watershed and the Northern Basin and Range Ecoregion (Omernik, 1986). Flow in the ditch is continuous, with discharges ranging from about 0.3 to 2.0 MGD. Discharge from the treatment facility is about 1.0 MGD. This unnamed irrigation ditch has earthen banks with riparian vegetation. The discharger reported that downstream land use along the flood plain is irrigated agriculture. The City of Tooele WWTP is located in Tooele County. Threatened and endangered species potentially occurring in Tooele County include the bald eagle (*Haliaeetus leucocephalus*), Barneby reed-mustard (*Schoenocrambe barnebyi*), clay reed-mustard (*Schoenocrambe argillacea*), last chance townsendia (*Townsendia aprica*), Mexican spotted owl (*Strix occidentalis lucida*), peregrine falcon (*Falco peregrinus*), shrubby reed-mustard (*Schoenocrambe suffrutescens*), Ute ladies'-tresses (*Spiranthes diluvialis*), and whooping crane (*Grus americana*). The Utah Division of Water Quality reported that designated beneficial uses are irrigation and livestock (1997). Significant water quality concerns identified by the discharger are metals, biological and chemical oxygen demand, and infiltration. An anticipated permit issue will be the new wastewater treatment plant that should be on-line by August of 2000. There will be no need for permits because all wastewater will be for reuse.

4.1.13 Washington

Unidentified Watershed

Walla Walla

The City of Walla Walla WWTP (WA0024627) discharges to Mill Creek December 1 through April 30. Average discharge for this five-month period is 6.5 MGD. The WWTP discharges to irrigation districts for the remainder of the year. Mill Creek is an intermittent stream that is located in the Columbia Basin Ecoregion (Omernik, 1986). From December 1 through April 30 Mill Creek is designated as a trout stream. Mill Creek is in a flood control district. Its banks are lined with large rocks. There are beaver, birds, and other wildlife downstream. High flow is in February, March, April, and May. The pH level of the creek is approximately 7.0 and ammonia levels run from 4.0 ppm to less than 0.5 ppm. The creek goes dry in late July, August, and

September. The discharger reported that uses of down stream areas include wildlife habitat, some residential areas, and small farms. The City of Walla Walla WWTP is located in Walla Walla County. Threatened and endangered species which may be present in Walla Walla County include the Aleutian Canada goose (*Branta canadensis leucopareia*), bald eagle (*Haliaeetus leucocephalus*), and bull trout (*Salvelinus confluentus*). The only water quality concern identified by the discharger is ammonia limits. Removal of phosphate from the effluent is an anticipated water quality issue for the WWTP.

4.1.14 Wyoming

Unidentified Watershed

Gillette

The City of Gillette WWTP (WY0020125) discharges into Stonepile Creek where effluent flows for 600 feet before flowing into Donkey Creek where it flows for 50 miles before emptying into Belfourche in Keyhole State Park. Stonepile Creek is ephemeral above the WWTP and is located in the Northwestern Great Plains Ecoregion (Omernik, 1986). The plant sells an average of about 140 gallons per minute to a power plant. Discharge from the treatment facility is approximately 2.2 MGD. This reach of the Stonepile Creek has a natural channel with a concrete effluent trough. Along this creek there are sagebrush, isolated cottonwoods, high plains prairie, minnows, antelope, deer, elk, no threatened or endangered species, and there are ferrets miles away. The uses of downstream areas are recreation, livestock, rural, and natural prairie. The City of Gillette WWTP is located in Campbell County. There are no threatened or endangered species listed for this county. The discharger reported that the designated beneficial use of the creek is livestock watering. The discharger indicated that reuse of effluent water for irrigation may be investigated in the future. Ammonia limits may be implemented.

City of Rawlins

The City of Rawlins WWTP (WY0020427) discharges into Sugar Creek, a storm water sewage drainage which is ephemeral above the WWTP. Discharge from the treatment facility averages approximately 1.26 MGD, four to six months each year. The City of Rawlins WWTP is located in Carbon County and the Wyoming Basin Ecoregion (Omernik, 1986). The treatment plant discharges into a natural channel. There is some algae growth, but no aquatic life. The discharger reported that land uses downstream are irrigation and livestock watering. Threatened and endangered species which may occur in Carbon County include the bald eagle (*Haliaeetus leucocephalus*), Colorado squawfish (*Ptychocheilus lucius*), Kendall warm springs dace (*Rhinichthys osculus thermailis*), Ute ladies'-tresses (*Spiranthes diluvialis*), and whooping crane (*Grus americana*). The discharger indicated that the designated beneficial uses of the receiving water are agriculture and livestock watering. Issues of concern for this facility include storm sewer treatment. The discharger reported that Sugar Creek water is very toxic, which the discharger feels defeats the purpose of the plant treating the domestic sewage before dumping into this water.

Cheyenne Board of Public Utilities

The Dry Creek WWTP (WY0022934) discharges into Crow Creek, which is effluent-dependent above the WWTP. Discharge from the treatment facility totals 5.7 MGD. This treatment plant discharges into a channel that has natural banks upstream with channelized rip-rap through town. There are natural banks with 3-30 acre irrigation impoundments downstream. The non-game fish up and downstream are impacted through town by storm water discharges and non-point pollutant sources. The mercury levels are 0.6-0.7 mg/Kg in creek chubs. Trout biomass potential is 11 pounds per acre. The discharger reported that no endangered species have been identified. Land uses downstream are rural, residential, irrigation for cow pastures and hay production. The stream is 16,000 CFS over-appropriated. The Dry Creek WWTP is located in Laramie County. There are no threatened or endangered species listed for this county. According to the discharger, the designated beneficial uses of the receiving water are irrigation and livestock watering. Issues of concern for the facility include effluent dominated streams and the protection of created habitat. The water quality/permit issues this plant may face in the future are extreme ammonia limits on ephemeral/effluent-dependent streams and temperature and dissolved oxygen restrictions.

The Crow Creek WWTP (WY0022381) discharges into Crow Creek, which is effluent-dependent above the WWTP. Discharge from the treatment facility totals 4.4 MGD on a daily average. This treatment plant discharges into a channel that has natural banks upstream with channelized rip-rap through town. There are natural banks with 3-30 acre irrigation impoundments downstream. The non-game fish up and downstream are impacted through town by storm water discharges and non-point pollutant sources. The mercury levels are 0.6-0.7 mg/Kg in creek chubs. Trout biomass potential is 11 pounds per acre. No endangered species have been identified. Land uses downstream are rural, residential, irrigation for cow pastures and hay production. The discharger reported that the stream is 16,000 CFS over-appropriated. According to the discharger, the designated beneficial uses of the receiving water are irrigation and livestock watering. Issues of concern for this facility include effluent dominated streams and the protection of created habitat, as well as non-point source pollutant control (TMDLs), and to whom the TMDLs violation letter will be sent. The discharger indicated that the water quality/permit issues this plant may face in the future are the end of pipe "stream standards," ammonia, temperature, and dissolved oxygen limitations. It will cost \$4.2 million for expansion and \$11.3 million for a single stage nitrification addition to 1950 and 1975 secondary plants.

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