Chapter 15: Ecosystem Resources

15.1 Introduction

This chapter provides a general overview of the Great Basin ecosystem along with detailed descriptions of habitat types and wildlife that are specific to the ecosystem impact analysis area. This chapter also presents the expected impacts to wildlife, habitat types, vegetation communities, sensitive species, and wetlands. This chapter was developed based on extensive consultation with the resource agencies, who requested that all of the above resources be evaluated in one chapter of this Environmental Impact Statement (EIS) that discusses impacts to the overall ecosystem.

Ecosystem Impact Analysis Area. The Mountain View Corridor (MVC) ecosystem impact analysis area encompasses an area from the Great Salt Lake on the north to Utah Lake on the south. The Oquirrh Mountains mark the western boundary of the ecosystem impact analysis area, and the Wasatch Mountains are the eastern limit of this area. Many bird species that use this area travel great distances to feed and rest at both the Great Salt Lake and Utah Lake and their adjacent habitats. In order to provide specific information about habitats that are

likely to be affected by the project, the description below focuses on the areas within or adjacent to the project alternatives.

15.2 Regulatory Setting

15.2.1 Endangered Species Act

The Endangered Species Act requires that federal agencies ensure that their actions neither jeopardize the continued existence of species listed as endangered or threatened nor result in destruction or adverse modification of the critical habitat of these species. Federal agencies must consult with the U.S. Fish and Wildlife Service (USFWS) if an action would result in "take" of a listed animal species, where "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect… [an individual of a protected species]" (16 United States Code [U.S.C.] 1532 et seq.). The Endangered Species Act is pertinent to the MVC project because the federally listed, threatened Ute ladies'-tresses (*Spiranthes diluvialis*) could be present within the ecosystem impact analysis area in Utah County. Table 15.2-1 provides an overview of the Endangered Species Act consultation process for the MVC project (see Appendix 15A, Ecosystems Correspondence).

Table 15.2-1. MVC Informal Consultation Process Status

Step	Status
Develop Species List/USFWS concurs with list	**Completed.** Initial list provided by USFWS in May 2003. List updated yearly during EIS process.
Identification of threatened or endangered species and/or critical habitat	**Completed.** Conducted field surveys and literature reviews of project area.
If species or critical habitat identified, prepare Biological Assessment	**Completed.** A Biological Assessment is required only if the Preferred Alternative could affect federally listed species. FHWA's Preferred Alternatives in Salt Lake County (5800 West Freeway Alternative) and Utah County (2100 North Freeway Alternative) would have no effect on Ute ladies'-tresses or any other federally listed species.
Make determination to USFWS if likely to adversely affect species or critical habitat	**No-effect determination submitted to USFWS.**
USFWS concurrence on no adverse impacts or start formal consultation process	**USFWS concurred with no-effect determination.**
Formal consultation process	**Not required.**

15.2.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits the take, sale, purchase, possession, barter, or transport, or offer to do any of the above, to either the bald or golden eagle (*Aquila chrysaetos*) at any time or in any manner (16 U.S.C. 668a–d). The Bald and Golden Eagle Protection Act could apply to the MVC project if any individual or nest of these two eagle species could be affected. The Endangered Species Act no longer applies to the bald eagle. As of June 28, 2007, the bald eagle has been delisted from threatened status under the Endangered Species Act. The bald eagle is still protected by the Bald and Golden Eagle Protection Act.

15.2.3 Migratory Bird Treaty Act of 1918

This treaty with Canada, Mexico, and Japan (16 U.S.C. 703–712) makes it unlawful at any time, by any means, or in any manner, to pursue, hunt, take, capture, kill, or sell migratory birds. The law grants full protection to any bird parts and applies to the removal of nests occupied by migratory birds during the breeding season (such as swallow nests on bridges). This statute applies to all migratory birds in the U.S. with the exception of a few exotic species such as the European starling and house sparrow. Executive Order 13186, which was signed by President Bill Clinton on January 10, 2001, directs federal agencies taking actions that are likely to have a measurable negative effect on migratory birds to undertake a number of actions in support of the Migratory Bird Treaty Act. One of these actions is for federal agencies to ensure that the environmental analyses required by the National Environmental Policy Act (NEPA) evaluate the effects of actions and agency plans on migratory birds, with an emphasis on species of concern. Even though the bald eagle was delisted from threatened status under the Endangered Species Act, it is still protected under the Migratory Bird Treaty Act, as are many other species of migratory birds.

The area within and surrounding the MVC project is part of an important migratory flyway for birds in the Intermountain West and provides important migratory stopover habitat for birds traveling north and south. This area also provides nesting habitat for numerous migratory bird species. One potential effect of the MVC project could be to migratory bird nests during construction. If protected species are found nesting within the construction zone or buffer zone during construction, consultation with the appropriate authorities would be required in order to comply with the Migratory Bird Treaty Act.

15.2.4 Clean Water Act

The U.S. Army Corps of Engineers (USACE) developed a definition of waters of the United States under the 1972 Clean Water Act (33 U.S.C. 1251). *Waters of the U.S.* are defined as waters currently or previously used for interstate or foreign commerce; all interstate waters; any waters, the destruction of which could affect interstate or foreign commerce; all impoundments; tributaries of the previously mentioned waters; the territorial seas; and wetlands adjacent to waters.

Wetlands are defined as a subset of waters of the U.S. and, for the purposes of regulatory guidance, are considered special aquatic sites.

USACE has jurisdiction over waters of the U.S. USACE further defines wetlands in Section 404 of the Clean Water Act as:

> ...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

USACE presently has jurisdiction over any waters that are adjacent to, bordering, or contiguous with navigable waterways. For this EIS, it is assumed that all waters of the U.S. within the ecosystem impact analysis area are jurisdictional and subject to the authority of USACE.

Under Section 404 of the Clean Water Act, no discharge of dredged or fill material is permitted in waters of the U.S. if there is a less environmentally damaging practicable alternative to that part of the activity that would result in a discharge of fill material to waters of the U.S. An alternative is practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.

For actions that are subject to NEPA, where USACE is the permitting agency and, in this case, a cooperating agency, the NEPA alternatives analysis must provide the information necessary for a Clean Water Act Section 404(b)(1) alternatives analysis and selection of the least environmentally damaging practicable alternative.

15.2.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. 661–667e, as amended) states that, whenever construction within the waters or channel of a body of water is planned by a department or agency of the U.S., the department or agency must consult with USFWS and the head of the agency exercising administration over

the wildlife resources of the state where construction will occur, with a view to the conservation of wildlife resources. The Act's purposes include providing that wildlife conservation receives equal consideration and is coordinated with other features of water-resource development programs.

15.3 Agency Consultation, Coordination, and Roles

At the start of the MVC project, regulatory and resource agencies were consulted regarding any resources that could be affected by the MVC project. Coordination letters and figures illustrating the location of the ecosystem impact analysis area were sent to USFWS, the Utah Division of Wildlife Resources (UDWR), the UDWR's Natural Heritage Program, and USACE. Each agency was given an opportunity to give feedback regarding the resources under their jurisdiction. USFWS was consulted regarding any federally designated threatened or endangered species that could be present within either Salt Lake County or Utah County. The Utah Natural Heritage Program was consulted regarding any state-listed species of concern. UDWR and USFWS biologists were also consulted about specific habitat types and wildlife present in the impact analysis area. USACE was consulted regarding waters of the U.S. methodologies throughout the process. (See Appendix 15A, Ecosystems Correspondence, for copies of these letters.)

USFWS and UDWR habitat biologists were consulted about the wildlife species that represent each healthy habitat type in the impact analysis area. Once the species that indicate suitable habitat were determined, agency specialists in the biology of each species were consulted to verify the conditions that are needed to provide optimal habitat for these indicator animals.

Prior to the start of the MVC wetland assessment, numerous meetings were held with USACE, UDWR, and USFWS to develop a methodology for the wetland inventory and impact analysis. The methods developed and agreed to by this team are described in Section 15.4.1.3, Jurisdictional Wetlands, and detailed in Technical Report 15, Wetland Resource Assessment Plan (MVC Management Team 2005) (see Appendix 15A, Ecosystems Correspondence).

15.4 Affected Environment

15.4.1 Methodology

Several methods were used to collect data on the elements of the environment that could be affected by the MVC project. These methods consisted of conducting literature reviews, consulting with agency personnel, performing field surveys, and interpreting aerial photographs and map resources. Data were confirmed in the field and recorded using global positioning system (GPS) receivers, and these data were digitized and added to geographic information system (GIS) databases. The resource data in the GIS databases were then used to calculate the acreage of impacts from the project.

15.4.1.1 Wildlife

The coordination with resource agency personnel from USFWS and UDWR resulted in determining which habitat types important to wildlife were present within the project corridor and should be evaluated further. Only habitat types that were known to be useful to terrestrial wildlife were selected for evaluation. Five main terrestrial habitat types were selected: playas, uplands, ephemeral drainages, riparian habitats, and wetlands (other than playas). Perennial streams (such as the Jordan River and Spring Creek) were also evaluated for aquatic species but were not included in the terrestrial wildlife habitat analyses. These five terrestrial habitat types are further described in Section 15.4.2.7, Wildlife Habitat.

Once the habitat types were identified and classified, species that indicate these habitat types were discussed with the agency personnel, resulting in a list of wildlife species that could be present in the impact analysis area. The species lists were not intended to be all-inclusive of each habitat type but rather to indicate the wildlife species typically found in these general habitat types in the area. Nine species, eight birds and one mammal, were selected. Table 15.4-1 below shows the species selected for the habitat types used in the wildlife evaluations.

Table 15.4-1. Wildlife Species and Habitat Types Evaluated

Species	Habitat Type				
	Playas	Uplands	Ephemeral Drainages	Riparian Habitats	Wetlands
American avocet	✓				
Black-necked stilt	✓				
Mule deer		✓	✓		
Brewer's sparrow		✓	✓		
Western meadowlark		✓	✓		
Red-tailed hawk		✓	✓		
Red-winged blackbird				✓	✓
Yellow-headed blackbird				✓	✓
Yellow warbler				✓	

15.4.1.2 Threatened, Endangered, and Sensitive Species

Data regarding threatened, endangered, and sensitive species were initially researched by coordinating with USFWS, which maintains a list of threatened, endangered, and candidate species with the potential to occur in Utah; this list is organized by county. USFWS provided a list of federally listed species that are, or have historically been, known to occur within Salt Lake and Utah Counties.

In addition to the federally listed species, the State of Utah lists sensitive species. Coordination with the Utah Natural Heritage Program resulted in a list of state sensitive species that could be present within the ecosystem impact analysis area. Additionally, the Utah Natural Heritage Program provided GIS files that illustrated the general locations of the species.

After the threatened and endangered species lists were compiled, the biology of each species on the list was researched. The species with habitat requirements that were not consistent with present habitat conditions were eliminated from further study, while those with habitat requirements consistent with present habitat conditions were evaluated further.

15.4.1.3 Jurisdictional Wetlands

The process for identifying wetlands included several steps, and the cooperating agencies determined that each step was suitable for a given level of planning during development of the alternatives, description of the affected environment, and determination of environmental consequences (MVC Management Team 2005). Because of the size of the ecosystem impact analysis area (35 miles long by up to 5 miles wide), formal wetland delineations were not conducted for the alternatives. Instead, wetland resources were identified and mapped using

National Wetland Inventory data (USFWS 2003), aerial photographs, reconnaissance-level field surveys, and recent USACE-verified wetland delineations. If one of the action alternatives is approved, wetland delineations would be conducted before construction in accordance with the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2006), which was adopted in February 2007, and in accordance with any new and recent guidance from USACE such as the memorandum "Clean Water Act Jurisdiction Following the U.S. Supreme Court Decision in *Rapanos v. United States* and *Carabell v. United States Army Corps of Engineers*" (USACE 2007).

In the Draft EIS, wetlands in the MVC study area north of SR 201 in the vicinity of the 5800 West Freeway Alternative and the 7200 West Freeway Alternative were called playa wetlands. However, additional field research conducted in May 2008 found that these wetlands are a subsection of the Great Salt Lake and have hydrologic connections via ditches and sloughs. Therefore, these wetlands would be classified as mineral flats. In this chapter, the term *playa* refers to the mineral flats.

Preliminary Wetland Inventory

Digital National Wetlands Inventory (NWI) maps obtained from the USFWS website (USFWS 2003) were overlaid on 2002 aerial photographs to help identify potential wetland locations. The NWI maps range in date from 1971 to 1992. Because no NWI maps are more recent than 1992, a reconnaissance-level field survey was performed to compare the NWI data to current conditions. While in the field, the NWI maps were checked for accuracy and updated where wetland boundaries had obviously contracted or expanded. Wetlands that were observed in the field but were not identified on the NWI maps were added to the data. Wetland areas that were not accessible by road were not updated during this inventory.

Wetland Inventory Refinement

After the NWI information was verified in the field, data from more recent, higher-resolution aerial photographs were used to further refine the preliminary wetland inventory. Additional field reconnaissance using new photographs and hydric soils data from the National Resources Conservation Service (NRCS) was conducted in October 2005 for the proposed alternatives (including possible alignment shifts) rather than for the entire ecosystem impact analysis area. Hydric soils are defined as those soils that are sufficiently wet in the upper part to develop anaerobic conditions during the growing season.

For the refined wetlands mapping approach, an area was considered a wetland if it had greater than 50% wetland vegetation (that is, plants with a wetland indicator status of facultative or wetter) during the time of the visit. The facultative wetland indicator status means that a plant species is likely to be found in wetlands 34% to 66% of the time in the region. Field notes on the presence of hydrophytic ("water-loving") vegetation, hydrologic indicators, and other important aspects relative to wetlands were collected and used in the functional assessment to determine impacts to wetland functions. Questionable areas were more thoroughly assessed by sampling for hydric soil characteristics such as mottling or gleying (the process by which a soil changes color from an earthy reddish-yellow to a bluish-gray due to waterlogging and the change in iron compounds and loss of oxygen).

Following USACE's guidance regarding irrigated croplands, agricultural fields containing greater than 50% hydrophytic vegetation (tall fescue; *Lolium arundinaceum*[1]) were considered wetlands for the purposes of this EIS (Defreese 2006). Within the ecosystem impact analysis area, these fields occur only in Utah County. This threshold was developed as a substitute for formal delineations in these areas because typical information used to determine wetlands was lacking (information such as knowledge of historic irrigation practices and seeding in the fields, ongoing use of the fields, the timing of the assessment, and historic surface and/or groundwater connectivity to Utah Lake). Furthermore, due to the extent of the wetlands, it was decided to dig soil observation pits at certain locations only to expedite the assessment. Further information on these subjects would be gathered during a later, formal wetland delineation.

Within the ecosystem impact analysis area, some parcels that were planned for development and were recorded (platted) with Salt Lake County or Utah County were not surveyed for wetland resources. Parcels that were platted (as indicated by the land-use layer of the GIS file used for Chapter 4, Land Use) and showed evidence of development (for example, stakes and survey work, blading, or actual construction) were not evaluated because it was assumed that the actual development process had begun and any wetlands in the area would be filled as part of the impending development. However, if an area was platted but there was no evidence of development, then the area was included in the wetland inventory. USACE accompanied the MVC project wetland specialists in the field for one day each in Utah County and Salt Lake County to ensure that appropriate assessment methods were used.

[1] Since the completion of the wetland study for this project, *Lolium arundinaceum* has been classified by the Natural Resources Conservation Service plant database as *Schedonorus phoenix*; another commonly used name for this species is *Festuca arundinacea*.

Once the wetland inventory was completed, the ecosystem impact analysis area was divided into 32 geographic wetland functional units (WFU), or blocks, based on historic wetland boundaries, adjacent and internal land use, and wetland type for use in the functional assessment model (see Figure 15-1 through Figure 15-6, Wetland Functional Units). Wetland functional units 8 through 22 are located in Salt Lake County, while units 1 through 7, 24, and 25 are located in Utah County. In addition, eight units, described as Lolium functional units (LFU) due to the dominant plant cover (*Lolium arundinaceum*, or tall fescue) and irrigated agricultural/grazing land use, are located in Utah County.

The following aquatic habitat types are found in the impact analysis area and could be delineated as waters of the U.S.:

- **Playas (Mineral Flats) –** special aquatic sites that typically display salt crusts and have halophytic ("salt-loving") vegetation around the periphery. Playas in the ecosystem impact analysis area typically have pickleweed (*Salicornia utahensis*), fivehorn smotherweed (*Bassia hyssopifolia*), iodinebush (*Allenrolfea occidentalis*), and inland saltgrass (*Distichlis spicata*) as dominant plants. In the MVC study area, these wetlands are a sub-basin of the Great Salt Lake.
- **Emergent marshes –** characterized by rooted herbaceous hydrophytes (water-loving plants) with a water table found above, at, or very near the ground surface for the majority of the year. Those found within the ecosystem impact analysis area are typically dominated by common reed (*Phragmites australis*) and cattail (*Typha* spp.).
- **Wet meadows –** wetlands that consist of rooted herbaceous vegetation with a varying water table. The plants can tolerate saturation or dryness within certain limits for the given soil type. The most common native or non-native wetland plants associated with wet meadow wetlands include inland saltgrass, Baltic rush (*Juncus balticus*), foxtail barley (*Hordeum jubatum*), tall fescue, and fivehorn smotherweed.
- **Peat-forming wetlands** – found in certain areas of Utah County, this fen-like wetland type receives water from both surface runoff and groundwater. Typically, sedge (*Carex* spp.) and rush (*Juncus* spp.) dominate the vegetation community, and organic matter accumulates as peat. Peteetneet soils characterize this type of wetland.
- **Shrub-scrub wetlands** – wetlands that consist of broad-leafed, deciduous, woody vegetation less than 20 feet tall. Plant types include true shrubs, young trees (saplings), and trees or shrubs that are small or

stunted because of environmental conditions. A common shrub-scrub wetland plant in the impact analysis area is willow (*Salix* spp.).

- **Perennial streams** – streams that flow throughout the year.
- **Ephemeral washes** – channels characterized by a defined bed and bank that conduct seasonal surface flow from precipitation and snowmelt.
- **Riparian wetlands** – wetlands associated with perennial or intermittent streams, ditches, and canals. Vegetation typically consists of reed canary grass (*Phalaris arundinacea*) and tall fescue.

The jurisdictional status of these habitat types, some of which are physically isolated from a traditional navigable water or permanent tributary thereto, depends on the specific landscape position, hydrologic connection, and/or significant nexus determination for each site with respect to the Great Salt Lake, Utah Lake, or other traditional navigable water. This jurisdictional determination will be made by the Corps of Engineers according to the published Corps guidance with respect to the Supreme Court *Rapanos* decision.

The MVC study area was reviewed for the presence of wetlands because this is the area of potential impacts on wetlands. The MVC study area includes 37,246 acres. Of this area, about 3,689 acres or 9.8% (excluding ephemeral washes) were wetlands. This acreage is substantially greater than the wetland acreage that would be affected by any of the action alternatives, since only the footprint of the alternative (right-of-way plus 300 feet on either side) would be affected by a given alternative. The results of a literature review conducted as part of the development of the functional assessment model suggest that impacts to wetland hydrology and water quality are less perceptible beyond 300 feet.

In April and May 2008, UDOT conducted a formal delineation of both the Salt Lake County and Utah County Preferred Alternatives. In addition, an analysis assessed the jurisdictional status along the 7200 West Freeway Alternative between Interstate 80 (I-80) and State Route (SR) 201 where the playa (mineral flats) wetlands are concentrated. This analysis supported the conclusion of the likely jurisdictional status of these wetlands. This area was found to have a hydrologic connection to the Great Salt Lake and is considered a sub-basin of the lake. The results of this analysis were based on an interpretation of USACE and U.S. Environmental Protection Agency (EPA) guidance following the *Rapanos* decision (June 2006) and were reported to UDOT in a letter dated May 20, 2008 (see Appendix 15A, Ecosystems Correspondence).

The USACE and EPA guidance lists three separate scenarios in which federal jurisdiction applies over navigable waters and wetlands and uses a different test for each. First, the federal agencies can assert jurisdiction over traditional

navigable waters, as described in 33 CFR 328.3(a)(1) and 40 CFR 230.3(s)(1), and their adjacent wetlands regardless of whether those wetlands have a continuous surface connection to traditional navigable waters. Second, the agencies will assert jurisdiction over non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally, as well as over those adjacent wetlands that have a continuous surface connection to such tributaries. Finally, a "significant nexus" test is used to determine jurisdiction over wetlands that are adjacent to non-navigable tributaries that are not relatively permanent. A significant nexus test is used where the water body in question significantly affects the chemical, physical, and biological integrity of other covered waters more readily understood as "navigable."

The delineation conducted in April and May 2008 found that most of the potential playas (mineral flats) in the northern portion of the project area will likely fall under the jurisdiction of USACE as waters of the United States. This determination is based on the playas (mineral flats) being adjacent to a navigable water (that is, the Great Salt Lake) and the playas (mineral flats) being adjacent to permanent non-navigable tributaries and having a surface water connection to the tributaries.

Even if wetlands affected by the MVC project are not jurisdictional, it is federal policy to ensure there is "no net loss" of wetlands. In addition, it is the policy of the U.S. Department of Transportation to assure the protection, preservation, and enhancement of the nation's wetlands to the fullest extent practicable during the planning, construction, and operation of transportation facilities and projects. In accordance with Executive Order 11990, Protection of Wetlands, new construction located in wetlands must be avoided unless there is no practicable alternative to the construction and the proposed action includes all practicable measures to minimize harm to wetlands that could result from such construction. For the MVC project, there are no practicable alternatives that avoid wetlands, and all measures to minimize harm to wetlands have been taken including avoidance and minimization of impacts through changes in project design.

15.4.2 General Overview of the Ecosystem Impact Analysis Area

The ecosystem impact analysis area is located within the physiographic region known as the Great Basin complex. The Great Basin is most commonly defined as a contiguous watershed, roughly bounded to the east by the Rocky Mountains and on the west by the Sierra Nevada, that has no natural outlet to the sea. The Great Basin, which is located mostly in Nevada and Utah, is ecologically defined as a large and diverse cold desert that is characterized by cold winters and short,

hot summers where evapotranspiration exceeds precipitation, most of which occurs as late-winter, early-spring snowfall.

Most of the ecosystem impact analysis area has been disturbed by past development and agricultural activities. In addition, new development is occurring at a very rapid rate, further disturbing the few remaining natural habitat systems. All of the 14 cities in the area are planning for development in the impact analysis area, and this development will include a mix of commercial and residential uses. Wildlife that uses these areas often experiences frequent disturbances from human activities and domestic pets, resulting in habitat degradation and wildlife mortality. Areas outside the cities are dominated by low-density rural residential and ranch uses. In these areas, human sources of wildlife disturbances include vehicle traffic on paved and unpaved roads, off-road vehicle use, grazing, and farming.

The existing habitats within the ecosystem impact analysis area exhibit extensive fragmentation due to previous construction and/or activities associated with utility corridors, railroads, roadways, urban development, agriculture, and mining. In particular, the roadways and railroads have resulted in movement barriers between the mountains and foothills along the west side of the ecosystem impact analysis area and the Jordan River. Barriers also exist between upland/wetland habitat areas and the northern Utah Lake shoreline. The wildlife populations now present in these areas are likely to have already experienced many of the effects typically associated with habitat fragmentation (such as reduced carrying capacity, lower reproductive success, and higher susceptibility to predation).

The following sections discuss the dominant features of the Great Basin that support different types of habitat.

15.4.2.1 Great Salt Lake

The MVC project is located in a portion of the Great Basin that is a remnant of the ancient Lake Bonneville. The Great Salt Lake, which is north of the project area, is one of the remnant water bodies of Lake Bonneville. The Great Salt Lake supports a rich and dynamic biological system of regional, national, and global importance. Having no outlet, the lake water varies in both elevation and salinity over time due to the combined effects of freshwater flowing in from four rivers (Bear, Weber, Ogden, and Jordan), precipitation, and groundwater and outflow generated by evaporation. This variation in water level influences the nutrient base and habitats for plants, invertebrates, reptiles, amphibians, mammals, and birds. The variation also creates a mosaic of habitats including wetlands (ranging from freshwater to hyper-saline playas), shorelines, and uplands.

Because of the breadth and abundance of shorebirds at Great Salt Lake, it is designated as a Hemispheric Site of Importance by the Western Hemisphere Shorebird Reserve Network (WHSRN, no date). Birds of regional, national, and international importance are drawn to its 15,000 square miles of water environment, remote islands, shoreline, and 400,000 acres of wetlands. An estimated 5 million birds representing 257 species rely on the lake for resident feeding and sanctuary, breeding, or migratory stopovers (WHSRN, no date).

A few studies have been conducted regarding the number of shorebirds that use the Great Salt Lake. These studies suggest that high numbers of shorebirds use the lake for breeding and migration. A few one-day counts have been conducted for a few species, and these provide a base count from which to extrapolate and estimate total counts for these species.

For some species, such as the Wilson's phalarope (*Phalaropus tricolor*), the lake is a major staging area. A one-day aerial survey in July 1986 estimated a population of 387,000 Wilson's phalaropes. On a single day in July 1991, the population of Wilson's phalarope was estimated at 600,000. Numbers of red-necked phalarope (*Phalaropus lobatus*), the populations of which seem more variable, have been estimated as high as 300,000 on a single day. Recent ongoing studies suggest that at least 5,000 to 10,000 snowy plover (*Charadrius alexandrinus*) nest on the alkaline flats surrounding the lake. The current estimates for breeding American avocet and black-necked stilt are 40,000 and 30,000, respectively (WHSRN, no date).

The Great Salt Lake is also important to many other bird species. Hundreds of thousands of eared grebes (*Podiceps nigricollis*) stage on the lake, fattening on the abundant brine shrimp. One of the world's largest populations of white-faced ibis (*Plegadis chihi*) nests in the marshes along the east side of the lake. The Great Salt Lake hosts the largest number of breeding California gulls (*Larus californicus*), including the world's largest recorded single colony. About 150,000 breeding adults have been documented in recent years. The American white pelican (*Pelecanus erythrorhynchos*) colony on Gunnison Island, where up to 17,000 breeding adults have been recorded, ranks in the top three populations in North America. Numerous other species depend on the lake, such as other species of gulls, waterfowl, herons, egrets, terns, raptors, and songbirds (WHSRN, no date).

15.4.2.2 Utah Lake

Utah Lake, which is also a remnant of Lake Bonneville, is a freshwater lake located at the southern end of the ecosystem impact analysis area. It is one of the largest naturally occurring freshwater lakes in the western United States. Utah Lake drains north into the Great Salt Lake via the Jordan River. The wetlands

surrounding Utah Lake are an important link in the Great Basin ecosystem and have long been recognized locally and nationally for their critical importance to fish and wildlife. The wetlands are an important breeding area and stopover point for many migratory birds in the Pacific Flyway. About 226 species of birds, 49 species of mammals, 16 species of amphibians and reptiles, and 18 species of fish are known to use Utah Lake and the surrounding wetlands. Utah Lake also provides feeding areas for birds nesting on the Great Salt Lake.

15.4.2.3 Jordan River

The Jordan River starts at Utah Lake and flows north for 44 miles where it drains into the Great Salt Lake. Historically, the Jordan River was a meandering stream that conveyed water through unconsolidated lake sediments to the Great Salt Lake after the draining of Lake Bonneville. Over time, the river developed a larger natural meander corridor and associated floodplain, which created oxbows, marshes, and sloughs. The water quality of the Jordan River is discussed in Chapter 14, Water Quality.

Since the Salt Lake basin was settled by pioneers, water has been diverted from the Jordan River for irrigation and the river has been dammed, channelized, and degraded, which altered the river's scouring and deposition patterns.

Additionally, many flood-control projects on the Jordan River have involved dredging and straightening the river. In most places, the active floodplain of the Jordan River is 6 feet to 10 feet below the historic floodplain. These alterations have contributed to the hydrologic separation of the river from the floodplain, drying of the floodplain and associated springs, and the loss of native riparian vegetation and wildlife habitat.

Even though the Jordan River now flows at nearly "bank full" conditions for several months a year, it is disconnected from the large expanse of floodplain that it used to hydrologically support (National Audubon Society 2000).

15.4.2.4 American Fork and Spring Creeks

American Fork Creek and Spring Creek are two of many waterways in the ecosystem impact analysis area. These two creeks flow south into the north end of Utah Lake. American Fork Creek provides staging areas for the June sucker at its mouth. However, the June sucker has not been found upstream from there. Additionally, Spring Creek flows out of the Lehi Mill Pond where the June sucker has historically been stocked. While the June sucker is no longer found in the Lehi Mill Pond, it does still stage at the mouth of Spring Creek, where Spring Creek flows into Utah Lake, and spawns upstream. Additionally, these smaller creeks provide some degree of riparian habitat along their banks and connect the

upland habitats with the lakeshore wetlands. Although they are smaller and less rich in species than the more extensive riparian habitat surrounding the Jordan River south of the Jordan Narrows, these smaller riparian areas are still important habitat for wildlife species and can be used as migration or dispersal corridors. A list of wildlife and aquatic species associated with American Fork and Spring Creeks[2] is presented in Table 15.4-2.

Table 15.4-2. Representative Wildlife Species That Use American Fork and Spring Creeks

Type	Common Name	Scientific Name
Birds	Song sparrow	*Melospiza melodia*
	Red-winged blackbird	*Agelaius phoeniceus*
	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
	Yellow warbler	*Dendroica petechia*
	Cattle egret	*Bubulcus ibis*
	Common yellowthroat	*Geothlypis trichas*
	Virginia rail	*Rallus limicola*
	Sora	*Porzana carolina*
Reptiles	Ring-necked snake	*Diadophis punctatus*
	Western yellow-bellied racer	*Coluber constrictor mormon*
	Gartersnake	*Thamnophis sirtalis*
Mammals	American mink	*Mustela vison*
	Long-tailed weasel	*Mustela frenata*
	Muskrat	*Ondatra zibethicus*
	Northern raccoon	*Procyon lotor*
	Striped skunk	*Mephitis mephitis*
Fish	Brown trout	*Salmo trutta*
	June sucker	*Chasmistes liorus*
	Mottled sculpin	*Cottus bairdii*
	Mountain sucker	*Catostomus platyrhynchus*
	Rainbow trout	*Oncorhynchus mykiss*
	Walleye	*Sander vitreus*
	Utah sucker	*Catostomus arden*
Amphibians	Tiger salamander	*Ambystoma tigrinum*
	Great Basin spadefoot	*Spea intermontana*
	Woodhouse's toad	*Bufo woodhousii*
	Western chorus frog	*Pseudacris triceriata*
	Green frog	*Rana clamitans*

Source: Utah Division of Wildlife Resources, no date

[2] The list of species is not a comprehensive list of all the species that use habitat associated with American Fork Creek and Spring Creek. The species listed in the table are a sample of species.

15.4.2.5 Springs

No springs were identified in the ecosystem impact analysis area during the wetland and biological field surveys. No specific surveys for springs were conducted in these areas; however, there are many wells in the ecosystem impact analysis area that might have been developed from springs, especially throughout Utah County. These wells are discussed in Chapter 14, Water Quality. Springs would be identified during the jurisdictional wetland delineation that would be conducted as part of the process for obtaining a Section 404 permit under the Clean Water Act.

15.4.2.6 Conservation Areas

The Spring Creek Ranch Habitat Restoration and Conservation Project is a parcel of land along Utah Lake's north shoreline that was acquired and set aside by the land owner for conservation. The conservation project will include public outreach and education with nature trails and information kiosks. It will also allow university-led scientific research by faculty from Brigham Young University and Utah Valley State College (HDR 2006). The conservation area surrounds parts of Spring Creek where it approaches Utah Lake and includes a larger parcel of the mixed wetlands and wet meadows near the Utah Lake shoreline. Some other preservation areas near Utah Lake and the Jordan River include Inlet Park, Jordan Willows Park, and Willow Park. These parks both provide recreational activities and conserve lands adjacent to the two water bodies.

The Utah Lake Wetland Preserve is located on the southern end of Utah Lake outside the ecosystem impact analysis area. The preserve consists of two units: Goshen Bay and Benjamin Slough. These units include a network of wetland and interspersed upland habitats that provide habitat for wetland- and upland-dependent species. The preserve will ultimately be managed by UDWR.

15.4.2.7 Wildlife Habitat

Five valuable wildlife habitat types were identified in the ecosystem impact analysis area: playas (mineral flats), uplands, ephemeral drainages, wetlands, and riparian habitats. These habitats are common and characteristic of habitats throughout the Great Basin. Representative photos of these five habitat types that are located within the impact area are found in Figure 15-7, Wildlife Habitat Types.

There are three important considerations when evaluating the use or value of land as wildlife habitat: (1) valuable habitats for wildlife are actually a matrix or mixture of other habitats; (2) wildlife habitats exist when a complete community or complex of species resides there, not simply where a few of those species are

present; and (3) when specifically discussing wetlands, jurisdictional wetlands (that is, wetlands that are subject to regulation by USACE under the Clean Water Act) and wetland wildlife habitats are not necessarily the same. Although jurisdictional wetlands and wetland wildlife habitat definitions can overlap to some degree, their definitions serve specific purposes. This section addresses wetland wildlife habitat.

Valuable wildlife habitats can have several small inclusions of other habitat types. A specific habitat type is defined by the predominant plant species and environmental conditions that constitute the typical form of that habitat, but can include pockets or inclusions of several different habitat types.

Valuable wildlife habitat consists of a full community of interdependent species that are adapted to a specific set of environmental conditions. Although some of the animal species might be able to exist in other habitats or in other areas with similar environmental conditions, those other habitats might not support the animal's life requisites. In other words, the simple presence of an animal in one habitat type does not indicate that the area is valuable habitat for that species. The wildlife habitat must support one or more life requisites of the animal to be considered valuable. For example, if a mule deer is standing in a fallow agricultural field, this does not necessarily mean that the field is valuable mule deer habitat.

Wetland wildlife habitat, as described in this section, refers exclusively to wetland complexes (combinations of wetland and upland) that are used by wetland wildlife species. These are distinguished from USACE jurisdictional wetlands in several ways. A wetland wildlife habitat often is a complex of jurisdictional wetlands and uplands. Also, wildlife species use both hydrophytic and upland vegetation for a combination of breeding, feeding, and cover. Therefore, wetland wildlife habitats are *larger* areas (including the associated upland inclusions) than jurisdictional wetlands. On the other hand, an area might be considered a jurisdictional wetland because it meets the USACE definition, but if it is a small inclusion in an upland habitat, it would be identified as part of the upland wildlife habitat and might not be considered wetland wildlife habitat. This section does not consider jurisdictional wetlands that are not managed to support wetland wildlife species as wildlife habitat (for example, a small wet pasture used for horses).

Playas (Mineral Flats)

Playa habitats in the ecosystem impact analysis area are associated with, and hydrologically connected to, the Great Salt Lake. Playa habitats in the impact analysis area are located near I-80. Playa communities develop where

evaporation exceeds inflow and the salt and alkali contents of soil are high. High salt accumulation and alkalinity are a result of this evaporation cycle and account for distinct plant composition and zonation. Playas are classified as jurisdictional waters of the U.S. Many vegetated playas are also classified as jurisdictional wetlands. Typical playa vegetation is described in the section titled Wetland Inventory Refinement on page 15-8. Sandy hummocks found in playas also support mound saltbush (*Atriplex nuttallii*), Gardner's saltbush (*Atriplex gardneri*), seepweed (*Suaeda* spp.), shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), alkaligrass (*Puccinellia* spp.), foxtail barley, alkali sacaton (*Sporobolus airoides*), and inland saltgrass.

Playas provide a unique type of habitat due to their plant community and salinity. Many of the waterfowl that use playa habitats have specialized habitat requirements. For this reason, these playa habitats are important migratory stopover locations and provide a unique ecological function.

The existing playa habitat in the ecosystem impact analysis area is in variable condition and is generally less than optimal. Development has removed some areas of playa entirely. There are some areas of playa on the western side of the impact analysis area that are in relatively pristine condition. However, there are areas adjacent to these pristine zones that have been disturbed by overgrazing, garbage dumping, and fires. Where fire has removed the native vegetation, invasive exotic plant species have become established and have reduced the quality of habitat for wildlife. However, during periods of extreme high water, many pristine playa habitats (especially those north of I-80) are inundated. Many of the playas south of I-80, regardless of habitat quality, can serve as refugia for wildlife species during these periods. This being said, with the exception of some refugia habitat during high-water periods, much of the playa habitat along this disturbed and urbanized project corridor is not of high quality for wildlife.

Uplands

Upland habitat is found along the arid foothills and slopes of the area's mountain ranges, specifically along the western edge of the ecosystem impact analysis area. Uplands are a mosaic of grasslands and arid shrublands. The uplands are bisected by numerous west-to-east-running ephemeral drainages that convey stormwater and snowmelt from steeper areas to the valley floor. The topography of the foothills typically is somewhat variable and is steeper than that of the valley floor.

The upland plant communities are dominated by big sage (*Artemesia tridentata*), gambel oak (*Quercus gambelii*), black sage (*Artemesia nova*), bud sage (*Artemesia spinescens*), rabbit brush (*Chrysothamnus nauseosus*), low rabbit

brush (*Chrysothamnus viscidiflorus*), and broom snakeweed (*Gutierrezia sarothrae*). Commonly found forb and grass species in the uplands are buckwheat (*Eriogonum* spp.), storksbill (*Erodium cicutarium*), pale evening-primrose (*Oenothera pallida*), Munro's globemallow (*Sphaeralcea munroana*), Hood's phlox (*Phlox hoodii*), Fendler's euphorb (*Euphorbia fendleri*), ragweed (*Ambrosia acanthicarpa*), Indian rice-grass (*Oryzopsis hymenoides*), crested wheatgrass (*Agropyron cristatum*), Great Basin wildrye (*Secale cereale*), and intermediate wheatgrass (*Elymus intermedium*).

Most of the upland habitat has been disturbed by agriculture or urbanization. Moreover, uplands adjacent to urbanized areas have subsequently been disturbed by fire or overgrazing. After a fire, faster re-establishing shrub species, such as low rabbit bush and broom snakeweed, sometimes take the place of the slower-recovering sagebrush species. In addition, invasive forbs and grasses are also likely to infest uplands after a fire. Some of these invasive plants include halogeton (*Halogeton glomeratus*), clasping pepperweed (*Lepidium perfoliatum*), bur buttercup (*Ranunculus testiculatus*), and cheatgrass (*Bromus tectorum*). In general, these faster-growing and invasive plant species have a lower value to wildlife than do the slower-growing species. Much of the foothill upland habitat has been subjected to frequent fires and is dominated by the less desirable plants. Therefore, much of the upland habitat along this disturbed and urbanized area is of a lower value for wildlife.

Arid shrublands are a component of upland habitats and are present throughout much of the Great Basin. Within the ecosystem impact analysis area, arid shrublands are located primarily on the west side of the Salt Lake and Utah Valleys. This habitat type transitions into the playa to the north and foothill communities to the west.

The arid shrublands are dominated by the same shrub species found in the uplands (see species list above), though in different community compositions. As the name implies, arid shrubland areas are characterized and dominated by the shrub species complexes.

Over the years, arid shrublands on the western side of the Salt Lake Valley have been slowly lost or degraded from development, fire, and other human activities. Any remaining quality shrubland habitat exists only in the upper elevations of the foothills of the Oquirrh Mountains. A majority of the arid shrubland habitat in the ecosystem impact analysis area has been disturbed by agriculture or urbanization.

Ephemeral Drainages

The ephemeral drainage habitat is found along the arid foothills and slopes of the area's mountain ranges, specifically along the western edge of the ecosystem

impact analysis area. Over time, the topographic fluctuations of the foothills have created ephemeral drainages. The ephemeral drainages convey storm precipitation and spring snowmelt to the valley floor, the floodplains, and ultimately to the Great Salt Lake.

Vegetation present in the ephemeral drainages includes shrubs, trees, forbs, and grasses, many of which can also be found in the uplands. Shrubs present include species such as big sagebrush, rabbit brush, skunkbush (*Rhus trilobata*), gambel oak, and chokecherry (*Prunus virginiana*). Trees present can include box elder (*Acer negundo*) and bigtooth maple (*Acer grandidentatum*). Forbs present include many of those found in the uplands. Additionally, grass species such as Indian rice-grass, foxtail barley, fescue (*Festuca* spp.), crested wheatgrass, Great Basin wildrye, and intermediate wheatgrass can be found in ephemeral drainages. If disturbance occurs, invasive species similar to those that occupy disturbed uplands can also inhabit the ephemeral drainages.

Due to the greater availability of moisture in ephemeral drainages, pristine areas are vegetated more densely than are the adjacent upland areas. Increased vegetation cover provides better-quality wildlife habitat than the adjacent shrublands. These ephemeral drainages can provide wildlife cover, forage, nesting sites, and travel corridors between dry upland shrub communities and habitats associated with the floodplain below. There are few remaining pristine ephemeral drainages in the ecosystem impact analysis area as most ephemeral drainages have had the native vegetation removed from the channel, the adjacent upland areas, or both. In most cases, land uses adjacent to these drainages have been converted to winter wheat cultivation. Additionally, channel courses have often been changed to accommodate housing development and other types of agriculture. As vegetation is converted from native to invasive species, the ephemeral drainage's ability to convey stormwater is not impaired, but the value as wildlife habitat is greatly reduced.

Wetlands

The wetland complexes within the ecosystem impact analysis area are located along the northern fringes of Utah Lake and consist mainly of wet meadows and emergent marsh habitats. Wetland vegetation communities are described in the section titled Wetland Inventory Refinement on page 15-8.

Utah Lake's wetlands are critical for fish and wildlife. The wetland complexes associated with the lake are important as a breeding area and stopover for migratory birds in the Pacific Flyway, as well as habitat for mammals, amphibians, reptiles, fish, and invertebrates.

Development and urbanization have fragmented and reduced the once large, contiguous blocks of wetland habitat. Many of the remaining small and isolated portions of wetlands have been so modified by development and agriculture that they are of little value as wildlife habitat.

Riparian Habitats

Most of the riparian wildlife habitats in the ecosystem impact analysis area are found along the Jordan River in both Salt Lake and Utah Counties, although some riparian habitat is also associated with the smaller creeks and streams flowing into Utah Lake (in Utah County). Within the Jordan River system, there is less than 300 feet of elevation change from the pumping station at Inlet Park in Utah County (where the Jordan River flows out of Utah Lake) to the point where the Jordan River empties into Great Salt Lake. For this reason, the river usually flows at a slow speed, and the Jordan River habitat is typical of that near slow-moving water. This habitat associated with slow-moving water is more likely to support emergent marsh–type vegetation than are the steeper (higher water velocity) riverine systems in the Great Basin. The low velocity and relative lack of scouring events greatly affect the vegetation species found along the Jordan River corridor. Common species include cattails, bulrushes (*Scirpus* spp.), rushes, common reed, reed canarygrass, saltcedar, Russian olive, willows, and Fremont cottonwood (*Populus fremontii*).

Cold desert riparian habitats such as the Jordan River can be described as oases. In these areas, wildlife species use the habitat for water, cover, resting, feeding, nesting, and raising young. However, the quality of the Jordan River habitat has decreased over time. The numerous diversion structures and flow-control devices have virtually eliminated the natural flows that can support a healthy riparian ecosystem. Without the occasional natural scouring events that redistribute sediments, the channel bed has dropped in elevation to the point that it is no longer hydrologically connected to the floodplain. The overall effect of these changes has lowered the value of the riparian corridor as wildlife habitat.

15.4.3 Salt Lake County

This section provides more specific information about the location and condition of habitats in the Salt Lake County portion of the ecosystem impact analysis area. In Salt Lake County, the wildlife habitat types found are playas, uplands (including arid shrublands), ephemeral drainages, and riparian habitats (see Figure 15-8, Wildlife Habitat – Salt Lake County).

15.4.3.1 Habitat Locations

Playas

Playas occur only in the northern part of the ecosystem impact analysis area (Salt Lake County). Playa habitats are found south of I-80 and extend south past SR 201 to about 3500 South.

Uplands

Uplands (including arid shrublands) are found on the slopes of the foothills on the western side of the ecosystem impact analysis area. This habitat can be found intermittently in Salt Lake County beginning at about 4100 South and continuing south to the Salt Lake County–Utah County line near Camp Williams.

Ephemeral Drainages

Ephemeral drainages are found on the western side of the ecosystem impact analysis area, flowing from the foothills. The ephemeral drainage habitat in Salt Lake County begins at 4100 South and continues south to the Salt Lake County–Utah County line.

Riparian Habitats

The Jordan River riparian habitat spans both Utah and Salt Lake Counties. In the Salt Lake County portion of the ecosystem impact analysis area, the Jordan River flows from the Utah County–Salt Lake County line north to the Great Salt Lake.

15.4.3.2 Wildlife

Playas

The dominant wildlife found inhabiting the playas are bird species, although some smaller- and medium-sized mammals are also present. Many bird species use the playas for feeding and resting during their annual migrations. The main food supply for many of the migratory waterfowl is invertebrates, which hatch in large numbers during wet spring periods. Some of the typical bird species include American avocet (*Recurvirostra americana*), black-necked stilt (*Himantopus mexicanus*), long-billed curlew (*Numenius americanus*), Wilson's phalarope, and snowy plover. The sandy hummocks provide elevated areas to nest and burrow for small mammal species such as the deer mouse (*Peromyscus maniculatus*), Great Basin pocket mouse (*Perognathus parvus*), and western harvest mouse (*Reinthrodontomys megalotis*) (Vest 1962). Medium to large mammals sometimes use the playa habitat to prey on smaller mammals or to graze or

browse. Large animals use this habitat type, but to a lesser extent than the smaller mammals. These medium to large animals include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), kit fox (*Vulpes macrotis*), black-tail jack rabbit (*Lepus californicus*), and mule deer (*Odocoileus hemionus*).

Uplands

The uplands/arid shrublands provide cover and foraging habitat for many mammals including rodents such as least chipmunk (*Tamias minimus*), Townsend's ground squirrel (*Spermophilus townsendii*), Ord's kangaroo rat (*Dipodomys ordii*), deer mouse, and Great Basin pocket mouse. Larger mammals also typically present include striped skunk, black-tail jack rabbit, desert cottontail rabbit (*Sylvilagus audubonii*), coyote, badger (*Taxidea taxus*), and mule deer.

This habitat type is beneficial for wildlife because it provides forage and cover. The shrubs provide vegetation that big game can browse on during the winter. Additionally, the variety of vegetation provides year-round habitat for many smaller bird species such as loggerhead shrike (*Lanius ludovicianus*), Virginia's warbler (*Vermivora virginiae*), black-throated gray warbler (*Dendroica nigrescens*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*), western meadow lark (*Sturnella neglecta*), scrub jay (*Aphelocoma californica*), and black-billed magpie (*Pica pica*); upland game birds such as ring-necked pheasant (*Phasianus colchicus*) and grouse (*Dendragapus* spp.); and raptors such as golden eagle, red-tailed hawk (*Buteo jamaicensis*), kestrel (*Falco sparverius*), and northern harrier (*Circus cyaneus*).

Ephemeral Drainages

Wildlife that use the ephemeral drainages include several mammal and bird species. Mammals include deer mouse, meadow vole, rock squirrel (*Spermophilus variegatus*), desert cottontail rabbit, striped skunk, badger, and mule deer.

Birds commonly found in ephemeral drainages vary widely from songbirds to upland game birds to raptors. Songbirds include Brewer's sparrow, American robin (*Turdus migratorius*), sage sparrow, horned lark (*Eremophila alpestris*), western meadow lark, scrub jay, and black-billed magpie. Upland game birds include ring-necked pheasant and grouse. Raptors include golden eagle, red-tailed hawk, kestrel, and northern harrier.

Riparian Habitats

Many species of mammals that are present in the other habitats (playas, uplands, and ephemeral drainages) can also be found in the riparian habitat along the Jordan River and other drainages. Species commonly found in the Jordan River riparian habitat include deer mouse, vole, muskrat, mink, beaver (*Castor canadensis*), coyote, red fox, northern raccoon, striped skunk, badger, and mule deer.

Bird species that occupy the Jordan River riparian habitat are similar to those of the wetland habitats. These include American robin, sage sparrow, Brewer's sparrow, European starling (*Sturnus vulgaris*), red-winged blackbird, yellow-headed blackbird, yellow warbler, mourning dove (*Zenaida macroura*), and migratory waterfowl species.

Invertebrates in the Jordan River riparian habitat are plentiful and provide enough prey to support a healthy population of animals. Additionally, the Jordan River provides aquatic habitat. Some fish species that are present in the Jordan River are brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), yellow perch (*Perca flavescens*), white bass (*Morone chrysops*), largemouth bass (*Micropterus salmoides*), walleye (*Sander vitreus*), and carp (*Cyprinus carpio*).

15.4.3.3 Threatened, Endangered, and Sensitive Species

Federally Listed Species

Table 15.4-3 below shows the federally listed and sensitive species that could be present in the ecosystem impact analysis area. The table provides the common and scientific name, listing status, county occurrence (that is, whether the species is present in Utah County or Salt Lake County), and the probability of each of the federally listed species to occur in the ecosystem impact analysis area. The list contains nine species, six of which were determined to have no potential of being present in the ecosystem impact analysis area. One species, the yellow-billed cuckoo (*Coccyzus americanus*), is a candidate species and has a low potential to be present in the Salt Lake County portion of the ecosystem impact analysis area. One threatened plant, the Ute ladies'-tresses, was determined to be present in Utah County. The endangered June sucker is known to stage at the mouths of American Fork and Spring Creeks near the inlet of Utah Lake in Utah County, but are not known to occur upstream. They are not known to be in the Jordan River.

Yellow-Billed Cuckoo (Candidate). Yellow-billed cuckoos historically were common-to-uncommon summer visitors in Utah and across the Great Basin. The current distribution of yellow-billed cuckoos in Utah is poorly understood,

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although they appear to be an extremely rare breeder in lowland riparian habitats statewide. They arrive in late May or early June and breed during late June through July. Cuckoos typically start their southerly migration by late August or early September. Yellow-billed cuckoos are considered a riparian obligate species (that is, a species that requires riparian habitat) and are usually found in large tracts of cottonwood/willow habitat with dense subcanopies.

Table 15.4-3. Federally Listed Species in the Ecosystem Impact Analysis Area (Salt Lake and Utah Counties)

Species (Scientific Name)	County Occurrence[a]	Status[b]	Probability[c]
Invertebrates			
Utah valvata snail (*Valvata utahensis*)	U	E - Extirpated	None
Fish			
June sucker (*Chasmistes liorus*)	SL, U	E	Good
Birds			
Yellow-billed cuckoo (*Coccyzus americanus*)[d]	SL, U	C	Low
Mammals			
Brown (grizzly) bear (*Ursus arctos*)	U	T - Extirpated	None
Canada lynx (*Lynx canadensis*)	SL, U	T	None
Plants			
Clay phacelia (*Phacelia argillacea*)	U	E	None
Deseret milkvetch (*Astragalus desereticus*)	U	T	None
Slender moonwort (*Botrychium lineare*)	SL	C	None
Ute ladies'-tresses (*Spiranthes diluvialis*)[d]	U	T	Good

[a] Denotes county with known or suspected occurrence:
SL = Salt Lake County, U = Utah County

[b] Status definitions:
E = A species that is listed as endangered by USFWS.
T = A species that is listed as threatened by USFWS.
C = A species for which USFWS has on file enough information on biological vulnerability and threats to justify its being a "candidate" for listing as endangered or threatened (but the species is not yet legally protected).

[c] Probability definitions:
None = No habitat identified within the analysis area; no known occurrences documented.
Low = Potential for habitat identified within the analysis area; no known occurrences documented.
Good = Habitat identified within the analysis area; known occurrences documented.

[d] A federally listed species that was also included in the correspondence from the Utah Natural Heritage Program.

Source: Utah Division of Wildlife Resources 2007

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State Listed Species

Table 15.4-4 provides the state-listed sensitive species that could be present in the ecosystem impact analysis area.

Table 15.4-4. State of Utah Species of Concern in the Ecosystem Impact Analysis Area (Salt Lake and Utah Counties)

Species (Scientific Name)	County Occurrence[a]	Status[b]	Probability[c]
Invertebrates			
California floater (*Anodonta californiensis*)	U	SPC	Low
Eureka mountainsnail (*Oreohelix eurekensis*)	U	SPC	None
Lyrate mountainsnail (*Oreohelix haydeni*)	SL	SPC	None
Southern Bonneville pyrg (*Pyrgulopsis transversa*)	U	SPC	Low
Utah physa (*Physella utahensis*)	U	SPC	None
Western pearlshell (*Margaritifera falcata*)	SL	SPC	None
Reptiles and Amphibians			
Columbia spotted frog (*Rana luteiventris*)	SL, U	CS	None
Smooth greensnake (*Opheodrys vernalis*)	SL, U	SPC	None
Western toad (*Bufo boreas*)	SL, U	SPC	None
Fish			
Bluehead sucker (*Catostomus discobolus*)	U	CS	None
Bonneville cutthroat trout (*Oncorhynchus clarkii utah*)	U	CS	None
Least chub (*Iotichthys phlegethontis*)	SL, U	CS	None
Southern Leatherside chub (*Lepidomeda aliciae*)	U	SPC	Good
Roundtail chub (*Gila robusta*)	U	CS	None
Birds			
American white pelican (*Pelecanus erythrorhynchos*)	SL, U	SPC	None
Black swift (*Cypseloides niger*)	SL, U	SPC	None
Bobolink (*Dolichonyx oryzivorus*)	SL, U	SPC	Low
Burrowing owl (*Athene cunicularia*)	SL, U	SPC	Low
Ferruginous hawk (*Buteo regalis*)	SL, U	SPC	Low
Grasshopper sparrow (*Ammodramus savannarum*)	SL	SPC	Low
Greater sage-grouse (*Centrocercus urophasianus*)	SL, U	SPC	None
Lewis' woodpecker (*Melanerpes lewis*)	SL, U	SPC	None
Long-billed curlew (*Numenius americanus*)	SL, U	SPC	Low
Northern goshawk (*Accipiter gentilis*)	SL, U	CS	None
Short-eared owl (*Asio flammeus*)	SL, U	SPC	Low
Three-toed woodpecker (*Picoides tridactylus*, also known as *Picoides dorsalis*)	SL, U	SPC	None

Species (Scientific Name)	County Occurrence[a]	Status[b]	Probability[c]
Mammals			
Fringed myotis (*Myotis thysanodes*)	U	SPC	Low
Kit fox (*Vulpes macrotis*)	SL, U	SPC	None
Spotted bat (*Euderma maculatum*)	SL, U	SPC	None
Townsend's big-eared bat (*Corynorhinus townsendii*)	SL, U	SPC	None
Western red bat (*Lasiurus blossevillii*)	U	SPC	Low
White-tailed prairie-dog (*Cynomys leucurus*)	U	SPC	None

[a] Denotes county with known or suspected occurrence:
SL = Salt Lake County, U = Utah County

[b] Status definitions:
SPC = Special Concern Species, CS = Conservation Species

[c] Probability definitions:
None = No habitat identified within the analysis area; no known occurrences documented.
Low = Potential for habitat identified within the analysis area; no known occurrences documented.
Good = Habitat identified within the analysis area; known occurrences documented.

Source: Utah Division of Wildlife Resources 2006

In the Salt Lake County portion of the ecosystem impact analysis area, there is potential habitat for the burrowing owl, ferruginous hawk, long-billed curlew, and short-eared owl.

Burrowing Owl. This species prefers very open and level grasslands or low shrublands and is closely associated with prairie dog burrow complexes, which it uses for nesting. Burrowing owl sightings or nesting areas are recorded from several locations close to, but outside of, the ecosystem impact analysis area. Most of the known burrowing owl habitat in western Salt Lake County is in the Cougar Park Nature Preserve in West Jordan, about 1 mile east of and well outside the nearest MVC project alternative.

Ferruginous Hawk. This species prefers open grasslands and shrublands that are found in upland habitat in the western portions of Salt Lake and Utah Counties. Some of this upland habitat is located within the ecosystem impact analysis area, although most of it is disturbed and of a much lower quality than uplands outside the ecosystem impact analysis area. The species' nesting habitat requirements include an abundant small-mammal food source surrounding elevated cliffs or banks for nesting, none of which are found in the ecosystem impact analysis area.

Long-Billed Curlew. This species forages and breeds in the playa habitats and fallow croplands and hayfields of the ecosystem impact analysis area. There are several known sightings of long-billed curlews near the playa habitat south of I-80. The majority of thee playa habitat south of I-80 is considered disturbed and might provide poor habitat for the long-billed curlew. However, these habitat

areas are still important, especially during high-water years when many other playa wetlands associated with the Great Salt Lake are inundated and the higher-elevation wetland habitats function as wildlife refugia.

Short-Eared Owl. This species inhabits Utah during its non-breeding times, typically preferring open grasslands, scrublands, or fields in which it hunts small mammals. The ecosystem impact analysis area includes a large amount of open land that could be used by the short-eared owl, although such habitat is common throughout Utah.

Bobolink. Bobolink distribution is fairly continuous in the eastern United States but is patchy in the western United States. There are isolated breeding populations in northern Utah and Nevada, central Washington, and eastern Arizona. Bobolinks do not breed in most of Utah. They occur in low abundance and in isolated patches primarily in the northern half of the state. Bobolinks have been found consistently and are likely to breed or have bred near Logan, Brigham City, Kamas, Heber, Morgan, Mountain Green, Huntsville, West Layton, and Provo and at the south end of Bear Lake. Bobolinks in the West nest and forage in wet meadow (grasses and sedges), wet grassland, and irrigated agricultural (primarily pasture and hay field) areas.

Grasshopper Sparrow. The grasshopper sparrow is a bird of the grasslands of North America, Central America, and northwestern South America. The densest breeding populations are found in the central and northern Great Plains, but nesting occurs across the eastern United States and at scattered locations west of the Rocky Mountains. In Utah, breeding populations have been found only in the northern parts of the state. The dry grassland habitat in the ecosystem impact analysis area provides very marginal habitat because it has been disturbed by human activities.

15.4.3.4 Migratory Birds

The entire ecosystem impact analysis area is located within the flyways of bald eagles and golden eagles, although the corridor is not considered prime nesting habitat for these species. No bald eagle nesting sites have been reported within the ecosystem impact analysis area. Golden eagles have just over 60 active nests in Utah (as of 2005). There is nesting habitat for other migratory birds in the impact analysis area, including ferruginous hawk, burrowing owl, short-eared owl, long-billed curlew, black-necked stilt, American avocet, snowy plover, sage sparrow, western meadowlark, Brewer's sparrow, horned lark, and scrub jay. Nesting habitat for small migratory birds (that is, songbirds and shorebirds) is common throughout the region.

15.4.3.5 Jurisdictional Wetlands

The MVC study area was reviewed for the presence of wetlands because this is the area of potential impacts on wetlands. The MVC study area includes 37,246 acres. Of this area, about 3,689 acres or 9.8% (excluding ephemeral washes) could potentially qualify as jurisdictional based on the methodology used in Section 15.4.1.3, Jurisdictional Wetlands. These figures are substantially greater than the wetland acreage that would be affected by any of the action alternatives, since only the footprint of the alternative (right-of-way plus 300 feet on either side) would be affected by a given alternative.

Wetlands were identified and mapped within and adjacent to the alternatives in Salt Lake County (see Figure 15-9 through Figure 15-11, Wetland Locations). Nearly 75% of the wetlands in the Salt Lake County portion of the corridor are vegetated playa (see Table 15.4-5).

Table 15.4-5. Wetlands in the Salt Lake County Portion of the Ecosystem Impact Analysis Area

Wetland Type	Total Acres in Analysis Area	Percent Wetland by Type
Emergent marsh	52.61	5%
Wet meadow	227.39	20%
Vegetated playa	853.47	75%
Total	**1,133.47**	**100%**

In addition to the differences in wetland types, wetlands in Salt Lake County differ relative to surrounding land uses and current hydrologic conditions. For example, some wetlands occur within the interchanges of SR 201, and their functional quality is low. Others are part of a large complex or were created by past mitigation, and these wetlands have high functional quality. Using these landscape-level conditions, wetlands in Salt Lake County were grouped into wetland functional units based on the different land-use types as described in Section 15.4.1, Methodology.

15.4.4 Utah County

Wildlife habitat types found in Utah County include uplands/arid shrublands, ephemeral drainages, wetlands, and riparian habitat. The general description of these habitat types is provided in Section 15.4.2.7, Wildlife Habitat. Section 15.4.4.1 below provides the locations of the habitat types within the Utah County portion of the ecosystem impact analysis area.

15.4.4.1 Habitat Locations

Within Utah County, the specific habitat types are shown in Figure 15-12 through Figure 15-14, Wildlife Habitat – Utah County.

Uplands

Uplands (including arid shrublands) in the ecosystem impact analysis area are found on the slopes of the western foothills. In Utah County, the habitat is present from the Salt Lake County–Utah County line near Camp Williams south to about 2100 North in Lehi.

Ephemeral Drainages

The ephemeral drainages in Utah County are found on the western side of the ecosystem impact analysis area, flowing from the foothills. The ephemeral drainage habitats in Utah County are present from the Salt Lake County–Utah County line south to American Fork.

Wetlands

The non-playa wetland wildlife habitats are situated in the southern portion of the ecosystem impact analysis area. The majority of these are located immediately north of Utah Lake from North Saratoga Road eastward toward Utah Lake, south of American Fork.

Riparian Habitats

The Jordan River riparian habitat occurs in both Utah and Salt Lake Counties. The Jordan River starts at Utah Lake and flows north and ultimately empties into the Great Salt Lake. Within Utah County, the Jordan River is located in the eastern portion of the ecosystem impact analysis area. Spring Creek and American Fork Creek also provide limited riparian habitat north of Utah Lake.

15.4.4.2 Wildlife

Uplands

The wildlife of the uplands and arid shrublands within the Utah County portion of the ecosystem impact analysis area is the same as that found in the Salt Lake County portion (see Section 15.4.3.2, Wildlife).

Ephemeral Drainages

The wildlife of the ephemeral drainages within the Utah County portion of the ecosystem impact analysis area is the same as that found in the Salt Lake County portion (see Section 15.4.3.2, Wildlife).

Wetlands

The wetland wildlife habitats within the Utah County portion of the ecosystem impact analysis area provide important nesting, young-rearing, and foraging habitat for many mammal and bird species. Mammal species that use the habitat include beaver, muskrat, red fox, raccoon, mink, striped skunk, and many small rodents.

Bird species known to be residents of wet meadow/emergent marsh habitats include common species such as red-winged blackbird, yellow-headed blackbird, American robin, black-billed magpie, rock pigeon (*Columba livia*), house sparrow (*Passer domesticus*), horned lark (*Eremophila alpestris*), and common raven (*Corvus corax*). Some of the common waterfowl to be found nesting in these habitats can include western grebe (*Aechmophorus occidentalis*), great blue heron (*Ardea herodias*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), American coot (*Fulica americana*), and American avocet (*Recurvirostra americana*). Many species of birds could be casual users of this habitat or even hunt in this habitat, such as the marsh hawk (*Circus cyaneus*) and rough-legged hawk (*Buteo lagopus*).

Invertebrates are plentiful and provide enough prey to support a healthy population of birds and insectivorous (insect-eating) mammals.

Riparian Habitats

The wildlife of the riparian habitat within the Utah County portion of the ecosystem impact analysis area, which includes the Jordan River, Spring Creek, and American Fork Creek, is essentially the same as that associated with the Jordan River riparian habitat in the Salt Lake County portion (see Section 15.4.3.2, Wildlife). However, more wetland wildlife species are present near the

origin of the Jordan River at Utah Lake, where large areas of wetland habitats are found, than farther downstream (north) near the Utah County–Salt Lake County line. The riparian habitats along the smaller creeks (Spring Creek and American Fork Creek) have a reduced amount of the same riparian wildlife species because there is less riparian wildlife habitat.

15.4.4.3 Threatened, Endangered, and Sensitive Species

Federally Listed Species

A general overview of threatened and endangered species and migratory birds in the ecosystem impact analysis area is provided in Section 15.4.3.2, Wildlife. Table 15.4-3 above provides the common and scientific name, status, county, and probability of occurrence for each of the federally listed species. Ute ladies'-tresses (threatened), June sucker (endangered), and yellow-billed cuckoo (candidate) have a potential to occur in Utah County. The description of the yellow-billed cuckoo is provided in Section 15.4.3.3, Threatened, Endangered, and Sensitive Species, for Salt Lake County.

Ute Ladies'-Tresses. The threatened terrestrial orchid, Ute ladies'-tresses, could occur in the wetland wildlife habitat type within the Utah County portion of the ecosystem impact analysis area. Ute ladies'-tresses occurs in moist areas, wet meadows, and riparian zones near Utah Lake. Ute ladies'-tresses is present in 12 watersheds in Utah, in which there are at least 25 known populations. The total number of individual plants statewide is estimated to be between 6,000 and 46,000, and the species occupies a total habitat area of about 230 acres to 299 acres.

June Sucker. The June sucker, an endangered fish named for its annual June spawning run, is endemic to Utah Lake. This means there are no other places in Utah or the world where June suckers live naturally. The June sucker numbers have gone from millions in the early 1800s to a natural population of less than 1,000 today (June Sucker Recovery Implementation Program 2007).

State Listed Species

State sensitive species that could occur in the Utah County portion of the ecosystem impact analysis area include the California floater, southern Bonneville pyrg, burrowing owl, ferruginous hawk, long-billed curlew, bobolink, fringed myotis, western red bat, and short-eared owl. Descriptions of the burrowing owl, ferruginous hawk, long-billed curlew, bobolink, and short-eared owl are provided in Section 15.4.3.3, Threatened, Endangered, and Sensitive Species, for Salt Lake County.

California Floater. This invertebrate is thought to be extirpated from its historical habitat in and around Utah Lake, although recent sightings and records are uncertain and lacking. There is confusion as to whether this species has been correctly identified as existing in Utah. The ecosystem impact analysis area falls within the California floater's historically occupied area surrounding Utah Lake.

Southern Bonneville Pyrg, Also Known as Southern Bonneville Springsnail. This species has been recorded in one location in Utah County, in the area of Mill Pond near the existing Interstate 15 (I-15) corridor. No known surveys for this snail species have been conducted in the Spring Creek drainage, which is connected to Mill Pond. The southern Bonneville pyrg could exist in Spring Creek.

Southern Leatherside Chub. This species could occur within the Utah County portion of the ecosystem impact analysis area in Dry Creek. There were records of occurrence in the early 1980s in American Fork Creek, but no recent surveys (1995–2004) have identified any individuals (Mills 2007). They have never been identified in Spring Creek.

Fringed Myotis. The fringed myotis uses mines, caves, and buildings for roosting. Water courses and lowland riparian areas are important for this bat species. Though this species is widely distributed throughout the western United States, it is rare in Utah. There are no documented occurrences in Salt Lake or Utah Counties. However, the ecosystem impact analysis area does support some habitat for this species.

Western Red Bat. The western red bat depends on broad-leafed shrubs and trees in lowland riparian zones, typically with cottonwoods. The Western red bat is rare in Utah, and 14 specimens have been recorded for Utah. Although the western red bat rarely occurs in Utah, the ecosystem impact analysis area has potential habitat in Utah County.

15.4.4.4 Migratory Birds

The types of migratory birds present in the Utah County portion of the ecosystem impact analysis area are the same as those in the Salt Lake County portion (see Section 15.4.3.4, Migratory Birds).

A pair of golden eagles has nested successfully along the Jordan River in Utah County for the last 2 years (USFWS 2008). Typically, the golden eagle is found in open country, especially in mountainous regions. It feeds mainly on small mammals, especially rabbits, marmots, and ground squirrels, but it also eats insects, snakes, birds, and carrion. Nests are constructed on cliffs or in large trees. Pairs are monogamous and often use the same nest in consecutive years,

but some pairs use alternate nests some years. Eggs are laid from late February to early March in Utah (UDWR 2008).

15.4.4.5 Jurisdictional Wetlands

Of the jurisdictional wetland types described in Section 15.4.3.5, Jurisdictional Wetlands, for Salt Lake County, only the wet meadow type is found in Utah County (see Figure 15-15 through Figure 15-17, Wetland Locations). Wetland types are not distributed evenly within the ecosystem impact analysis area. Nearly 99% of the wetlands in the Utah County portion of the impact analysis area are wet meadow (see Table 15.4-6).

Table 15.4-6. Wetlands in the Utah County Portion of the Ecosystem Impact Analysis Area

Wetland Type	Total Acres in Analysis Area	Percent Wetland Type
Wet meadow	2,164.20	99%
Scrub/shrub	1.00	0%
Riparian	20.30	1%
Total	**2,185.50**	**100%**

In addition to the differences in wetland types, wetlands in Utah County differ relative to surrounding land uses and current hydrologic conditions. For example, some wetlands occur adjacent to I-15, on the fringes of Utah Lake, or in conjunction with grazing. Wetlands in Utah County were grouped into wetland functional units based on the different land-use types as described in Section 15.4.1, Methodology.

15.5 Environmental Consequences

This section describes the expected impacts of the No-Action Alternative and each MVC action alternative on ecosystem resources. Additionally, this section describes the methods used to analyze the expected impacts.

The impact analysis has been updated since the Draft EIS based on refinements to the action alternatives as described in Section 2.1.7.3, Design Options Incorporated in the Final EIS, and Section 2.1.7.4, Additional Changes to the Alternatives between the Draft EIS and Final EIS. In addition, the analysis was updated based on comments from USFWS on the Draft EIS. See Section 35.15, Ecosystems.

15.5.1 Methodology

15.5.1.1 Wildlife

Habitat Suitability Indices

Habitat Suitability Index (HSI) modeling was originally developed by USFWS (1982) to provide a way to quantitatively evaluate the impacts to wildlife habitat that result from water or land-use changes. The HSI models are used to support rapid decision-making in situations where data is lacking. To help determine habitat quality, wildlife habitat experts are consulted and literature sources are reviewed to develop suitability indices for wildlife species' habitat preferences. These indices are then combined to produce an overall habitat suitability index.

HSIs are unique in that they are restricted to habitat characteristics with an emphasis on quantitative relationships between key environmental variables (for example, the density of standing snags [dead trees], proximity to water, height of the dominant shrub component, slope, herbaceous cover and height, and so on) and habitat suitability for the evaluation species.

Each of the models uses numerous literature references to consolidate scientific information on species-habitat relationships. Models provide a numerical index of habitat suitability on a 0.0 to 1.0 scale, with 1.0 representing the best possible habitat for a specific wildlife species. In essence, an HSI is a group of formulas that calculate the value of different habitat parameters that measure physical characteristics of life requisites for each species (for example, water, nesting, breeding, prey base, and cover requirements). The index is calculated such that if one habitat parameter is not present, there is no suitable habitat for that species and the HSI = 0.0. The models are based on the theory that there is a positive correlation between the habitat index value and habitat carrying capacity. This

methodology is widely accepted and is used throughout the United States to evaluate many habitat types.

The parameters used in creating each index are documented within the model. The documentation explains the model's structure and inherent assumptions. Documenting the rationale for each decision provides the insights necessary for other researchers to modify the model when used with local conditions or new knowledge. This allows the model to be reformulated to meet individual study constraints.

> The models should be viewed as hypotheses of best current knowledge of species-habitat relationships rather than statements of proven cause and effect relationships. Their value is to serve as a basis for improved decision-making and increased understanding of habitat relationships [USGS, no date].

Determining the impact of a particular project involves converting the quantitative description of existing habitat quality for a wildlife species provided by the HSI model into impact quantities. This conversion is performed by multiplying the number of acres affected by a proposed project (as calculated by GIS) by the habitat suitability index value (from 0.0 to 1.0) for the species in question. The resulting quantity is referred to as the Habitat Suitability Value (HSV).

The HSV is a dimensionless number. For example, using the above-mentioned HSI scale of 0.0 to 1.0, if the first alternative under evaluation had an area of impact of 100 acres and an HSI value for a species of 0.5, the HSV would be 50 *units* (100 acres of affected area × HSI index value of 0.5 = 50). If the second alternative under analysis affected 200 acres, but the habitat was more degraded with a resulting HSI value of only 0.25 for a species, then the HSV would also be 50 *units*. Therefore the overall functional impacts of each alternative would be the same for the evaluation species, even though the second alternative affected twice the acreage.

Application of the Habitat Suitability Indices to the MVC Project

USFWS and UDWR assisted in developing the methods used for the MVC HSI analysis. This effort included identifying the wildlife habitat types that are present along the proposed MVC alternatives, the species that are appropriate habitat quality indicators within each existing habitat type, and fine-tuning of existing HSI models for local conditions.

Once existing habitat types were determined, species that indicated pristine conditions within each habitat type were identified as study species. The HSIs used for the MVC project were developed from the USFWS reference (USFWS

1982), literature searches, and discussions with UDWR biologists (HDR 2005a, 2005b, 2005c; Paul 2005).

Specific measurable habitat parameters were developed from these HSI models. The parameters were measured in the field at representative sites of each of the wildlife habitat community types (ephemeral drainages, wetlands, riparian habitat, playas, and uplands) identified by the wildlife team. The field surveys were conducted at various times between 2002 and 2006. The data collected from the field surveys were entered into the appropriate species HSI model formulas, with resulting values reflecting habitat quality throughout the ecosystem impact analysis area.

To calculate the impact (which is also the HSV) for the alternatives, the HSI value for a particular habitat was multiplied by the acreage of that habitat within the area of impact.

Example of a Habitat Suitability Index Calculation Using the Brewer's Sparrow

The HSI model for Brewer's sparrow (*Spizella breweri*) identifies the shrub and shrub-steppe plant communities as the most suitable habitat types. Habitat suitability is greatest if the dominant shrub is sagebrush. Suitability decreases for shrub communities if the dominant shrubs consist mostly of hawthorn, plum, serviceberry, bitter brush, or rabbitbrush. Suitability is even lower if the dominant shrubs consist mostly of saltbush, greasewood, hopsage, ceanothus, manzanita, or currant.

With regard to plant morphology (what the plant looks like), habitat suitability is greatest when the height of shrub communities is between 20 inches and 30 inches. Suitability is lower when the shrub height is either less than 20 inches or greater than 30 inches. Open shrub communities that do not contain dense branches near the ground are not suitable shrub habitat. Suitability increases in dense canopy cover when the percentage of shrub canopy cover is greater than 30%. In areas where the canopy cover is less than 30%, suitability decreases.

Habitat fragmentation is analyzed using three variables: the size of the habitat block, terrain slope, and percentage of rocky cover. The HSI model for this species considers only habitat blocks of at least 0.5 acre. Habitat blocks having a slope of greater than 30° are similarly not considered suitable habitat. With regard to rocky cover, suitability is greatest when the percentage of rock cover is less than 30%. Suitability decreases in habitat blocks that have a percentage of rock cover greater than 30% but less than 60%. Habitat blocks are not considered habitat if the percentage of rock cover exceeds 60%.

The intent of the model is to estimate the quantity of niche spaces that are available to the Brewer's sparrow. Habitats with higher HSI values are assumed to provide more niche spaces. A greater number of niche spaces can often accommodate a greater number of Brewer's sparrows in a given area.

Brewer's Sparrow HSI Variables

This section describes each HSI variable and how the value for each variable is determined.

- **V1** – evaluates the size of the block of habitat. The index score will be high (1.0) if the block is ≥0.5 acre in size. The score will be low (0.0) if the block is <0.5 acre in size. This variable does not allow the field observer to interpolate a value between 1.0 and 0.0. If the block of habitat is too small to support the Brewer's sparrow (<0.5 acre), then there is no habitat for the Brewer's sparrow and the habitat suitability index for that block does not need to be calculated.
- **V2** – evaluates the slope of the habitat block. The index score will be high (1.0) if the habitat block is on a slope of ≤30°. The index score will be low (0.0) if the habitat block is on a slope of >30°. Once again, this variable does not allow the field observer to interpolate a value between 1.0 and 0.0. If the slope of the block is too steep to support the Brewer's sparrow (>30°), then there is no habitat for the Brewer's sparrow and the habitat suitability index for that block does not need to be calculated.
- **V3** – evaluates the composition of the terrestrial substrate (specifically, rock cover). The index score will be high (1.0) if the rock cover is 0% to ≤30%. The index score decreases when the rock cover is >30%. The index score drops to 0.0 when the rock composition is ≥60%.
- **V4** – evaluates the composition of the shrub community. The index score will be high (1.0) if the dominant shrub is sagebrush. The score will be intermediate (0.5) if the dominant shrubs consist mostly of hawthorne, plum, serviceberry, bitterbrush, or rabbitbrush. The index score will be low (0.1) if the dominant shrubs consist mostly of saltbush, greasewood, hopsage, ceanothus, manzanita, or currant. The index score will drop to 0.0 if the shrub community consists mostly of open shrubs without dense branches within 3 feet of the ground and without a dense canopy cover.
- **V5** – evaluates the percent canopy cover of shrubs. The index score will be high (1.0) if the percent canopy cover of shrubs is ≥30%. The index score decreases to 0.0 as the percent canopy cover of shrubs drops to 0%.

- **V6** – evaluates the average height of the shrub canopy. The index score will be high (1.0) if the shrub cover height is 20 inches to 30 inches. The index score will be lower if the average height of shrub canopy cover is <20 inches or >30 inches. The index score drops to 0.0 when the average height of shrub canopy cover drops to 0 inches, and drops to a low of 0.1 when the average height of shrub canopy cover is ≥50 inches.

Brewer's Sparrow HSI Calculation

$$\text{HSI} = \sqrt{(\text{V1} \times \text{V2}) \sqrt[3]{(\text{V3} \times \text{V5} \times \text{V6})\ (\text{V4})}}$$

Note that V1 and V2 are either 1.0 or 0.0. If either is zero, there is no habitat for the Brewer's sparrow.

Example 1. High-Quality Habitat

Variable	Comments	Value
V1	Block size is >0.5 acre.	V1 = 1.0
V2	Slope is flat.	V2 = 1.0
V3	Rock cover is less than 60% but more than 30%.	V3 = 0.5
V4	Shrub community is dominated by sagebrush and rabbitbrush.	V4 = 0.5
V5	Shrub canopy cover is >30%.	V5 = 1.0
V6	Average shrub height is between 20 and 30 inches.	V6 = 1.0

$$\text{HSI} = \sqrt{(\text{V1} \times \text{V2}) \sqrt[3]{(\text{V3} \times \text{V5} \times \text{V6})\ (\text{V4})}}$$

$$\text{HSI} = \sqrt{(1.0 \times 1.0) \sqrt[3]{(0.5 \times 1.0 \times 1.0)\ (0.5)}}$$

$$\text{HSI} = \sqrt{(1)\ (0.79)\ (0.5)}$$

HSI for the Brewer's sparrow for this example habitat (high quality) = **0.63**

Example 2. Poor-Quality Habitat

Variable	Comments	Value
V1	Block size is >0.5 acre.	V1 = 1.0
V2	Slope is flat.	V2 = 1.0
V3	Rock cover is 62%.	V3 = 0.1
V4	Shrub community is dominated by saltbrush.	V4 = 0.1
V5	Shrub canopy cover is >10%.	V5 = 0.3
V6	Average shrub height is greater than 50 inches.	V6 = 0.1

$$HSI = \sqrt{(V1 \times V2)\ \sqrt[3]{(V3 \times V5 \times V6)}\ (V4)}$$

$$HSI = \sqrt{(1.0 \times 1.0)\ \sqrt[3]{(0.1 \times 0.3 \times 0.1)}\ (0.1)}$$

$$HSI = \sqrt{(1)\ (0.14)\ (0.1)}$$

HSI for the Brewer's sparrow for this example habitat (low quality) = **0.12**

Wildlife Habitat Fragmentation and Roadway Mortality

The action alternatives for the MVC project would bisect the wildlife habitats in the ecosystem impact analysis area. This would fragment wildlife habitat, which could contribute to direct and indirect impacts on wildlife species by reducing the habitat value of the area for species that require large contiguous tracts of habitat. Very limited data are available on the specific habitat use patterns of wildlife species in the project area. Therefore, it is not possible to provide a detailed analysis of how habitat fragmentation from the different alternatives would affect the population biology of local species. However, current research on the measured effects of fragmentation on similar species or species groups in other areas can provide a general idea of the likely effects on species in the project area (Verboom and others 2001).

GIS analysis was used to evaluate landscape-level fragmentation effects of changes in the size and distribution of suitable wildlife habitats due to the project alternatives. Habitat fragmentation was evaluated by mapping habitat types through aerial photograph interpretation and field surveys (see Figure 15-18 through Figure 15-21, Habitat Fragmentation Analysis). The habitat types identified for this analysis were named similarly to those used for the HSI model, but the habitats themselves were defined somewhat differently due to coordination with the regulatory agencies. The upland habitat type evaluated for

fragmentation impacts included some upland habitats not considered to be of good functional quality for wildlife use, such as dry winter-wheat fields. The riparian and ephemeral drainage categories were not used because it was determined that these habitat types would be crossed using bridges or culverts large enough for wildlife species to pass under or through, so the impacts of such crossings were considered minor in terms of fragmentation. One habitat type was added for this analysis through coordination with the resource agencies: the irrigated agriculture habitat type located in Utah County near Utah Lake.

Mapped habitat types were classified into "blocks" of large, relatively uninterrupted areas of identical habitat and digitized into the GIS database. Some of the blocks (for example, Blocks 1 and 2 in Salt Lake County) contain small, internal roads that have little to no traffic. Such internal roads were not considered a cause of fragmentation under existing conditions and were disregarded in delineating the blocks. The mapped and digitized habitat blocks were reviewed for each of the alternatives to identify the number of blocks fragmented and the resulting number and area of fragments.

Because general quantitative data regarding wildlife mortality caused by roadway construction and operation of a new alignment are lacking in the literature, the analyses for impacts in both counties in Section 15.5.3, Salt Lake County Alternatives, and Section 15.5.4, Utah County Alternatives, describe the potential for wildlife mortality in qualitative terms. However, studies on SR 68 (Redwood Road) near Camp Williams through the ecosystem impact analysis area detail multiple deer impacts through this area for the study period 2001–2005. The *SR 68, Bangerter Highway through Saratoga Springs Environmental Assessment* (April 2007) can be referenced for more detailed information about wildlife mortality through this section of the proposed alignment.

Wildlife Noise Impacts

Roadway noise can cause direct and indirect impacts to wildlife, although few studies have specifically addressed this issue (FHWA 2007). Quantitative data and research regarding the effects of elevated noise levels on wildlife are lacking in the literature. Therefore, the potential for noise impacts to wildlife is described mostly in qualitative terms. However, noise modeling data and analysis prepared for the MVC alternatives have been included to provide a more quantitative description of the existing affected environment and the expected changes in noise levels.

15.5.1.2 Jurisdictional Wetlands

The Clean Water Act mandates an evaluation to determine a proposed project's least environmentally damaging practicable alternative in support of the USACE's issuance of a Clean Water Act Section 404 permit. This mandate is considered in the discussion of methodologies for assessing impacts to wetland resources. The purpose of the different assessment methodologies is to provide not only a general overview of wetland impacts, but also to evaluate impacts to specific important wetland types. No springs were identified in the ecosystem impact analysis area during the wetland and biological field surveys. No specific surveys for springs were conducted in these areas; however, many wells were identified through this area (see Chapter 14, Water Quality). During the wetland delineation, if any springs are specifically identified within the impact analysis area, they will be addressed through the process for obtaining a Section 404 permit under the Clean Water Act.

Developing the methodologies for wetland impact assessment involved a series of meetings with regulatory and resource agencies throughout the EIS process. Agencies included in this process include USACE, USFWS, UDWR, the Utah Natural Heritage Program, EPA Region 8, the Federal Highway Administration (FHWA), and the Utah Department of Transportation (UDOT). During these meetings, various approaches to assessing wetland impacts were discussed to determine the best approach to providing information on the number and quality of wetlands that would be affected by the project.

Impacts to wetland acreage consist of two types: primary impacts and secondary impacts. Primary impacts, those resulting in the complete loss of wetland area, would occur within the footprint for each alternative. Secondary impacts are those that result in a loss of wetland function if an alternative is built near the wetland. Secondary impacts are estimated to occur from the edge of the right-of-way out to 300 feet based on a literature review of the effects of roads on hydrology and water quality (Keate 2001). The environmental consequences of constructing an alternative are presented with regard to (1) the total acreage of wetland impact, (2) the amount of impact to wetland function, (3) the functional impact to high-quality wetlands, and (4) the acreage of impact to rare or irreplaceable wetlands.

In the Draft EIS, wetlands in the MVC study area north of SR 201 in the vicinity of the 5800 West Freeway Alternative and the 7200 West Freeway Alternative were called playa wetlands. However, additional field research conducted in May 2008 found that these wetlands are a subsection of the Great Salt Lake and have hydrologic connections via ditches and sloughs. Therefore, these wetlands would

be classified as mineral flats. In this chapter, the term *playa* refers to the mineral flats.

Total Acreage of Wetland Impacts

This assessment is a measure of the primary wetland acreage affected by the right-of-way and, therefore, covered by the footprint of the freeway or transit alternative. It also includes secondary impacts, or the number of acres within 300 feet of either side of the right-of-way that could be affected.

Total Impact to Wetland Function

Wetland functions were determined using the Functional Assessment of Great Salt Lake ecosystem slope and depressional wetlands model (Keate 2005). In summary, this model calculates a numerical value between 0.0 and 1.0 that represents the functional value of a wetland, called the Functional Capacity Index (FCI). Functional capacity units (FCU) are subsequently derived by multiplying a wetland's FCI by the acres of impact, which creates a common measure for assessing impacts to wetland function for each alternative. Total impact to wetland function is a measure of the FCUs lost due to both primary and secondary impacts for all wetland functional units affected by a given alternative.

Model Background. Dr. Nancy Keate at UDWR developed the model used to assess wetland function and determine the impacts from project alternatives. Dr. Keate was assisted by the Utah Assessment Team, which included representatives from state and federal agencies and local wetland professionals. This functional assessment methodology is based on the hydrogeomorphic (HGM) approach (Brinson 1993; Brinson and others 1995).

The purposes of a functional assessment model such as this are to (1) provide a scientifically defensible method to determine wetland function, (2) rank wetlands by functionality, and (3) provide information for land-use planning. This functional assessment approach provides a consistent method for understanding existing wetland functions, determining future development-related impacts to wetlands, and developing adequate compensatory mitigation for development (Keate 2005). In the case of the MVC EIS, it also helps identify the least environmentally damaging practicable alternative.

The model groups all wetlands into two types: slope and depressional. Slope wetlands occur at points of surface change or breaks in slope. Groundwater is the primary water source, and water flow is unidirectional and flows down-gradient to streams, ponds, or depressions. Depressional wetlands are low areas relative to the surrounding landscape and have closed contours. Hydrology is driven by groundwater and precipitation, typically a vertical rather than horizontal

hydrodynamic, but depressional wetlands can also receive surface water (typically surface runoff or sheet flow).

This functional assessment model is designed to consider local conditions found within the Great Basin, particularly near the Great Salt Lake. In general, salinity increases toward the Great Salt Lake and influences wetland vegetation communities. This model was specifically developed for local conditions and salinity in this area.

Functional Capacity Indices. The model calculates a score between 0.0 and 1.0 for six indices of wetland functionality. These six Functional Capacity Indices (FCIs) reflect the level of a wetland's functional quality in relation to hydrology, ability to improve water quality, and potential as wildlife habitat. For the MVC EIS, four of the six FCIs developed by Keate (2005) were used: Hydro, InHydro, Dissolved, and Particulates. The two excluded FCIs are designed to measure wildlife habitat quality and habitat connectivity; these were excluded after the resource agencies determined that wildlife habitat impacts could be better described by the wildlife habitat assessment method.

Eight variables are used in the four FCI model formulas. Seven of these are extrapolated values related to runoff, pollutant loading, and suspended solid filtration within and adjacent to the wetland. One variable used in the calculation of the FCIs, vegetation structure, is derived from field work. All variables are listed below as components of their respective FCI equation.

The four FCIs and component variables (abbreviated as "V***") and formulas used in the MVC wetland functional assessment model are:

1. **FCI_{Hydro}** measures a wetland's capacity for intercepting groundwater and surface water outside the wetland as affected by land-use and hydrologic modification.

   $FCI_{Hydro} = \sqrt{V_{mod} \times V_{runoff}}$, where:

   - **V_{mod}** – related to how land-use modifications have affected surface water hydrology in the area of the wetland
   - **V_{runoff}** – the average amount of overland flow or surface runoff reaching the wetland

2. **$FCI_{InHydro}$** measures how a wetland functions with respect to the internal water flow as related to vegetation and land use.

   $$FCI_{InHydro} = \frac{V_{vegstruct} + V_{runoffin}}{2}$$, where:

   - **$V_{vegstruct}$** – measures how surface roughness associates with the quality and cover of wetland vegetation
   - **$V_{runoffin}$** – measures the impact of land use on surface roughness and water infiltration and flow within the wetland

3. **$FCI_{Dissolved}$** measures a wetland's capacity to remove dissolved elements or compounds, which can occur through biotic, physical, or chemical processes.

   $$FCI_{Dissolved} = \frac{V_{diswetuse} + V_{disload}}{2}$$, where:

   - **$V_{diswetuse}$** – refers to the load of dissolved solids associated with land use within the wetland
   - **$V_{disload}$** – measures the amount of dissolved solids associated with land uses adjacent to the wetland

4. **$FCI_{Particulates}$** measures the deposition and detention of inorganic and organic particulates due primarily to physical processes.

   $$FCI_{Particulates} = \frac{V_{susload} + V_{suswetuse}}{2}$$, where:

   - **$V_{susload}$** – the total suspended solids or particulate matter associated with adjacent land uses
   - **$V_{suswetuse}$** – the total suspended solids or particulate matter associated with land uses within the wetland

Component Variables. This section provides a description of each component variable and an example of how the variable score is calculated.

1. **V_{mod}** is a categorical measure of the disruption of groundwater and surface water hydrology within a wetland and its adjacent, 300-foot perimeter (2,000-foot buffer used for $FCI_{Habitat}$ and $FCI_{Connectivity}$).

   To calculate V_{mod}, identify all human-made disturbances (such as roads, berms, and ditches) that alter hydrology by either drying or storing water. Assign each modification a coefficient based on severity:

   - 0.00 = 1, Extreme (for example, four-lane paved highway, ditches more than 3 feet deep)
   - 0.50 = 2, Moderate (for example, two-lane paved road, ditches 1 foot to 3 feet deep)
   - 0.75 = 3, Slight (for example, near-grade roads, ditches less than 1 foot deep)
   - 1.00 = 4, None

   Multiply the percentage of the wetland functional unit affected by each modification by its coefficient. Sum them for a composite score (see example).

   Example calculation:

   65% of wetland is unmodified (65% × 1.00 = 0.65)
   20% of wetland is slightly modified (20% × 0.75 = 0.15)
   15% of wetland is extremely modified (15% × 0.00 = 0.00)
   V_{mod} = 0.65 + 0.15 + 0.00 = 0.80

2. **$V_{vegstruct}$** is one measure of surface roughness. It is an indicator of vegetation structure as a function of native and non-native species, based on wetland type or subclass.

   The $V_{vegstruct}$ variable described in this chapter is the sum of the native species score and the score for herbaceous cover, divided by 2 (Keate 2001). Vegetation cover is determined at 6 inches above ground surface. The native species score is determined by dividing the number of individuals of the five dominant, native species by 5. If there are less than five dominant species, the total number of species is used as the divisor (for example, if there are only four dominant, native species, the total number of individuals of those species is divided by 4).

   Herbaceous cover scores are calculated by subclass, and scores are based on the relative level of salinity (see the example in Table 15.5-1).

Table 15.5-1. Example of Calculating Herbaceous Cover Scores

Subclass	Salinity	Actual Cover	Score
Slope wetland subclasses	< 8 dS	≥ 0.83	1
	< 8 dS	< 0.83	(2.87 × cover) – 1.40
	> 8 dS	≤ 0.71	1
	> 8 dS	> 0.71	3.46 × cover
Depressional wetland subclasses	< 8 dS	≥ 0.82	1
	< 8 dS	< 0.82	(0.43 × cover) + 0.39
	8 dS – 16 dS	≥ 0.76	1
	8 dS – 16 dS	< 0.76	(0.39 × cover) + 0.37
	> 16 dS	≤ 0.61	1
	> 16 dS	> 0.61	2.98 – (3.28 × cover)

dS = decisiemens

Example calculation:

Total number of dominant species = 5
Total number of native dominant species = 2
Native Species Score = 2 ÷ 5 = 0.40

For a depressional wetland with a salinity of 10 dS and an actual cover of 0.65:

Modified Herbaceous Cover Score = (0.39 × cover) + 0.37 =
(0.39 × 0.65) + 0.37 = 0.62

$V_{vegstruct}$ = (Native Species Score + Modified Herbaceous Cover Score) ÷ 2

$V_{vegstruct}$ = (0.40 + 0.62) ÷ 2 = 0.51

3. **V_{runoff}** is the average amount of overland flow that reaches the wetland functional unit. It is affected by land uses surrounding the wetland that reduce soil permeability and alter the quantity and timing of water delivery to the wetland. V_{runoff} coefficients were calculated from one Florida study and tabulated in a working paper by Nnadi (1997).

   To calculate V_{runoff}, identify all land uses within a 300-foot perimeter of the wetland functional unit and determine the percentage of the total area that each use occupies. Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

   Example calculation:

   50% of perimeter is rotational grazing (50% × 0.96 = 0.48)

   34% of perimeter is field crops (34% × 0.95 = 0.32)

   16% of perimeter is light-intensity commercial development (16% × 0.19 = 0.03)

   V_{runoff} = 0.48 + 0.32 + 0.03 = 0.83

4. **$V_{runoffin}$** measures the impact of land uses within the wetland functional unit by surface roughness (as related to plant structure) and water infiltration and flow over wetland soils. $V_{runoffin}$ coefficients were calculated from one Florida study represented by a tabulation of multiple studies throughout the U.S. by Nnadi (1997).

   To calculate $V_{runoffin}$, identify all land uses within the wetland functional unit and determine the percentage of the total area that each use occupies. Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

   Example calculation:

   62% of wetland is waterfowl management area (62% × 0.86 = 0.53)
   21% of wetland is rotational grazing (21% × 0.96 = 0.20)
   17% of wetland is dirt road (17% × 0.71 = 0.12)
   $V_{runoffin}$ = 0.53 + 0.20 + 0.12 = 0.85

5. **$V_{disload}$** is a measure of the loading of the wetland functional unit with elements and compounds from land uses on adjacent lands within a 300-foot perimeter. $V_{disload}$ coefficients were calculated from studies conducted throughout the U.S. and tabulated in a working paper by Nnadi (1997).

   To calculate $V_{disload}$, identify all land uses within the 300-foot perimeter and determine the percentage of the total area that each use occupies. Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

   Example calculation:

   68% of perimeter is waterfowl management area (68% × 0.86 = 0.58)

   21% of perimeter is rotational grazing (21% × 0.96 = 0.20)

   11% of perimeter is sewage treatment lagoon (11% × 0.61 = 0.07)

   $V_{disload} = 0.58 + 0.20 + 0.07 = 0.85$

6. **$V_{diswetuse}$** is a measure of the loading of the wetland with elements and compounds from land uses within the wetland functional unit. $V_{diswetuse}$ coefficients were calculated from studies conducted throughout the U.S. and tabulated in a working paper by Nnadi (1997).

   To calculate $V_{diswetuse}$, identify all land uses within the wetland functional unit and determine the percentage of the total area that each use occupies. Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

   Example calculation:

   54% of wetland is heavy grazing (54% × 0.87 = 0.47)
   36% of wetland is forested (36% × 1.00 = 0.36)
   10% of wetland is high-traffic highway (10% × 0.43 = 0.04)
   $V_{diswetuse} = 0.47 + 0.36 + 0.04 = 0.87$

7. **$V_{susload}$** is a measure of the relative volume of total suspended solids (TSS) carried into the wetland functional unit surface water from the surrounding landscape. $V_{susload}$ coefficients were calculated from studies conducted throughout the U.S. and tabulated in a working paper by Nnadi (1997).

   To calculate $V_{susload}$, identify all land uses within the 2,000-foot perimeter and determine the percentage of the total area that each use occupies.

Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

Example calculation:

74% of perimeter is low-density rural development (74% × 0.98 = 0.73)

16% of perimeter is surface solid waste (16% × 0.61 = 0.10)

10% of perimeter is dirt road (10% × 0.97 = 0.10)

$V_{susload} = 0.73 + 0.10 + 0.10 = 0.93$

8. **$V_{suswetuse}$** is a measure of the relative volume of TSS carried into the wetland functional unit surface water from land uses within the wetland. $V_{suswetuse}$ coefficients were calculated from studies conducted throughout the U.S. and tabulated in a working paper by Nnadi (1997).

   To calculate $V_{suswetuse}$, identify all land uses within the wetland and determine the percentage of the total area that each use occupies. Multiply each percentage by its land-use coefficient (see Appendix 15B, Wetland Calculations). Sum them for a composite score (see example).

   Example calculation:

   35% of wetland is field crops (35% × 1.00 = 0.35)
   33% of wetland is rotational grazing (33% × 0.98 = 0.32)
   32% of wetland is range (32% × 1.00 = 0.32)
   $V_{suswetuse} = 0.35 + 0.32 + 0.32 = 0.99$

Land-Use Classification. A major component of the model is the land-use classification. Land-use classification for the MVC project was performed through interpretation of aerial photographs from the National Agriculture Imaging Program and field verification conducted in October 2005. Subsequent revision of the land-use information was performed in January 2006. Land uses were classified into 22 types, and each type was assigned a functional value coefficient based on studies conducted throughout the U.S. (Nnadi 1997; see Table 15.5-2 below).

High-value coefficients (those near 1.0) are associated with land uses, such as rotational grazing, that have relatively little adverse effect on wetland function. Low-value coefficients (those at or close to 0) correspond to land uses, such as high-intensity commercial development, that have a relatively large effect on wetland function.

Table 15.5-2. Sample Land-Use Types and Associated Wetland Functional Value Coefficients for Different Variables

	Model Variables		
Land Use	Runoff	Loading	Suspended Solids
Dirt road	0.71	0.92	0.97
High-intensity commercial	0.13	0.00	0.00
Heavy grazing	0.76	0.87	0.98
Rotational grazing	0.96	0.95	0.98
Multi-family residential	0.38	0.69	0.16

Functional Capacity Units. Once the FCIs were calculated for each wetland functional unit (for examples, see Table 15.5-3 and Table 15.5-4 below), they were converted to Functional Capacity Units (FCU) by multiplying the FCI score by the acres of impact (see Figure 15-22, Wetland Calculation Example). This provides a standardized measure of the functional loss to each wetland unit from the effects of each proposed alternative. Consequently, FCUs are the main "currency" of wetland analysis within this model. For the analysis of wetland functional units for the MVC alternatives, calculations were performed using only FCI Hydro because UDWR, USACE, and USFWS considered this function to be the most critical to maintaining wetland functionality.

Table 15.5-3. Sample Baseline FCI Scores for Salt Lake County

Function	Final FCI Score	Calculations
Wetland Functional Unit 16		
FCI Hydro	0.289	$= \sqrt{V_{mod} \times V_{runoff}} = \sqrt{0.218 \times 0.382}$
FCI InHydro	0.431	$= \frac{V_{vegstruct} + V_{runoffin}}{2} = \frac{0.610 + 0.251}{2}$
FCI Dissolved	0.648	$= \frac{V_{diswetuse} + V_{disload}}{2} = \frac{0.658 + 0.639}{2}$
FCI Particulates	0.229	$= \frac{\frac{V_{susload} + V_{suswetuse}}{2} + V_{mod}}{2} = \frac{\frac{0.335 + 0.144}{2} + 0.218}{2}$
Wetland Functional Unit 20		
FCI Hydro	0.695	$= \sqrt{V_{mod} \times V_{runoff}} = \sqrt{0.505 \times 0.953}$
FCI InHydro	0.919	$= \frac{V_{vegstruct} + V_{runoffin}}{2} = \frac{0.840 + 0.997}{2}$
FCI Dissolved	0.975	$= \frac{V_{diswetuse} + V_{disload}}{2} = \frac{0.989 + 0.960}{2}$
FCI Particulates	0.745	$= \frac{\frac{V_{susload} + V_{suswetuse}}{2} + V_{mod}}{2} = \frac{\frac{0.971 + 0.999}{2} + 0.504}{2}$

Table 15.5-4. Sample Baseline FCI Scores for Utah County

Function	Final FCI Score	Calculations
Wetland Functional Unit 1		
FCI Hydro	0.769	$= \sqrt{V_{mod} \times V_{runoff}} = \sqrt{0.662 \times 0.894}$
FCI InHydro	0.903	$= \frac{V_{vegstruct} + V_{runoffin}}{2} = \frac{0.860 + 0.951}{2}$
FCI Dissolved	0.928	$= \frac{V_{diswetuse} + V_{disload}}{2} = \frac{0.947 + 0.909}{2}$
FCI Particulates	0.810	$= \frac{\frac{V_{susload} + V_{suswetuse}}{2} + V_{mod}}{2} = \frac{\frac{0.941 + 0.979}{2} + 0.662}{2}$
Wetland Functional Unit 24		
FCI Hydro	0.184	$= \sqrt{V_{mod} \times V_{runoff}} = \sqrt{0.139 \times 0.245}$
FCI InHydro	0.630	$= \frac{V_{vegstruct} + V_{runoffin}}{2} = \frac{1.000 + 0.260}{2}$
FCI Dissolved	0.653	$= \frac{V_{diswetuse} + V_{disload}}{2} = \frac{0.690 + 0.615}{2}$
FCI Particulates	0.162	$= \frac{\frac{V_{susload} + V_{suswetuse}}{2} + V_{mod}}{2} = \frac{\frac{0.209 + 0.160}{2} + 0.139}{2}$

Functional Impact to High-Quality Wetlands

To further evaluate wetland impacts, effects to high-functioning wetland units within the footprint of each alternative were analyzed. This analysis was done because of the limited ability to mitigate impacts to these high-quality systems or to enhance other sites to replicate their function. High-functioning wetlands were identified using all four functional capacity indices: Hydro, InHydro, Dissolved, and Particulates. High-functioning wetland units were identified based on the range of each FCI score. FCI scores were classified as high, medium, and low-functioning categories. High-functioning wetland units had scores in the top one-third of the range for three out of four FCIs.

In Salt Lake County, wetland functional units (WFUs) 15, 17, and 20 are considered high-functioning units (see Table 15.5-5 and Figure 15-1 through Figure 15-3, Wetland Functional Units – Salt Lake County). For example, the FCI_{Hydro} scores range from 0.289 (Unit 16) to 0.817 (Unit 15). The difference between these two scores is 0.528, a third of which is 0.176. Subtracting 0.176 from 0.817 equals 0.641. Therefore, any functional unit that scored between 0.641 and 0.817 for hydrology was within the top one-third of the range and was considered high-functioning for this FCI. The same calculation was applied to $FCI_{InHydro}$, $FCI_{Dissolved}$, and $FCI_{Particulates}$.

Table 15.5-5. High-Functioning Wetland Units in Salt Lake County

	Functional Capacity Indices (FCIs)			
WFU	Hydro	InHydro	Dissolved	Particulates
8	**0.690**	0.718	**0.901**	**0.760**
9	0.479	**0.853**	0.786	0.585
10	0.518	0.610	0.601	0.588
11	**0.714**	0.637	**0.927**	**0.752**
12	0.556	**1.000**	**0.863**	**0.696**
13	0.448	**0.928**	**0.865**	0.563
14	0.589	**0.935**	**0.936**	**0.678**
15	**0.817**	**0.883**	**0.975**	**0.834**
16	0.289	0.430	0.648	0.229
17	**0.647**	**0.875**	**0.949**	**0.710**
18	0.385	**0.871**	0.854	0.524
19	**0.814**	0.809	**0.983**	**0.836**
20	**0.695**	**0.919**	**0.975**	**0.746**
21	0.391	0.639	**0.865**	0.477
22	0.480	**0.876**	0.823	0.539

Scores in bold are within the top one-third of the range.
Functional units shaded in gray scored within the top one-third for each FCI.

In Utah County, Units 1, 6, and Lol1 were considered high-functioning (see Table 15.5-6 below and Figure 15-4 though Figure 15-6, Wetland Functional Units – Utah County).

Table 15.5-6. High-Functioning Wetland Units in Utah County

	Functional Capacity Indices (FCIs)			
Unit	**Hydro**	**InHydro**	**Dissolved**	**Particulates**
1	**0.768**	**0.903**	**0.928**	**0.810**
4	0.742	0.868	0.874	0.838
6	**0.768**	**0.936**	**0.991**	**0.823**
7	0.203	**0.895**	**0.991**	0.518
24	0.184	0.630	0.653	0.126
25	0.303	0.650	0.736	0.369
Lol1	**0.851**	**0.853**	**0.941**	**0.872**
Lol3	0.635	0.686	0.846	**0.730**
Lol5	0.656	0.777	**0.896**	**0.916**
Lol6	**0.821**	0.815	**0.916**	**0.872**
Lol8	**0.770**	0.832	**0.929**	**0.817**

Scores in bold are within the top one-third of the range.
Functional units shaded in gray scored within the top one-third for each FCI.

Once these high-functioning units were identified, it was possible to evaluate the loss of functional capacity to these wetlands from each alternative. This methodology shows how each alternative would affect the top one-third functioning wetlands.

Evaluation of Rare and Irreplaceable Wetlands

Certain wetland types are considered rare or irreplaceable because they have a low frequency of occurrence and/or because it is not possible to compensate for impacts to these wetlands through creating new wetlands, restoring low-quality wetlands, or enhancing existing wetlands. For instance, in Salt Lake County, playas and vegetated playas are of particular importance, given the difficulty in mitigating impacts to these types of waters of the U.S. Agencies have attempted to re-create the wetland hydrology and soil chemistry of these systems with only limited success. Therefore, the Salt Lake County alternatives were assessed for their impacts to playas.

Likewise, Utah County contains small areas of Peteetneet soil, which is an indicator of peat-forming wetlands or the hydrology necessary to support this type of wetland. This type of soil is rare and takes many years to form. Therefore, the alternatives in Utah County were assessed for their impacts to Peteetneet soil as identified using the NRCS soil series maps for Utah County.

The primary and secondary impacts to these wetlands were measured in terms of acreage only.

Evaluation of Linear Aquatic Features

Impacts to linear aquatic features were measured in terms of linear feet of impact only, because the functional value model does not address this type of habitat. These features were categorized as canal, ephemeral wash, and riparian features. Canals were defined as perennial or intermittent streams that have obviously been modified by humans through straightening and installation of water-control devices. Riparian features included unmodified perennial and intermittent streams as well as any associated wetlands. Ephemeral washes were defined as described in Section 15.4.1.3, Jurisdictional Wetlands.

Wetland Avoidance and Minimization

Methods to avoid or minimize wetland impacts were developed as a result of meetings held with the resource agencies during the development of this EIS. To address comments from the resource agencies regarding potential wetland and wildlife habitat fragmentation from the MVC alternatives along 1500 South and 1900 South, an alternative refinement process was initiated in cooperation with the resource agencies, cities, and several non-governmental organizations. This process focused on the 1500 South and 1900 South options of the Southern Freeway Alternative. As a result of this alternative refinement process, a roadway concept was developed north of 1500 South. Initially this concept was developed such that the alignment of the Southern Freeway Alternative was at 1000 South in Lehi. However, from a technical perspective, this concept was eliminated because the freeway connection at I-15 was too close to the adjacent interchanges and would have violated requirements from FHWA and the American Association of State Highway and Transportation Officials (AASHTO) for interchange spacing.

Therefore, the alignment on about 1000 South was moved south to align with the 1500 South option from Lehi to American Fork. In addition, the Southern Freeway Alternative options on 1500 South and 1900 South had been merged together at 1900 South in American Fork to further avoid wetland impacts. Modifications to the 1900 South option were also developed and consisted of moving the roadway farther north toward the 1500 South option so that the overall wetland impacts of the 1500 South and 1900 South options would be similar. Several meetings and workshops were held in 2006 and early 2007 to refine the alignment developed by the resource agencies. See Section 2.1.6, Reconsideration of the Utah County Alternatives.

To address the concern of the resource agencies regarding wetland impacts and habitat fragmentation, an alternative along 2100 North (2100 North Freeway Alternative) was developed. This alternative has no roadway alignments near Utah Lake.

15.5.2 No-Action Alternative

Under the No-Action Alternative, the MVC project would not be constructed. No direct impacts to ecosystem resources would occur from MVC-related activities. Other transportation projects identified in the Wasatch Front Regional Council (WFRC) and Mountainland Association of Governments (MAG) long-range plans and by local communities would be constructed. These projects, along with other future projects, could cause impacts to ecosystem resources in the future.

As development continues on the west side of Salt Lake County and north of Utah Lake, previously undeveloped lands, including some wildlife habitats, would be lost. The No-Action Alternative would not prevent this future development.

Most of the communities along the proposed MVC action alternatives expect most of their communities to be developed by 2030. If the MVC project were not constructed, the land that would be used for the project would likely be developed for other urban uses and associated infrastructure, which could result in ecosystem impacts similar to those described in this chapter for the MVC action alternatives. Based on local land-use plans, the wetlands that would be affected by the MVC action alternatives would still be affected by urban development under the No-Action Alternative, resulting in similar types of impacts.

15.5.2.1 Wildlife (Habitat Types)

Commercial and residential development in wildlife habitats would continue regardless of whether the MVC project is built. As developments are platted west of West Valley City and Kearns, this would lead to future impacts and the eventual loss of much of the existing playa habitats south of I-80. Farther south, the cities of West Jordan, South Jordan, and Herriman are planning and platting large areas of agricultural lands and upland habitats for future development. Riparian habitats are being lost from developments underway and will be lost to planned development all along the Jordan River corridor from West Valley City south to Lehi in Utah County. Wetland habitats along the north shore of Utah Lake will be affected by residential and commercial developments as cities in northern Utah County expand. Direct and indirect impacts associated with future development would result in additional loss of habitat, habitat fragmentation, and increased ambient noise levels.

15.5.2.2 Threatened, Endangered, and Sensitive Species

Under the No-Action Alternative, the MVC project would not be constructed. The No-Action Alternative would not affect Ute ladies'-tresses or June sucker, the only federally listed threatened or endangered species with any real potential

to be adversely affected by the action alternatives. The federally listed, threatened Ute ladies'-tresses, the endangered June sucker, and numerous state-listed species could be adversely affected by other unrelated development projects.

15.5.2.3 Migratory Birds

Under the No-Action Alternative, no direct impacts to migratory birds would occur due to MVC-related activities. Other transportation projects identified in the WFRC and MAG long-range plans and by local communities could be constructed and could cause impacts to migratory birds in the future. All migratory bird habitats in the area could be affected by ongoing activities that would occur under the No-Action Alternative. The loss of these areas to ongoing development would further fragment migratory bird habitat, reduce the size of the habitat through direct construction, and indirectly adversely affect habitat use due to human presence and related noise.

15.5.2.4 Jurisdictional Wetlands

Wetlands and linear aquatic features could be gradually permitted and filled under many different smaller, unrelated development and infrastructure projects that could occur if the No-Action Alternative is implemented. In addition, it is expected that, under the No-Action Alternative, much of the area in western Salt Lake County and northwest Utah County (north of Utah Lake) will be developed as a result of the rapid population and employment growth. These developments would likely result in impacts to wetlands, especially north of Utah Lake in Lehi, Saratoga Springs, American Fork, and Eagle Mountain. Because the impacts to these wetlands and waters would be regulated by USACE, it is likely that there would be no overall net loss of wetland functions or waters of the U.S.

15.5.2.5 Summary of Impacts to Ecosystem Resources

Under the No-Action Alternative, the MVC project would not be constructed. No direct or indirect impacts to ecosystem resources would occur due to MVC-related activities. Continued residential and commercial development and related infrastructure projects could adversely affect ecosystem resources throughout the area.

15.5.3 Salt Lake County Alternatives

In Salt Lake County, two roadway alternatives and a transit alternative which would be implemented as part of the roadway alternatives are under consideration: the 5600 West Transit Alternative, the 5800 West Freeway Alternative, and the 7200 West Freeway Alternative. Under the 5600 West

Transit Alternative, there is a dedicated right-of-way option and a mixed-traffic option. In addition, a tolling option was considered for each freeway alternative. Impacts under each combination of alternatives and options are discussed in the following sections.

The two roadway alternatives in Salt Lake County were evaluated with both options from the 5600 West Transit Alternative to help determine the total impact from the combined alternatives.

15.5.3.1 General Impact Information

Wildlife Habitat Fragmentation and Roadway Mortality

The MVC project would directly cause a loss of wildlife habitat, which would displace and increase the mortality of birds, mammals, amphibians, and reptiles. In addition, the direct loss of wildlife habitat would fragment other habitat and cause additional pressure on surrounding habitat blocks that are unfragmented. Urbanization and development also change the wildlife structure; some species thrive, while others that are less tolerant of human activity leave the area.

Although the primary direct impact to wildlife expected from the MVC project is the loss of habitat, fragmentation and increased noise levels in both Salt Lake and Utah Counties could cause indirect impacts. The potential adverse effects of habitat loss and fragmentation include the following:

- **Reduced connectivity.** Fragmentation of existing upland and wetland habitat blocks would eliminate connectivity between large areas of habitat that are currently contiguous. In many areas, the freeway would form an impassable barrier to some wildlife movement between currently connected areas. The freeway could be a physical barrier, though bridges and culverts might allow wildlife to pass beneath the freeway. The suitability of such artificial passageways for different species is not well understood (Forman and others 2003). The freeway could also be an environmental barrier; in this case, wildlife would not even approach the area looking for potential places to cross the freeway due to increased noise in their environment or because the freeway is a visual deterrent.

  If individual animals in populations that are separated from their populations by the freeway wanted to disperse or migrate, this would require longer, roundabout travel, possibly through marginal or unsuitable habitat, to reach formerly connected areas. The increased level of exposure from such longer travel paths would increase the amount of energy required and increase the risk of animals being killed. Reduced connectivity between habitat blocks could also reduce the gene flow

between populations, resulting in decreased biodiversity (Transportation Research Board 2002).

- **Reduced carrying capacity.** Fragmentation would reduce the total habitat area, access to vital habitat, and habitat block size. This would decrease the resources available to wildlife species, which in turn would reduce the local carrying capacity.
- **Higher levels of roadside pollution.** Where habitat blocks are bisected by the freeway, this could increase the levels of various airborne and waterborne pollutants. In particular, small, isolated wetlands are more likely than larger ones to concentrate pollutants, which could potentially degrade habitat quality (Forman and others 2003).
- **Greater highway mortality.** Wildlife habitats in the ecosystem impact analysis area provide refuge areas for wildlife. Some species move between the upper-elevation foothills to the lower-level valley areas. Other species move between the various habitats. Although some species are highly mobile and can easily fly between these areas, the freeway would likely restrict or eliminate access to some areas that are currently being used. An increased amount of deaths of individual animals, regardless of their mobility, is expected during construction and operation of the MVC due to collisions with vehicles. In addition, traffic can increase the general mortality rate in an area, though this phenomenon is not well understood (Transportation Research Board 2002). Some biologists suggest that highway noise can mask a species' predator warning calls and the movement of the predators themselves.

Wildlife Noise Impacts

The main difficulty in summarizing the effects of roadway-induced noise on wildlife lies in the fact that very few studies have directly addressed the impact of noise from roads (that is, the background sound that accompanies varying volumes of traffic). Few noise studies have been conducted for invertebrates, reptiles, and amphibians, whereas a higher number of noise studies has been conducted on fish, birds, and mammals. For birds, noise can apparently have a substantial effect; however, the results are not universal. Some species are adversely affected, many are unaffected, and others become more common near interstate highways (FHWA 2007).

However, it is widely hypothesized that human-induced noise, in this case highway noise, can mask important vocal communication and natural sounds that are important for mate attraction, social cohesion, predator avoidance, prey detection, navigation, and other basic behaviors of wildlife species. Large habitat

blocks can provide more buffering capacity against noise disturbance for wildlife species than do smaller blocks (Forman and others 2003).

Using birds as an example for explaining how noise created from highways can affect a wildlife species, vocal communications can be masked when highway noise interferes with the transmission of a sound by drowning out the sound or parts of the sound (for example, the low-amplitude elements of a bird song) or degrading the sound to a point where it is no longer recognizable to other members of a species. When such masking or degradation occurs, the normal communication and associated biological functions of the species can be impaired. Depending on the degree of masking and the particular species' capacity to adapt (for example, by singing louder), sound masking could cause a species to abandon an area or could reduce the species' ability to reproduce and survive. Sound masking could also prevent males from attracting mates or repelling territorial rivals. Additional energy could be required for a male bird to maintain a territory and to sing louder (Patricelli and Blickley 2006). Predator warning signals and parent-offspring signals can be impaired. All of these factors could reduce the survival and reproductive success of affected populations adjacent to the freeway.

The distance at which highway noise could affect bird species depends on the type of species present. The noise impact to a particular species can extend from less than 125 feet to much greater than 3,500 feet from the freeway. For reptiles and amphibians, effects appear to be localized and likely due to mortality or creating a barrier to movement. Mammals (particularly large species) might avoid noise; however, there is evidence (particularly for smaller species) that additional habitat and corridors for movement could be provided by roadways (FHWA 2007).

Noise from road traffic would be an operational indirect impact. It would be a different impact from temporary direct impacts, which would involve construction activities that can create high-level intensities of noise for short periods of time.

It is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. With any of the action alternatives, the project would contribute to increases in noise levels in the ecosystem impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. However, this does not necessarily indicate species that are at greatest need of protection (FHWA 2007).

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce

barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

During construction, there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts

Construction activities would remove vegetation and disturb soil, which could lead to erosion of and increased sedimentation in riparian and ephemeral drainage habitats, which would cause decreased water quality. Additionally, construction activities could release hazardous materials and wastes such as oil, grease, and fuels used for construction equipment, as well as other products such as concrete or silicants. If these materials entered riparian and ephemeral drainage habitats, they would lower the water quality. To minimize construction-related discharges of pollutants, a Utah Pollution Discharge Elimination System stormwater construction permit and a Stormwater Pollution Prevention Plan would be required for construction activities. Best management practices specified in the Stormwater Pollution Prevention Plan would be used during construction to minimize impacts to surface water.

Direct operational stormwater impacts are assessed and calculated by the area of new impervious surface created by the project. The primary operational impacts to water quality are due to stormwater runoff from new impervious surfaces created from the new road and bridges over riparian and ephemeral drainages. If this runoff is not mitigated, it could substantially increase stormwater runoff levels and in-stream flow velocities. The indirect effects to wildlife and aquatic resources would be due to adverse impacts to water quality from an increase in stormwater runoff and increased petroleum and solid contaminants from the increased number of vehicles in the area. Untreated stormwater can affect the hydraulic regime and water quality, which can negatively affect aquatic life and disrupt feeding, breeding, and shelter. To mitigate potential adverse impacts, the project would include stormwater management components designed to treat highway runoff (including metals) before it is discharged to waterways.

The proposed stormwater best management practices (BMPs) of vegetated bioswales and detention ponds would be designed to reduce pollution associated with stormwater runoff and decrease runoff velocities into waterways. Stormwater runoff from new bridges would be conveyed off the bridges through pipes, treated using standard BMPs such as vegetated bioswales, and conveyed to detention ponds before being discharged into surface waters. The proposed stormwater treatment facilities would be used to treat runoff during the entire operation of the highway. See Chapter 14, Water Quality, for specific impacts related to water quality and proposed treatment methods for water quality impacts.

Threatened, Endangered, and Sensitive Species

The determination of effect for federally listed threatened, endangered, or candidate species considers the expected impacts of the proposed action on these species and their habitat. It includes the direct and indirect effects of taking an individual of a listed species, adversely affecting a population of a listed species, or degrading designated critical habitat of a listed species. Table 15.5-7 below lists the species that are being evaluated and the determination of effect for each.

In summary, nine federally listed species were identified for evaluation within the ecosystem impact analysis area. Some of the listed species are or are thought to have been extirpated from the area (Utah valvata snail and grizzly bear). Habitat for other species does not exist in the ecosystem impact analysis area (Canada lynx and slender moonwort), while other species have a very limited geographic distribution in the ecosystem impact analysis area (desert milkvetch and clay phacelia).

One bird species, the yellow-billed cuckoo, has a low potential to occur within the ecosystem impact analysis area due to poor-quality habitat for this species and a lack of historical data placing it in the area. Because the MVC project would span all habitat containing the endangered June sucker (that is, a bridge would carry the roadway over this habitat) and because construction and operational stormwater runoff would be contained and treated before being discharged, the project would have no effect on individuals, populations, or habitat. Therefore, it has been determined that the proposed MVC project would have *no effect* on individuals, populations, or habitat for the species mentioned below in Table 15.5-7, except for the threatened terrestrial orchid, the Ute ladies'-tresses (Utah County only). The expected impacts to Ute ladies'-tresses are discussed under each Utah County alternative.

To ensure that all listed species potentially occurring within the impact analysis area were studied, state listed species of concern for Salt Lake County and Utah

County were included in the study. In April 2003, the Utah Natural Heritage Program compiled a list of species that have been known to occur within the ecosystem impact analysis area. In November 2006, that list was updated using the listing of all species' occurrences and observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS). This list is shown in Table 15.5-8 below.

The proposed project would not affect many species on the state list (marked "No impact") for a variety of reasons, including: (1) populations are known from habitats within the counties, but their habitats are not found near an MVC alternative; (2) populations are now extirpated from their historical locations within the MVC ecosystem impact analysis area; or (3) species are known from habitat similar to those found within the counties of the MVC project, but have never been known to occur there. A discussion of species that may be or would be affected is presented under each MVC alternative

Table 15.5-7. Species Addressed and Evaluation of Effects from the MVC Action Alternatives

Species (Scientific Name)	Effect
Invertebrates	
Utah valvata snail (*Valvata utahensis*)	No effect
Fish	
June sucker (*Chasmistes liorus*)	No effect
Birds	
Yellow-billed cuckoo (*Coccyzus americanus*)	No effect
Mammals	
Brown (grizzly) bear (*Ursus arctos*)	No effect
Canada lynx (*Lynx canadensis*)	No effect
Plants	
Clay phacelia (*Phacelia argillacea*)	No effect
Deseret milkvetch (*Astragalus desereticus*)	No effect
Slender moonwort (*Botrychium lineare*)	No effect
Ute ladies'-tresses (*Spiranthes diluvialis*)	No effect *or* May affect, but not likely to adversely affect[a]

[a] In Utah County, UDOT's preferred alternative (2100 North Freeway Alternative) would have no effect on Ute ladies'-tresses. The Southern Freeway and Arterials Alternatives may affect, but are not likely to adversely affect, Ute ladies'-tresses. The Salt Lake County action alternatives would have no effect on this species because it does not occur in Salt Lake County.

Table 15.5-8. State of Utah Species of Concern in the MVC Study Area

Species (Scientific Name)	County[a]	Status[b]	Impact
Invertebrates			
California floater (*Anodonta californiensis*)	U	SPC	May impact, but not adversely
Eureka mountainsnail (*Oreohelix eurekensis*)	U	SPC	No impact
Lyrate mountainsnail (*Oreohelix haydeni*)	SL	SPC	No impact
Southern Bonneville pyrg (*Pyrgulopsis transversa*)	U	SPC	May impact, but not adversely
Utah physa (*Physella utahensis*)	U	SPC	No impact
Western pearlshell (*Margaritifera falcata*)	SL	SPC	No impact
Reptiles and Amphibians			
Columbia spotted frog (*Rana luteiventris*)	SL, U	CS	No impact
Smooth greensnake (*Opheodrys vernalis*)	SL, U	SPC	No impact
Western toad (*Bufo boreas*)	SL, U	SPC	No impact
Fish			
Bluehead sucker (*Catostomus discobolus*)	U	CS	No impact
Bonneville cutthroat trout (*Oncorhynchus clarkii utah*)	U	CS	No impact
Least chub (*Iotichthys phlegethontis*)	SL, U	CS	No impact
Southern Leatherside chub (*Lepidomeda aliciae*)	U	SPC	No impact
Roundtail chub (*Gila robusta*)	U	CS	No impact
Birds			
American white pelican (*Pelecanus erythrorhynchos*)	SL, U	SPC	No impact
Black swift (*Cypseloides niger*)	SL, U	SPC	No impact
Bobolink (*Dolichonyx oryzivorus*)	SL, U	SPC	May impact, but not adversely
Burrowing owl (*Athene cunicularia*)	SL, U	SPC	May impact, but not adversely
Ferruginous hawk (*Buteo regalis*)	SL, U	SPC	May impact, but not adversely
Grasshopper sparrow (*Ammodramus savannarum*)	SL	SPC	May impact, but not adversely
Greater sage-grouse (*Centrocercus urophasianus*)	SL, U	SPC	No impact
Lewis' woodpecker (*Melanerpes lewis*)	SL, U	SPC	No impact
Long-billed curlew (*Numenius americanus*)	SL, U	SPC	May impact, but not adversely
Northern goshawk (*Accipiter gentilis*)	SL, U	CS	No impact
Short-eared owl (*Asio flammeus*)	SL, U	SPC	May impact, but not adversely
Three-toed woodpecker (*Picoides tridactylus*, also known as *Picoides dorsalis*)	SL, U	SPC	No impact

Species (Scientific Name)	County[a]	Status[b]	Impact
Mammals			
Fringed myotis (*Myotis thysanodes*)	U	SPC	May impact, but not adversely
Kit fox (*Vulpes macrotis*)	SL, U	SPC	No impact
Spotted bat (*Euderma maculatum*)	SL, U	SPC	No impact
Townsend's big-eared bat (*Corynorhinus townsendii*)	SL, U	SPC	No impact
Western red bat (*Lasiurus blossevillii*)	U	SPC	May impact, but not adversely
White-tailed prairie-dog (*Cynomys leucurus*)	U	SPC	No impact

[a] County definitions: SL = Salt Lake County, U = Utah County

[b] Status definitions: SPC = Special Concern, CS = Conservation Species

15.5.3.2 5600 West Transit Alternative

As described in Chapter 2, Alternatives, two transit options are under consideration along 5600 West in Salt Lake County. One option, the Dedicated Right-of-Way Option, would incorporate a transit system running down the center of the roadway, and the other, the Mixed-Traffic Option, would incorporate a transit system running alongside the roadway.

The majority of the 5600 West Transit Alternative would be located within the existing 5600 West roadway and, therefore, would have minor impacts to wildlife. The southern portion of the transit alternative, south of Old Bingham Highway, would be located in a currently undeveloped area. However, this area is expected to develop as a major urban center in the next 20 years regardless of whether the MVC project is built. For this reason, the new transit line by itself would have minor impacts to wildlife. Because the 5600 West Transit Alternative would be built only in conjunction with one of the Salt Lake County freeway alternatives (either the 5800 West Freeway Alternative or the 7200 West Freeway Alternative), the quantitative impact calculations are provided in the sections for those alternatives.

5600 West Transit Alternative with Dedicated Right-of-Way Transit Option

Under this option, the center-running transit system would require the acquisition of additional right-of-way at transit station and park-and-ride lot locations and along segments that would be on a new alignment outside the 5600 West roadway. As a result of this additional acquisition, there would be minor adverse impacts to ecosystem resources.

Wildlife

The Dedicated Right-of-Way Transit Option would result in the minor loss and alteration of playa, uplands, and ephemeral drainage wildlife habitat. Most of this transit option would be constructed within or adjacent to the existing 5600 West roadway where little habitat exists. However, where the option is located outside the existing 5600 West roadway, direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, habitat fragmentation, and incidental mortality of resident wildlife.

The Dedicated Right-of-Way Transit Option would affect small areas of playa, uplands, and ephemeral drainage habitats. The portion of playa habitat that would be affected is immediately north of I-80 where the proposed transit line would cross I-80 before it turns east toward the Salt Lake City International Airport. The ephemeral drainage habitat that would be affected consists of two drainages near the southern end of the alignment: one at Rose Creek and the other near the southern terminus at Herriman. In terms of acreage, the playa would be the most affected of the two habitats. However, the playa impact would be less than 5 acres, and the functional quality is low (HSI = 0.02) for the species that use this habitat (American avocet and black-necked stilt). The impact to ephemeral drainage habitat would be less than 0.3 acre, and the habitat is of a low to intermediate quality (HSI = 0.14 to 0.62) for the four species used to assess ephemeral drainage habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk.

Wildlife Habitat Fragmentation and Roadway Mortality. Fragmentation of wildlife habitat caused by the Dedicated Right-of-Way Transit Option is anticipated to be minor because this option either follows an existing alignment or would bisect low-quality or disturbed lands of the northernmost or southernmost portion of these alignments. In addition, much of the existing open space in western Salt Lake County is quickly being developed or is already platted out for development, which is removing wildlife habitats and increasing fragmentation. Wildlife in the cross-country portions near the north and south termini of the alternative could experience a slight increase in mortality, depending on fencing or other structures that might be constructed to prevent wildlife crossing. However, most wildlife could cross the transit line while avoiding the transit vehicle.

Wildlife Noise Impacts. 5600 West is a well-traveled transportation corridor with average daily traffic volumes ranging from 21,000 to 45,000 vehicles per day. This relatively high traffic volume results in higher-than-average noise levels near the road. Due to the constant urban background noise and the existing 5600 West and I-80 urbanized corridors, most wildlife species currently using these

areas adjacent to existing alignments and roads are assumed to function within their habitats with higher-than-average noise levels compared to wildlife species using habitat areas that are less disturbed (that is, more open space area and farther away from urban environments). Noise resulting from the construction and operation of the transit line would increase over ambient levels by 5 dBA (decibels weighted on the "A" scale) to over 15 dBA, depending on distance, topography, and other factors (see Chapter 13, Noise).

As described in the section titled Wildlife Noise Impacts on page 15-61, it is not known exactly how noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Noise-sensitive species could leave the affected areas, while others could experience reduced reproductive success. The distance at which noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the source, depending on the species. Certain sensitive species are disturbed at even greater distances.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

For the most part, 5600 West is located in urbanized areas where constant urban-type background noises are typically above ambient conditions. Noise levels are currently increasing throughout the Salt Lake and Utah Valleys due to increased human activity and continued development of vacant land. However, some parts of the ecosystem impact analysis area are undeveloped with lower background ambient noise levels. Because of existing higher-than-ambient noise levels and increasing background noise levels from continued development in combination with the proposed action, it is assumed that either most species that use the ecosystem impact analysis area would move to areas with lower noise levels or the abundance and distribution of species would decrease locally as a result of increased noise levels.

Water Quality Impacts to Wildlife. Construction activities would remove vegetation and disturb soil, which could lead to erosion of and increased sedimentation in riparian and ephemeral drainage habitats, which would cause decreased water quality. Additionally, construction activities could release hazardous materials and wastes such as oil, grease, and fuels used for construction equipment as well as other products such as concrete or silicants. If

these materials entered riparian and ephemeral drainage habitats, they would lower the water quality. To minimize construction-related discharges of pollutants, a Utah Pollution Discharge Elimination System stormwater construction permit and a Stormwater Pollution Prevention Plan would be required for construction activities. Best management practices specified in the Stormwater Pollution Prevention Plan would be used during construction to minimize impacts to surface water.

Direct operational stormwater impacts are assessed and calculated by the area of new impervious surface created by the project. The primary operational impacts to water quality are due to stormwater runoff from new impervious surfaces created from station parking and bridges over riparian and ephemeral drainages. If this runoff is not mitigated, it could substantially increase stormwater runoff levels and in-stream flow velocities. The indirect effects to wildlife and aquatic resources would be due to adverse impacts to water quality from an increase in stormwater runoff and increased petroleum and solid contaminants from the increased number of vehicles in the area. Untreated stormwater can affect the hydraulic regime and water quality, which can negatively affect aquatic life and disrupt feeding, breeding, and shelter. To mitigate potential adverse impacts, the project would include stormwater management components designed to treat runoff (including metals) before it is discharged to waterways.

The proposed stormwater BMPs of vegetated bioswales and detention ponds would be designed to reduce pollution associated with stormwater runoff and decrease runoff velocities into waterways. Stormwater runoff from new bridges would be conveyed off the bridges through pipes, treated using standard BMPs such as vegetated bioswales, and conveyed to detention ponds before being discharged into surface waters. The proposed stormwater treatment facilities would be used to treat runoff during the entire operation of the transit line. See Chapter 14, Water Quality, for specific impacts related to water quality and proposed treatment methods for water quality impacts.

Threatened, Endangered, and Sensitive Species

No federally listed threatened or endangered species have been identified within or adjacent to the Dedicated Right-of-Way Transit Option. Therefore, there would be no adverse impact to federally listed threatened, endangered, or candidate species due to this transit option.

The Utah listed sensitive species in Salt Lake County that could be affected by the Dedicated Right-of-Way Transit Option include burrowing owl, ferruginous hawk, long-billed curlew, grasshopper sparrow, bobolink, and short-eared owl. Most of this transit option would be located within an existing right-of-way

(5600 West) that provides no habitat. Where it departs from the existing right-of-way, this option would cross disturbed land, agricultural land, low-quality drainage habitat, or low-quality playa habitat. Therefore, there would be no impacts to state sensitive species due to the Dedicated Right-of-Way Transit Option.

Migratory Birds

The Dedicated Right-of-Way Transit Option would affect minor areas of playa and drainage habitats used by migratory birds because the alignment would be within an existing right-of-way through a mostly urbanized corridor in West Valley City and West Jordan. The area of playa habitat that would be affected is immediately north of I-80 where the proposed transit line would cross I-80 before it turns east toward the Salt Lake City International Airport. Because of the small area of impact and the low quality of the habitat, a minor number of migratory birds would be adversely affected by the impacts to playa habitat from this transit option.

The ephemeral drainage habitat that would be affected consists of two drainages near the southern end of the alignment: one at Rose Creek and the other near the southern terminus at Herriman. Because the impact to ephemeral drainage habitat would be less than 0.3 acre and the habitat is of a low to intermediate quality (HSI = 0.14 to 0.62), a minor number of migratory birds would be adversely affected by the impacts to ephemeral drainage habitat from this transit option.

Jurisdictional Wetlands

The Dedicated Right-of-Way Transit Option would affect small areas of jurisdictional vegetated playa. The area of jurisdictional playa wetlands that would be affected is immediately north of I-80 where the proposed transit line would cross I-80 before it turns east toward the Salt Lake City International Airport. However, the playa impact would be less than 5 acres. There would also be minor impacts to riparian vegetation associated with jurisdictional waters of the U.S. in the southern portion of the transit option alignment. Therefore, this option would have a minor adverse effect to jurisdictional wetlands and waters.

5600 West Transit Alternative with Mixed-Traffic Transit Option

As with the Dedicated Right-of-Way Transit Option, the side-running transit option would require the acquisition of additional right-of-way at transit station and park-and-ride lot locations and along segments that would be constructed on a new alignment outside the 5600 West roadway. As a result of this additional acquisition, there would be minor adverse impacts to ecosystem resources.

Wildlife

The Mixed-Traffic Transit Option would affect small areas of drainage habitat. The ephemeral drainage habitat that would be affected consists of two drainages near the southern end of this alignment: one at Rose Creek and the other near the southern terminus at Herriman. The small amount of drainage habitat acreage affected (less than 0.3 acre) is of low to intermediate quality (HSI = 0.14 to 0.62) for the four species that were used to assess ephemeral drainage habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. The Mixed-Traffic Transit Option would also affect about 4 acres of low-quality (HSI = 0.02) playa habitat southwest of the Salt Lake City International Airport.

All other wildlife habitat impacts would be the same as those from the Dedicated Right-of-Way Transit Option.

Threatened, Endangered, and Sensitive Species

The impacts to threatened and endangered species from the Mixed-Traffic Transit Option would be the same as those from the Dedicated Right-of-Way Transit Option.

Migratory Birds

The impacts to migratory birds from the Mixed-Traffic Transit Option would be the same as those from the Dedicated Right-of-Way Transit Option.

Jurisdictional Wetlands

This transit option would affect about 4 acres of jurisdictional playa wetlands north of I-80. In addition, there would be minor impacts to jurisdictional riparian waters of the U.S. as described for the Dedicated Right-of-Way Transit Option.

Summary of Ecosystem Impacts from the 5600 West Transit Alternative

The 5600 West Transit Alternative with Dedicated Right-of-Way Transit Option and the Mixed-Traffic Transit Option would both affect a small amount of playa habitat (5 acres and 4 acres, respectively) that is of a low quality for wildlife. Both options would affect similar amounts of ephemeral drainage habitat that is of an intermediate quality to wildlife. Wildlife habitat fragmentation and wildlife roadway mortality for both options would be minor. Adverse impacts from higher noise levels could extend from less than 125 feet to much greater than 3,500 feet.

No federally designated threatened or endangered species or any state sensitive species would be affected under either option. Impacts to migratory birds would be negligible under either the Mixed-Traffic Transit Option or the Dedicated Right-of-Way Transit Option. Impacts to jurisdictional wetlands under both options would be minor.

15.5.3.3 5800 West Freeway Alternative

As described in Chapter 2, Alternatives, the 5800 West Freeway Alternative would consist of a freeway extending from I-80 to the Utah County line.

Wildlife

The 5800 West Freeway Alternative would result in the loss and alteration of wildlife habitat. Direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, habitat fragmentation, and incidental mortality of resident wildlife. Some habitats or areas might be at carrying capacity while others might not, so some species would be able to relocate and survive while others would be competitively excluded.

Habitat Loss (HSI Analysis). The 5800 West Freeway Alternative would adversely affect three wildlife habitat types: playas, uplands, and ephemeral drainages. The playa habitat would be most affected in terms of acreage (240 acres), while the upland habitat impact would be 67 acres and the ephemeral drainage habitat impact would be 3 acres (see Table 15.5-9 below).

Within the playa habitat, two species were used to assess habitat quality: the American avocet and the black-necked stilt. Most of the affected playa habitat (65%) is of very poor quality (HSI = 0.02) for both species, although 62 acres of playa are of an intermediate quality (HSI = 0.55) for the American avocet and 28 acres are of an intermediate quality (HSI = 0.55) for the black-necked stilt.

The upland habitat is located along stretches of the alternative starting at 4100 South (West Valley City) to the Salt Lake County–Utah County line. This habitat is primarily within the foothills and rolling dry croplands on the east side of the Oquirrh Mountains. Four species were used to assess upland habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. The entire upland habitat affected is of high quality (HSI = 0.7 to 1.0) for mule deer and Brewer's sparrow. However, for western meadowlark and red-tailed hawk, the affected uplands were of low quality (HSI = 0.1 to 0.3).

In the ephemeral drainage habitat, the same four species were used to assess habitat quality. In general, the quality of drainages varied widely, which was reflected in the variable habitat values for the four indicator species. Most of the

affected drainage habitat is of intermediate to high quality (HSI = 0.62 to 0.76) for the Brewer's sparrow and mule deer but of lower quality for the other two species. There is about 0.5 acre of higher-quality habitat for the western meadowlark.

Table 15.5-9. Impacts to Wildlife Habitat from the 5800 West Freeway Alternative Using Acres of Impact and Habitat Suitability Index (HSI) Values

Species	Playa		Upland		Drainage	
	Acres[a]	HSI	Acres[a]	HSI	Acres[a]	HSI
American avocet	62	0.55	*	*	*	*
	178	0.02	*	*	*	*
Black-necked stilt	34	0.17	*	*	*	*
	178	0.02	*	*	*	*
	28	0.55				
Mule deer	*	*	67	0.90	1.9	0.62
	*	*			1.3	0.13
Brewer's sparrow	*	*	28	1.00	1.9	0.76
	*	*	39	0.70	0.5	0.50
	*	*			0.7	0.43
Western meadowlark	*	*	39	0.30	0.5	0.71
	*	*	28	0.10	1.9	0.18
	*	*			0.7	0.14
Red-tailed hawk	*	*	67	0.10	0.5	0.53

HSI values are an index between 0.0 and 1.0, where 0.0 indicates that no suitable habitat for the species of concern exists in the area of interest and 1.0 indicates that optimal habitat for that species exists at that location.

[a] The acres of impact are for each specific HSI value found near the alternative. For example, there would be 62 acres of impact to playa habitat for American avocet that has an HSI value of 0.55, and 178 acres of impact to playa habitat for American avocet that has an HSI value of 0.02.

* This habitat type was not assessed for this species.

Wildlife Habitat Fragmentation and Roadway Mortality. The 5800 West Freeway Alternative would fragment three playa habitat blocks into eight pieces (see Table 15.5-10 below). The original block sizes range from 110 acres to 1,700 acres, while the fragmented piece sizes would range from 15 acres to 1,535 acres. Two remaining playa pieces would be relatively large: 540 acres and 1,535 acres. The other six pieces would be relatively small: 15 acres, 25 acres, 30 acres, 50 acres, 55 acres, and 70 acres. However, the overall effects on wildlife from playa fragmentation for this alternative would be minor because much of this habitat is already disturbed and of a low quality to wildlife. Additionally, much of it is already planned for development.

Table 15.5-10. Wildlife Habitat Fragmentation Impacts from the Salt Lake County Alternatives

Habitat Type	Block No.	5800 West Freeway Alternative		7200 West Freeway Alternative	
		Block Acreage	Block Piece Acreage[a]	Block Acreage	Block Piece Acreage[a]
Playa	1			1,840	830 / 980
	2			707	540 / 160
	3	110	70 / 25		
	4	1,700	55 / 1,535 / 30	1,700	505 / 1,190
	5	675	540 / 50 / 15		
Uplands	6	55	15 / 20 / 10		
	7	95	45 / 20		
	8	1,225	1,270	1,225	1,085 / 35
	9	510	365 / 80	510	80 / 375
	10	470	380 / 85	470	380 / 85
	11	345	90 / 215	345	215 / 90
	12	45	10 / 20	45	20 / 10
	13	60	40 / 5	60	40 / 5
	14	100	50 / 30	100	50 / 30
	15	185	85 / 80	185	80 / 85
	16	100	95	100	95
	17	825	745 / 20 / 30	825	20 / 745 / 30
	18	925	495 / 395	923	490 / 395
	19	445	10 / 375	443	10 / 375
	20	10,370	855 / 9,315	10,370	855 / 9,315
		Existing	**After**	**Existing**	**After**
Number of Blocks		18	38	16	32
Maximum / Minimum Block Size		10,370 / 45	9,315 / 5	10,370 / 45	9,315 / 5
Average Block Size		1,015	460	1,240	565

[a] The combined acreage for the block pieces might be less than the original block total because some habitat would be converted to right-of-way.

The 5800 West Freeway Alternative would fragment 15 upland habitat blocks into 30 pieces (see Table 15.5-10 above). The existing block sizes range from 45 acres to 10,370 acres with an average of 1,015 acres; the fragmented piece sizes would range from 5 acres to 9,315 acres with an average of 460 acres. Eleven of the existing 15 upland habitat blocks (73%) are larger than 100 acres, while 10 of 30 of the pieces (33%) would be larger than 100 acres. The affected upland habitat acreage is a mixture of disturbed and developed lands that are already highly fragmented by various human activities (such as agriculture, military, fences, roads, and urban development) and are of low value to wildlife.

Because this area is already disturbed, the adverse effects of fragmentation caused by the 5800 West Freeway Alternative would be minor. However, the habitat values of the remaining fragmented habitat pieces would be further reduced due to the effects of disturbance, including noise. The exact amount of noise disturbance cannot be quantified because the impact depends on the affected species and the habitat type. This noise impact is described further in the next section.

Wildlife mortality due to the 5800 West Freeway Alternative would be low because the necessary right-of-way is already disturbed and is not highly used by wildlife. The area around the alternative could be used seasonally by migrating birds, but the increased risk of roadway mortality to mule deer and other larger wildlife would be low.

Wildlife Noise Impacts. There is constant urban background noise along the existing I-80 and 5600 West urbanized corridors. Most species that use this portion of the ecosystem impact analysis area are already adapted to noise. The areas with the greatest potential for adverse wildlife noise impacts would be those where the alternative is located beyond the existing urban development. These areas are north of California Avenue to south of I-80 for playa habitat and south of about 5400 South for upland habitat. At the southern end of the 5800 West Freeway Alternative, encroaching housing developments and arterial streets are adding to the background noise. The noise levels from this alternative would add to the existing noise levels, and the density of wildlife species near the freeway, typically within 125 feet to 3,500 feet, would decrease as a result of increased noise. The increase in noise from this alternative could have an effect on wildlife.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering

capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

Because of existing higher-than-ambient noise levels and increasing background noise levels from continued development in combination with the proposed action, it is assumed that either most species that use the ecosystem impact analysis area would move to areas with lower noise levels or the abundance and distribution of species would decrease locally as a result of increased noise levels.

During construction, there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts to Wildlife. Construction activities would remove vegetation and disturb soil, which could lead to erosion of and increased sedimentation in riparian and ephemeral drainage habitats, which would cause decreased water quality. Additionally, construction activities could release hazardous materials and wastes such as oil, grease, and fuels used for construction equipment as well as other products such as concrete or silicants. If these materials entered riparian and ephemeral drainage habitats, they would lower the water quality. To minimize construction-related discharges of pollutants, a Utah Pollution Discharge Elimination System stormwater construction permit and a Stormwater Pollution Prevention Plan would be required for construction activities. Best management practices specified in the Stormwater Pollution Prevention Plan would be used during construction to minimize impacts to surface water.

Direct operational stormwater impacts are assessed and calculated by the area of new impervious surface created by the project. The primary operational impacts to water quality are due to stormwater runoff from new impervious surfaces created from the new roadways and bridges over riparian and ephemeral drainages. If this runoff is not mitigated, it could substantially increase stormwater runoff levels and in-stream flow velocities. The indirect effects to wildlife and aquatic resources would be due to adverse impacts to water quality from an increase in stormwater runoff and increased petroleum and solid contaminants from the increased number of vehicles in the area. Untreated stormwater can affect the hydraulic regime and water quality, which can negatively affect aquatic life and disrupt feeding, breeding, and shelter. To mitigate potential adverse impacts, the project would include stormwater

management components designed to treat highway runoff (including metals) before it is discharged to waterways.

The proposed stormwater BMPs of vegetated bioswales and detention ponds would be designed to reduce pollution associated with stormwater runoff and decrease runoff velocities into waterways. Stormwater runoff from new bridges would be conveyed off the bridges through pipes, treated using standard BMPs such as vegetated bioswales, and conveyed to detention ponds before being discharged into surface waters. The proposed stormwater treatment facilities would be used to treat runoff during the entire operation of the highway. See Chapter 14, Water Quality, for specific impacts related to water quality impacts and proposed treatment methods for water quality impacts.

Threatened, Endangered, and Sensitive Species

No federally listed threatened, endangered, or candidate species have been identified within the right-of-way for or adjacent to the 5800 West Freeway Alternative. Therefore, this alternative would not affect federally listed species.

Six state listed sensitive species in Salt Lake County could be affected: burrowing owl, ferruginous hawk, long-billed curlew, grasshopper sparrow, bobolink, and short-eared owl. Any impacts to the upland habitat could affect the burrowing owl, ferruginous hawk, grasshopper sparrow, bobolink, and short-eared owl. However, this habitat is common throughout the region, and much of it is disturbed. These birds would probably move to other areas if disturbed by either construction or noise. The burrowing owl might use the uplands for nesting if there are badger or prairie dog burrows available. However, the only known burrowing owl nesting sites in the area are in the Cougar Park Nature Preserve in West Jordan, about 1 mile east of and well outside the 5800 West Freeway Alternative.

The long-billed curlew could be affected by loss of the playa habitat or the loss of agricultural fields in the western and southern areas of the ecosystem impact analysis area in Salt Lake County. Little of the affected playa habitat and agricultural land is of high quality, and its loss would be a minor adverse effect for this species. Therefore, the impacts from the combined freeway/transit alternative on habitat for the four state-listed species would not adversely affect these species.

Migratory Birds

USFWS has identified birds of conservation concern that occur in conservation regions throughout North America (USFWS 2002). The MVC project lies within Bird Conservation Region 9, the Great Basin. Constructing the 5800 West

Freeway Alternative would not cause substantive, long-term adverse effects to adult birds due to their mobility. However, if construction takes place during the avian breeding season, it could cause the destruction of bird nests, eggs, and/or young.

A wide variety of bird species could be affected by construction during the breeding season. The 5800 West Freeway Alternative would have direct impacts to 240 acres of playa habitat and 67 acres of upland habitat. Given that the largest habitat impacts would occur in the playa and upland habitats, birds associated with these two community types would have the highest potential to be adversely affected by construction. Migratory birds that could be directly affected by construction include the ferruginous hawk, burrowing owl, short-eared owl, long-billed curlew, black-necked stilt, American avocet, snowy plover, sage sparrow, western meadowlark, Brewer's sparrow, horned lark, grasshopper sparrow, bobolink, and scrub jay.

Because these impacts would occur within the freeway footprint and immediately adjacent to the roadway, they would affect individual birds but not bird populations. Long-term noise effects could reduce the use of habitat near the roadway. These noise impacts would be the same as those described in the section titled Wildlife Noise Impacts on page 15-61.

Jurisdictional Wetlands

As discussed in Section 15.4.1.3, Jurisdictional Wetlands, the wetland analysis addresses total wetland acreage impacts, impacts to wetland function, impacts to high-quality wetlands, and impacts to rare and irreplaceable wetlands.

Wetland Acreage Impacts. Under this combined freeway/transit alternative, there would be 30 acres of primary wetland impacts and about 89 acres of secondary wetland impacts (see Table 15.5-11 below).

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Table 15.5-11. Total Acres of Wetland Impact from the Salt Lake County Alternatives

Type of Impact	WFU 8	WFU 9	WFU 10	WFU 11	WFU 12	WFU 13	WFU 14	WFU 15	WFU 16	WFU 17	WFU 18	WFU 19	WFU 20	WFU 21	WFU 22	Total (acres)
5800 West Freeway with Dedicated Right-of-Way Transit Option																
Primary	1.46	0.01	0.00	10.06	0.00	0.00	0.00	0.00	1.75	3.84	0.07	4.36	0.14	5.95	2.55	**30.19**
Secondary	2.72	1.38	0.48	6.68	0.00	0.00	0.00	0.00	10.83	11.28	3.84	10.23	3.18	19.22	19.34	**89.18**
Total	4.18	1.39	0.48	16.74	0.00	0.00	0.00	0.00	12.58	15.12	3.91	14.59	3.32	25.17	21.89	**119.37**
5800 West Freeway with Mixed-Traffic Transit Option																
Primary	1.46	0.00	0.00	10.06	0.00	0.00	0.00	0.00	1.75	3.84	0.07	4.36	0.14	5.95	2.55	**30.18**
Secondary	2.72	1.39	0.48	6.68	0.00	0.00	0.00	0.00	10.81	11.25	3.84	10.24	3.18	19.08	19.35	**89.02**
Total	4.18	1.39	0.48	16.74	0.00	0.00	0.00	0.00	12.56	15.09	3.91	14.6	3.32	25.03	21.90	**119.20**
7200 West Freeway with Dedicated Right-of-Way Transit Option																
Primary	0.00	0.01	0.00	0.00	0.00	2.95	0.30	2.68	0.00	0.02	0.00	0.00	18.21	3.88	2.55	**30.60**
Secondary	2.41	1.38	0.48	0.00	1.66	2.40	3.20	15.53	7.50	2.87	0.00	4.23	81.11	24.70	16.05	**163.52**
Total	2.41	1.39	0.48	0.00	1.66	5.35	3.50	18.21	7.50	2.89	0.00	4.23	99.32	28.58	18.60	**194.12**
7200 West Freeway with Mixed-Traffic Transit Option																
Primary	0.00	0.00	0.00	0.00	0.00	2.95	0.30	2.68	0.00	0.02	0.00	0.00	18.21	3.88	2.55	**30.59**
Secondary	2.41	1.39	0.48	0.00	1.66	2.40	3.20	15.53	7.22	2.83	0.00	4.24	81.11	23.44	16.07	**161.98**
Total	2.41	1.39	0.48	0.00	1.66	5.35	3.50	18.21	7.22	2.85	0.00	4.24	99.32	27.32	18.62	**192.57**

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Table 15.5-12. Wetland Impacts Measured in Lost FCUs in Salt Lake County

Type of Impact	WFU 8	WFU 9	WFU 10	WFU 11	WFU 12	WFU 13	WFU 14	WFU 15	WFU 16	WFU 17	WFU 18	WFU 19	WFU 20	WFU 21	WFU 22	Total (FCU)
5800 West Freeway with Dedicated Right-of-Way Transit Option																
Primary	1.01	0.00	0.00	7.18	0.00	0.00	0.00	0.00	0.51	2.48	0.03	3.55	0.10	2.33	1.22	**18.41**
Secondary	0.69	0.32	0.12	3.07	0.00	0.00	0.00	0.00	1.23	5.28	0.55	4.66	0.02	0.85	3.79	**20.58**
Total	1.70	0.32	0.12	10.25	0.00	0.00	0.00	0.00	1.74	7.76	0.58	8.21	0.12	3.18	5.01	**38.99**
5800 West Freeway with Mixed-Traffic Transit Option																
Primary	1.01	0.00	0.00	7.18	0.00	0.00	0.00	0.00	0.51	2.48	0.03	3.55	0.10	2.33	1.22	**18.41**
Secondary	0.69	0.31	0.12	3.07	0.00	0.00	0.00	0.00	1.22	5.24	0.55	4.66	0.02	0.84	3.79	**20.51**
Total	1.70	0.31	0.12	10.25	0.00	0.00	0.00	0.00	1.73	7.72	0.58	8.21	0.12	3.17	5.01	**38.92**
7200 West Freeway with Dedicated Right-of-Way Transit Option																
Primary	0.00	0.00	0.00	0.00	0.00	1.32	0.18	2.19	0.00	0.01	0.00	0.00	12.66	1.52	1.22	**19.10**
Secondary	0.26	0.32	0.12	0.00	0.51	0.68	0.50	5.23	0.13	0.08	0.00	0.24	18.25	1.90	2.94	**31.16**
Total	0.26	0.32	0.12	0.00	0.51	2.00	0.68	7.42	0.13	0.09	0.00	0.24	30.91	3.42	4.16	**50.26**
7200 West Freeway with Mixed-Traffic Transit Option																
Primary	0.00	0.00	0.00	0.00	0.00	1.32	0.18	2.19	0.00	0.01	0.00	0.00	12.66	1.52	1.22	**19.10**
Secondary	0.26	0.31	0.12	0.00	0.51	0.68	0.50	5.23	0.11	0.07	0.00	0.23	18.25	1.80	2.94	**31.01**
Total	0.26	0.31	0.12	0.00	0.51	2.00	0.68	7.42	0.11	0.08	0.00	0.23	30.91	3.32	4.16	**50.11**

Impacts to Wetland Function. The loss of wetland function from this combined freeway/transit alternative was calculated using the acreage of impact in Table 15.5-11 above multiplied by the FCI_{Hydro} functional assessment values. The combined freeway/transit alternative would result in a primary loss of 18.41 FCU and a secondary loss of 20.51 FCU to 20.58 FCU, depending on which transit option is selected (see Table 15.5-12 above). The total primary and secondary impacts to wetland functions from the combined freeway/transit alternative would be between 38.92 FCU and 38.99 FCU.

Impacts to High-Quality Wetlands. Table 15.5-13 lists the functional losses to wetland units that are considered to be high-functioning, which for Salt Lake County are WFUs 15, 17, and 20 (see Figure 15-1 through Figure 15-3, Wetland Functional Units – Salt Lake County). This combined freeway/transit alternative would result in a primary loss of 2.58 FCU and a secondary loss of 5.26 FCU to 5.29 FCU. The total primary and secondary impacts from the combined freeway/transit alternative to the wetland functions of high-quality wetlands would be 7.84 FCU to 7.87 FCU.

Table 15.5-13. Impacts to High-Functioning Wetland Units in Salt Lake County

Type of Impact	WFU 15	WFU 17	WFU 20	Total (FCU)
5800 West Freeway with Dedicated Right-of-Way Transit Option				
Primary	0.00	2.48	0.10	**2.58**
Secondary	0.00	5.28	0.01	**5.29**
Total				**7.87**
5800 West Freeway with Mixed-Traffic Transit Option				
Primary	0.00	2.48	0.10	**2.58**
Secondary	0.00	5.24	0.02	**5.26**
Total				**7.84**
7200 West Freeway with Dedicated Right-of-Way Transit Option				
Primary	2.19	0.01	12.66	**14.86**
Secondary	5.23	0.08	18.25	**23.56**
Total				**38.42**
7200 West Freeway with Mixed-Traffic Transit Option				
Primary	2.19	0.01	12.66	**14.86**
Secondary	5.23	0.07	18.25	**23.55**
Total				**38.41**

Impacts to Rare and Irreplaceable Wetlands. Table 15.5-14 lists the total lost acreage of playa wetlands, which are considered irreplaceable since creating new playa wetlands would be difficult. Under this combined freeway/transit alternative, there would be 13.12 acres of primary playa wetland impacts and about 42 acres of secondary impacts. The total primary and secondary impacts to playa wetlands would be 55.09 acres to 55.14 acres.

Table 15.5-14. Impacts to Playa Wetlands in Salt Lake County (acres)

Alternative	Primary Impacts	Secondary Impacts	Total
5800 West Freeway with Dedicated Right-of-Way Transit Option	13.12	42.02	**55.14**
5800 West Freeway with Mixed-Traffic Transit Option	13.12	41.97	**55.09**
7200 West Freeway with Dedicated Right-of-Way Transit Option	24.37	116.71	**141.08**
7200 West Freeway with Mixed-Traffic Transit Option	24.37	116.49	**140.86**

Impacts to Linear Aquatic Features. These waters include linear aquatic features such as canals and ditches, ephemeral washes, and riparian areas. Since the functional assessment model was not designed to evaluate the condition of these linear features, the impacts were determined by measuring the length of the linear features within the right-of-way footprint. This combined freeway/transit alternative would affect 70 feet of irrigation canals and ditches, 4,419 feet to 4,494 feet of ephemeral washes, and 9,512 feet to 9,606 feet of riparian area (see Table 15.5-15).

Table 15.5-15. Impacts to Linear Aquatic Features in Salt Lake County (feet)

Alternative	Canal	Ephemeral Wash	Riparian	Total
5800 West Freeway with Dedicated Right-of-Way Transit Option	70	4,419	9,606	**14,095**
5800 West Freeway with Mixed-Traffic Transit Option	70	4,494	9,512	**14,076**
7200 West Freeway with Dedicated Right-of-Way Transit Option	70	4,767	3,533	**8,370**
7200 West Freeway with Mixed-Traffic Transit Option	70	4,842	3,403	**8,315**

Combined Impacts of 5800 West Freeway and 5600 West Transit Alternatives

The 5800 West Freeway Alternative would be implemented with one of the two 5600 West Transit Alternative options.

5800 West Freeway Alternative with Dedicated Right-of-Way Transit Option

Wildlife. The wildlife impacts of the 5800 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Together, the freeway alternative and transit option would affect three different wildlife habitat types: playas (245 acres), uplands (67 acres), and ephemeral drainages (6 acres) (see Table 15.5-9 above).

Wildlife Habitat Fragmentation and Roadway Mortality. The impacts from the 5800 West Freeway Alternative with the Dedicated Right-of-Way Transit Option on wildlife habitat fragmentation and roadway mortality are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Together, the freeway alternative and transit option would fragment three playa habitat blocks and 15 upland habitat blocks.

Wildlife Noise Impacts. The wildlife noise impacts from the 5800 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

Wildlife Water Quality Impacts. The water quality impacts to wildlife from the 5800 West Freeway Alternative with the Dedicated Right-of-Way Transit Option would be the same as those from the 5800 West Freeway Alternative.

Threatened, Endangered, and Sensitive Species. No federally listed threatened, endangered, or candidate species have been identified within the right-of-way of or adjacent to the 5600 West Transit Alternative or the 5800 West Freeway Alternative. Therefore, the 5800 West Freeway Alternative with Dedicated Right-of-Way Transit Option would have no impacts to federally listed species.

The impacts to Utah listed species are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Six state-listed sensitive species would be affected, but they would not be adversely affected.

Migratory Birds. The impacts to migratory birds from the 5800 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

Jurisdictional Wetlands. The impacts to wetlands and linear aquatic features from the 5800 West Freeway Alternative with the Dedicated Right-of-Way

Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

5800 West Freeway Alternative with Mixed-Traffic Transit Option

Wildlife. The wildlife impacts from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Together, the freeway alternative and transit option would affect three different wildlife habitat types: playas (244 acres), uplands (67 acres), and ephemeral drainages (6 acres) (see Table 15.5-9 above).

Wildlife Habitat Fragmentation and Roadway Mortality. The impacts from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option on wildlife habitat fragmentation and roadway mortality are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Together, the freeway alternative and transit option would fragment three playa habitat blocks and 15 upland habitat blocks.

Wildlife Noise Impacts. The wildlife noise impacts from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

Wildlife Water Quality Impacts. The water quality impacts to wildlife from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option would be the same as those from the 5800 West Freeway Alternative.

Threatened, Endangered, and Sensitive Species. No federally listed threatened, endangered, or candidate species have been identified within the right-of-way of or adjacent to the 5600 West Transit Alternative or the 5800 West Freeway Alternative. Therefore, the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option would have no impacts to federally listed species.

The impacts to Utah listed species are described in Section 15.5.3.3 for the 5800 West Freeway Alternative. Six state-listed sensitive species would be affected, but they would not be adversely affected.

Migratory Birds. The impacts to migratory birds from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

Jurisdictional Wetlands. The impacts to wetlands and linear aquatic features from the 5800 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.3 for the 5800 West Freeway Alternative.

5800 West Freeway Alternative with Tolling Option

Under the 5800 West Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative. Therefore, the impacts to ecosystem resources would be the same as those from the 5800 West Freeway Alternative. However, with slightly less traffic on the MVC, there would be less risk of wildlife strikes on the freeway as well as a slight reduction in adverse impacts caused by traffic noise.

Summary of Ecosystem Impacts from the 5800 West Freeway Alternative

The 5800 West Freeway Alternative would affect mostly low-quality wildlife habitats for the indicator species. The only exceptions are impacts to the HSVs (HSV = HSI × Acreage Affected) for mule deer and Brewer's sparrow, which are much higher than for any other species in any other habitat. Table 15.5-16 summarizes the wildlife HSV impacts for the 5800 West Freeway Alternative, the 5800 West Freeway Alternative with the 5600 West transit options, and the 5800 West Freeway Alternative with the Tolling Option.

Table 15.5-16. Impacts from the 5800 West Freeway Alternative and Options on Habitat Suitability Values

	5800 West Freeway Alternative			5800 West Freeway Alternative with Dedicated Right-of-Way Option			5800 West Freeway Alternative with Mixed-Traffic Option			5800 West Freeway Alternative with Tolling Option		
Species	**Pla**	**Upl**	**Dra**	**Pla**	**Upl**	**Dra**	**Pla**	**Upl**	**Dra**	**Pla**	**Upl**	**Dra**
American avocet	38			38			38			38		
Black-necked stilt	25			25			25			25		
Mule deer		60	1		62	2		62	2		60	1
Brewer's sparrow		55	2		57	2		57	2		55	2
Western meadowlark		14	1		15	1		15	1		14	1
Red-tailed hawk		7	<1		7	<1		7	<1		7	<1

Pla = Playas, Upl = Uplands, Dra = Ephemeral Drainages
HSV = HSI × Acres Affected

Wildlife habitat fragmentation caused by the 5800 West Freeway Alternative would increase the number of smaller habitat blocks. Roadway mortality would increase as a result of construction and operation of the MVC, although the exact amount cannot be quantified. Higher noise levels would further indirectly adversely affect wildlife. Migratory bird habitat would be affected, but the potential adverse effects to migratory birds would be minor. However, the 5800 West Freeway Alternative would affect mostly disturbed or low-quality wildlife habitat, including some urbanized areas. This alternative would not affect any threatened, endangered, candidate, or sensitive species.

Table 15.5-17 summarizes the jurisdictional wetland impacts for the various analytical methods used. There is little difference between the two transit options. The same is true regarding impacts to linear aquatic features.

Table 15.5-17. Summary of Wetland Impacts in Salt Lake County

Alternative and Transit Option	Total Primary Impacts (acres)	Total Secondary Impacts (acres)	Impacts to Wetland Function (FCU)	Impacts to High-Functioning Wetlands (FCU)	Impacts to Playa and Vegetated Playa (acres)
5800 West Freeway with Dedicated Right-of-Way Transit Option	30.19	89.18	38.99	7.87	55.14
5800 West Freeway with Mixed-Transit Option	30.18	89.02	38.92	7.84	55.09
7200 West Freeway with Dedicated Right-of-Way Transit Option	30.60	163.52	50.26	38.42	141.08
7200 West Freeway with Mixed-Transit Option	30.59	161.98	50.11	38.41	141.86

Chart 15-1 and Chart 15-2 are graphical representations of the summary findings in Table 15.5-17 above.

Chart 15-1. Summary of Wetland Impacts (acres) – Salt Lake County Alternatives

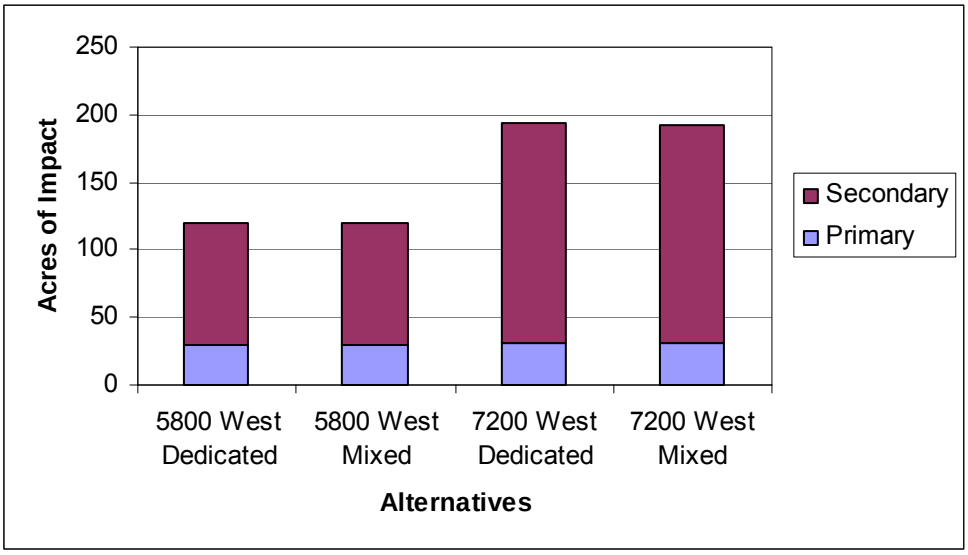
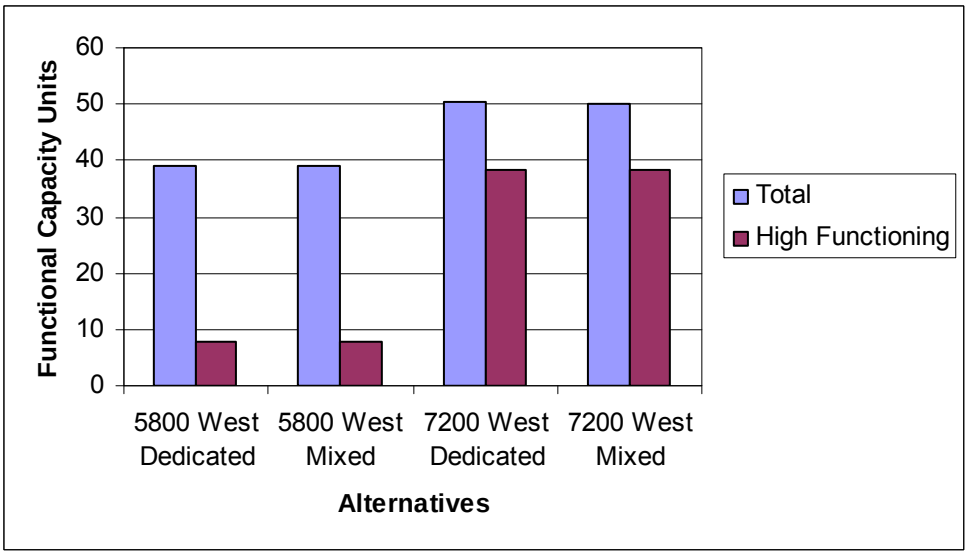


Chart 15-2. Summary of Wetland Impacts (Functional Units) – Salt Lake County Alternatives



15.5.3.4 7200 West Freeway Alternative

As described in Chapter 2, Alternatives, the 7200 West Freeway Alternative would consist of a freeway extending from I-80 to the Utah County line.

Wildlife

The 7200 West Freeway Alternative would result in the loss and alteration of wildlife habitat. Direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, fragmentation of habitat, and incidental mortality of wildlife. Some habitats or areas might be at carrying capacity while others might not, so some species would be able to relocate and survive while others would be competitively excluded.

Habitat Loss (HSI Analysis). The 7200 West Freeway Alternative would adversely affect three wildlife habitat types: playas, uplands, and ephemeral drainages. The upland habitat would be affected most in terms of acreage (136 acres), followed by playas (128 acres) and ephemeral drainages (3 acres) (see Table 15.5-18 below).

The upland habitat in the ecosystem impact analysis area is located along stretches of the alternative extending from 4100 South (in West Valley City) to the Salt Lake County–Utah County line. This habitat is primarily within the foothills and rolling dry croplands on the east side of the Oquirrh Mountains. Four wildlife species were used to assess upland habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. The entire upland habitat affected is of high quality (HSI = 0.7 to 1.0) for mule deer and Brewer's sparrow. However, for the western meadowlark and red-tailed hawk, the affected uplands were of low quality (HSI = 0.1 to 0.3).

Within the playa habitat (between I-80 and north of 3500 South), two species were used to assess habitat quality: the American avocet and the black-necked stilt. All of the 128 acres of playa are of an intermediate quality (HSI = 0.55 to 0.5) for both species.

In the ephemeral drainage habitat, the same four species were used to assess habitat quality as were used for the upland habitat. In general, the quality of drainages varied widely, which was reflected in the variable habitat values for the four indicator species. Most of the affected drainage habitat is of intermediate to high quality (HSI = 0.62 to 0.76) for the Brewer's sparrow and mule deer, but of lower quality for the other two species There is about 0.5 acre of higher-quality habitat for the western meadowlark and red-tailed hawk.

Table 15.5-18. Impacts to Wildlife Habitat from the 7200 West Freeway Alternative Using Acres of Impact and Habitat Suitability Index (HSI) Values

	Playa		Upland		Drainage	
Species	Acres	HSI	Acres	HSI	Acres	HSI
American avocet	113	0.55	*	*	*	*
	15	0.50	*	*	*	*
Black-necked stilt	113	0.55	*	*	*	*
	15	0.50	*	*	*	*
Mule deer	*	*	136	0.90	1.9	0.62
	*	*			1.3	0.13
Brewer's sparrow	*	*	27	1.00	1.9	0.76
	*	*	109	0.70	0.5	0.50
	*	*			0.7	0.43
Western meadowlark	*	*	109	0.30	0.5	0.71
	*	*	27	0.10	1.9	0.18
	*	*			0.7	0.14
Red-tailed hawk	*	*	136	0.10	0.5	0.53

* This habitat type was not assessed for this species.

Wildlife Habitat Fragmentation and Roadway Mortality. The indirect impacts to wildlife under the 7200 West Freeway Alternative could include habitat fragmentation, barriers to wildlife movement, and mortality from road kills. This alternative would bisect three very large blocks of playa habitat, but the remaining habitat pieces would also be large—over 150 acres (see Table 15.5-10 above). The 7200 West Freeway Alternative would also fragment 13 upland habitat blocks, resulting in 26 pieces. The existing upland habitat block sizes range from 45 acres to over 10,000 acres, and three blocks are 100 acres or less. The fragmented pieces would range from 5 acres to 9,315 acres in size, with 16 of them being 100 acres or less. This fragmentation would decrease the block size and connectivity between the blocks, while increasing edge and barrier effects. Considering all blocks, the average block size would decrease from 1,240 acres to 565 acres. Most of the land affected by this alternative is already disturbed and is not highly used by wildlife. However, even though the quality of this playa habitat is not optimal, due to existing land-use patterns, grazing, and fragmentation, some of this playa habitat could be used by wildlife during high-water years as refugia. If the habitat block size is further reduced from construction noise or operation noise from the MVC, some species might not use the area even as a refuge.

The reduced habitat block size would decrease the habitat resources available to wildlife and, in turn, reduce the local carrying capacity. The habitat values of the remaining fragmented habitat pieces would be further reduced due to the effects of disturbance, including noise. This impact is described further in the next section.

Wildlife mortality due to the 7200 West Freeway Alternative would be low because the necessary right-of-way is already disturbed and is not highly used by wildlife. The area around the alternative could be used seasonally, but the increased risk of roadway mortality to mule deer and other wildlife would be low.

Wildlife Noise Impacts. The 7200 West Freeway Alternative would have an overall greater adverse impact to wildlife than the 5800 West Freeway Alternative. This alternative would bisect playa habitat north of California Avenue in a relatively undeveloped area, and the increase in noise would affect more wildlife than would the 5800 West Freeway Alternative (which is closer to the existing 5600 West roadway and an industrial area). However, it is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species are disturbed at even greater distances.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

Because of existing higher-than-ambient noise levels and increasing background noise levels from continued development in combination with the proposed action, it is assumed that either most species that use the ecosystem impact analysis area would move to areas with lower noise levels or the abundance and distribution of species would decrease locally as a result of increased noise levels.

During construction there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock

substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts to Wildlife. The water quality impacts to wildlife from the 7200 West Freeway Alternative would be the same as those from the 5800 West Freeway Alternative.

Threatened, Endangered, and Sensitive Species

The impacts to threatened and endangered species from the 7200 West Freeway Alternative would be the same as those from the 5800 West Freeway Alternative.

Migratory Birds

The impacts to migratory birds from the 7200 West Freeway Alternative would be similar to those from the 5800 West Freeway Alternative, but would be slightly greater because there would be more impacts to the undeveloped playa habitat south of I-80 and north of California Avenue.

Jurisdictional Wetlands

As discussed in Section 15.4.1.3, Jurisdictional Wetlands, the wetland analysis includes total wetland acreage impacts, impacts to wetland function, impacts to high-quality wetlands, and impacts to rare and irreplaceable wetlands.

Wetland Acreage Impacts. Under this combined freeway/transit alternative, there would be about 30.59 acres to 30.60 acres of primary wetland impacts and between 161.98 acres and 163.52 acres of secondary wetland impacts, depending on which transit option is selected (see Table 15.5-11 above).

Impacts to Wetland Function. The loss of wetland function from this combined freeway/transit alternative was calculated using the acreage of impact in Table 15.5-11 above multiplied by the FCI_{Hydro} functional assessment values. The combined freeway/transit alternative would result in a primary loss of 19.10 FCU and a secondary loss of 31.01 FCU to 31.16 FCU depending on which transit option is selected. As shown in Table 15.5-12 above, the total primary and secondary impacts to wetland functions from this alternative would be 50.11 FCU to 50.26 FCU.

Impacts to High-Quality Wetlands. Table 15.5-13 above lists the functional losses to wetland units that are considered to be high-functioning. This combined freeway/transit alternative would result in a primary loss of 14.86 FCU and a secondary loss of about 23.55 FCU. The total primary and secondary impacts

from this alternative to the wetland functions of high-quality wetlands would be between 38.41 and 38.42 FCU, depending on the transit option selected.

Impacts to Rare and Irreplaceable Wetlands. Table 15.5-14 above lists the total lost acreage of playa wetlands, which are considered irreplaceable since creating new playa wetlands would be difficult. Under this combined freeway/transit alternative, there would be about 24.37 acres of primary playa wetland impacts and between 116.49 acres and 116.71 acres of secondary impacts. The total primary and secondary impacts would be 140.86 acres to 141.08 acres of playa wetlands.

Impacts to Linear Aquatic Features. These waters include linear aquatic features such as canals and ditches, ephemeral washes, and riparian areas. Since the functional assessment model was not designed to evaluate the condition of these linear features, the impacts were determined by measuring the length of the linear features within the right-of-way footprint. The 7200 West Freeway Alternative would affect 70 feet of irrigation canals and ditches, between 4,767 feet and 4,842 feet of ephemeral washes, and between 3,403 feet and 3,533 feet of riparian area (see Table 15.5-15 above).

Combined Impacts of 7200 West Freeway and 5600 West Transit Alternatives

As with the 5800 West Freeway Alternative, the 7200 West Freeway Alternative would be implemented with one of the two 5600 West Transit Alternative options.

7200 West Freeway Alternative with Dedicated Right-of-Way Transit Option

Wildlife. The wildlife impacts from the 7200 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative. Together, the freeway alternative and transit option would affect three wildlife habitat types: playas (133 acres), uplands (136 acres), and ephemeral drainages (6 acres).

Wildlife Habitat Fragmentation and Roadway Mortality. The impacts from the 7200 West Freeway Alternative with the Dedicated Right-of-Way Transit Option on wildlife habitat fragmentation and roadway mortality would be the same as those from the 7200 West Freeway Alternative.

Wildlife Noise Impacts. The wildlife noise impacts from the 7200 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

Wildlife Water Quality Impacts. The water quality impacts to wildlife from the 7200 West Freeway Alternative with Dedicated Right-of-Way Transit Option would be the same as those described from the 5800 West Freeway Alternative.

Threatened, Endangered, and Sensitive Species. No federally listed threatened, endangered, or candidate species have been identified within the right-of-way of or adjacent to the 5600 West Transit Alternative or the 7200 West Freeway Alternative. Therefore, the 7200 West Freeway Alternative with Dedicated Right-of-Way Transit Option would have no impacts to federally listed species.

The impacts to Utah listed species are described in Section 15.5.3.4 for the 7200 West Freeway Alternative. Six state-listed sensitive species would be affected, but they would not be adversely affected.

Migratory Birds. The impacts to migratory birds from the 7200 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

Jurisdictional Wetlands. The impacts to wetlands and linear aquatic features from the 7200 West Freeway Alternative with the Dedicated Right-of-Way Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

7200 West Freeway Alternative with Mixed-Traffic Transit Option

Wildlife. The wildlife impacts from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative. Together, the freeway alternative and transit option would affect three different habitat types: playas (131 acres), uplands (136 acres), and ephemeral drainages (6 acres).

Wildlife Habitat Fragmentation and Roadway Mortality. The impacts from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option on wildlife habitat fragmentation and roadway mortality would be the same as those from the 7200 West Freeway Alternative.

Wildlife Noise Impacts. The wildlife noise impacts from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

Wildlife Water Quality Impacts. The water quality impacts to wildlife from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option would be the same as those from the 5800 West Freeway Alternative.

Threatened, Endangered, and Sensitive Species. No federally listed threatened, endangered, or candidate species have been identified within the right-of-way of

or adjacent to the 5600 West Transit Alternative or the 7200 West Freeway Alternative. Therefore, the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option would have no impacts to federally listed species.

The impacts to Utah listed species are described in Section 15.5.3.4 for the 7200 West Freeway Alternative. Six state-listed sensitive species would be affected, but they would not be adversely affected.

Migratory Birds. The impacts to migratory birds from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

Jurisdictional Wetlands. The impacts to wetlands and linear aquatic features from the 7200 West Freeway Alternative with the Mixed-Traffic Transit Option are described in Section 15.5.3.4 for the 7200 West Freeway Alternative.

7200 West Freeway Alternative with Tolling Option

Under the 7200 West Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative. Therefore, the impacts to ecosystem resources would be the same as those from the 7200 West Freeway Alternative. However, with slightly less traffic on the MVC, there would be less risk of wildlife strikes on the freeway as well as a slight reduction in adverse impacts caused by traffic noise.

Summary of Ecosystem Impacts from the 7200 West Freeway Alternative

The 7200 West Freeway Alternative would affect mostly low-quality wildlife habitats for the indicator species. The exceptions are for two of the four indicator species for the upland habitat quality; the HSVs (HSV = HSI × Acreage Affected) for both the mule deer and Brewer's sparrow are much higher than for any other species in any other habitat (see Table 15.5-19 below). None of the options for this alternative would substantially increase adverse impacts to wildlife habitat.

Table 15.5-19. Impacts from the 7200 West Freeway Alternative and Options on Habitat Suitability Values

Species	7200 West Freeway Alternative			7200 West Freeway Alternative with Dedicated Right-of-Way Option			7200 West Freeway Alternative with Mixed-Traffic Option			7200 West Freeway Alternative with Tolling Option		
	Pla	Upl	Dra	Pla	Upl	Dra	Pla	Upl	Dra	Pla	Upl	Dra
American avocet	69			70			69			69		
Black-necked stilt	69			70			69			69		
Mule deer		123	1		125	1		125	1		123	1
Brewer's sparrow		104	2		106	2		106	2		104	2
Western meadowlark		35	1		36	1		36	1		35	1
Red-tailed hawk		14	<1		14	<1		14	<1		14	<1

Pla = Playas, Upl = Uplands, Dra = Drainages
HSV = HSI × Acres Affected

Wildlife habitat fragmentation caused by the 7200 West Freeway Alternative would increase the number of smaller habitat blocks from 16 to 32, with the average block size decreasing from 1,240 acres to 565 acres. Roadway mortality would increase as a result of construction and operation of the MVC, although the exact amount cannot be quantified. Higher noise levels would further indirectly adversely affect wildlife, causing reductions in density of wildlife species near the freeway, typically within 125 feet to 3,500 feet. Migratory bird habitat would be affected, but the potential adverse effects to migratory birds would be minor. However, the 7200 West Freeway Alternative would affect mostly disturbed or low-quality wildlife habitat, including some urbanized areas. This alternative would not affect any threatened, endangered, candidate, or sensitive species.

Table 15.5-17 above summarizes the jurisdictional wetland impacts for the various analytical methods used. There is little difference between the two transit options. The same is true regarding impacts to linear aquatic features. The combined freeway/transit alternative would result in a primary loss of 19.10 FCU and a secondary loss of 31.01 FCU to 31.16 FCU of wetland function (see Table 15.5-12 above). The total primary and secondary impacts to wetland functions for the combined freeway/transit alternative would be 50.11 FCU to 50.26 FCU.

15.5.3.5 Comparison of Ecosystem Impacts from the Salt Lake County Alternatives

The 5600 West transit options for either of the two Salt Lake County freeway alternatives would not result in substantial adverse impacts to wildlife habitat. Six wildlife species were used to assess habitat quality: two species for the playas and four each for the uplands and ephemeral drainages. Overall, the 7200 West Freeway Alternative would have greater habitat value impacts on playas and upland habitats than would the 5800 West Freeway Alternative (see Table 15.5-20 and Chart 15-3 below). In the case of the uplands, the two alternatives would affect habitats of similar value (HSI), but the 7200 West Freeway Alternative would adversely affect more acreage. However, the opposite is true for the playa habitats, where the higher habitat value (HSV) impacts from the 7200 West Freeway Alternative were due to higher quality habitat (HSI) being affected, but less acreage than for the 5800 West Freeway Alternative.

Table 15.5-20. Summary of Impacts to Habitat Suitability Values from the Salt Lake County Alternatives

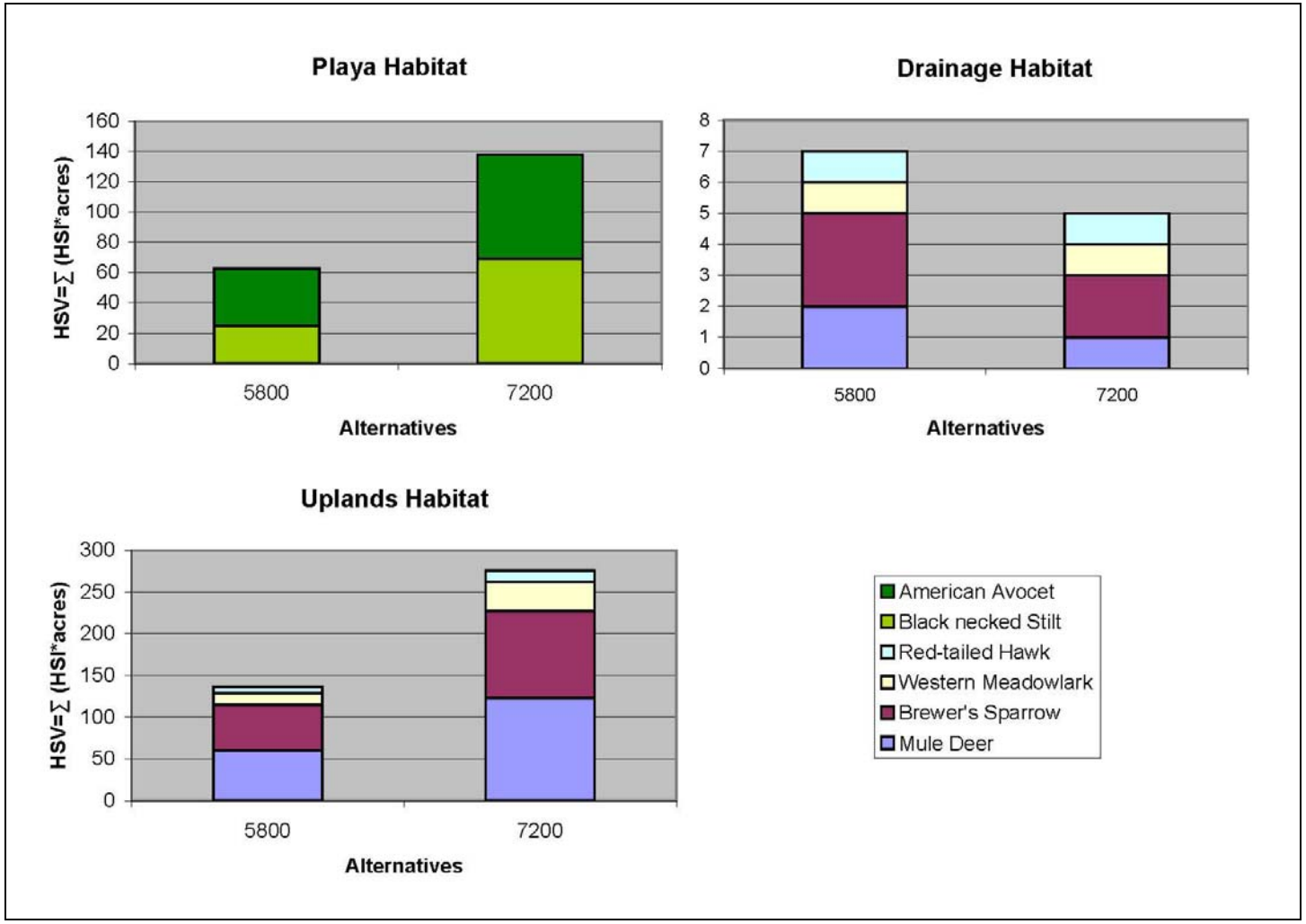
	5800 West Freeway[a]			7200 West Freeway[a]		
Species	**Pla**	**Upl**	**Dra**	**Pla**	**Upl**	**Dra**
American avocet	38			**69**		
Black-necked stilt	25			**69**		
Mule deer		60	2		**123**	1
Brewer's sparrow		55	3		**104**	2
Western meadowlark		14	1		**35**	1
Red-tailed hawk		7	<1		**14**	<1

Bold indicates higher values by alternative.

Pla = Playas, Upl = Uplands, Dra = Drainages

[a] Units are in Habitat Suitability Values (HSV = HSI × Acres Affected).

Chart 15-3. Comparison of Habitat Suitability Values for the Salt Lake County Alternatives



The differences in the effects of wildlife habitat fragmentation from the 5800 West Freeway and 7200 West Freeway Alternatives are difficult to quantify. Although the 5800 West Freeway Alternative would fragment more habitat blocks of playa and upland habitats into more pieces and smaller pieces than would the 7200 West Freeway Alternative, those existing blocks are already smaller and more fragmented than those found along the 7200 West Freeway Alternative. Overall, the 5800 West Freeway Alternative would reduce the size of habitat blocks in an area that is already fragmented and disturbed by urban land uses. The 7200 West Freeway Alternative habitat blocks are less disturbed north of SR 201, and the impacts of the alternative would leave several large blocks in place. Noise disturbance and roadway mortality would be the same for both alternatives.

The 5800 West Freeway Alternative would produce more small habitat blocks that would have greater adverse noise impacts. The 7200 West Freeway Alternative would fragment fewer habitat blocks, but these are currently less disturbed than those along the 5800 West Freeway Alternative corridor. Under both alternatives, the distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species are disturbed at even greater distances.

The impacts to threatened, endangered, candidate, and sensitive species would be the same for both alternatives.

The 7200 West Freeway Alternative would have somewhat greater impacts to migratory birds than would the 5800 West Freeway Alternative due to the greater impacts to playa and upland habitats.

Wetland impacts would differ between the 5800 West Freeway and 7200 West Freeway Alternatives as shown in Table 15.5-17 above. There would be only 0.41 acre of difference between the 5800 West Freeway (30.19 acres) and 7200 West Freeway (30.60 acres) Alternatives in terms of total acres of primary wetland impacts, which at the scale of this analysis is relatively small. However, the 7200 West Freeway Alternative would have about 87 acres more of total wetland impacts (primary and secondary) than would the 5800 West Freeway Alternative. Similarly, the 7200 West Freeway Alternative would have greater wetland function impacts, greater impacts to high-functioning wetland units, and greater impacts to rare and irreplaceable wetlands.

15.5.4 Utah County Alternatives

In Utah County, three alternatives are under consideration: the Southern Freeway Alternative, the 2100 North Freeway Alternative, and the Arterials Alternative. In addition, a tolling option was evaluated for each Utah County alternative. Impacts under each combination of alternatives and options are discussed in the following sections.

15.5.4.1 Southern Freeway Alternative

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from the Utah County line to Interstate 15 (I-15) at Lindon.

Wildlife

This alternative would result in the loss and alteration of wildlife habitat. Direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, habitat fragmentation, and mortality of resident wildlife.

Habitat Loss (HSI Analysis). The Southern Freeway Alternative would adversely affect four wildlife habitat types: wetlands, uplands, ephemeral drainages, and riparian areas. This alternative would have the greatest impact to upland habitat (165 acres), followed by wetlands (11.7 acres), riparian areas (9.6 acres), and ephemeral drainages (3.8 acres).

The upland habitat is located along stretches of the alternative starting at the Salt Lake County–Utah County line and extending south to about 2100 North, and also near the southern project terminus. This habitat is primarily within the foothills and rolling dry croplands on the east side of the Oquirrh Mountains. Four wildlife species were used to assess upland habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. About 76% (about 125 acres out of 165 acres) of the affected upland habitat is of high quality (HSI = 0.7 to 0.9) for mule deer and Brewer's sparrow (see Table 15.5-21 below). The other approximately 40 acres of upland habitat are of low to intermediate quality (HSI = 0.40) for mule deer, but are fairly valuable as habitat (HSI = 0.71) for Brewer's sparrow. However, for western meadowlark and red-tailed hawk, all of the affected 165 acres of uplands are of low quality (HSI = 0.10 to 0.30).

Table 15.5-21. Impacts to Wildlife Habitat from the Southern Freeway Alternative Using Acres of Impact and Habitat Suitability Index (HSI) Values

	Wetland		Riparian		Upland		Drainage	
Species	Acres	HSI	Acres	HSI	Acres	HSI	Acres	HSI
Red-winged blackbird	8.1	0.80	9.1	0.68	*	*	*	*
	1.8	0.78	-	0.66	*	*	*	*
	1.8	0.72	0.5	0.60	*	*	*	*
Yellow-headed blackbird	1.8	0.70	-	0.70	*	*	*	*
	1.8	0.50	9.1	0.60	*	*	*	*
	8.1	0.40	0.5	0.50	*	*	*	*
Yellow warbler	*	*	0.5	0.26	*	*	*	*
	*	*	9.1	0.13	*	*	*	*
	*	*	-	0.12	*	*	*	*
Mule deer	*	*	*	*	125.4	0.90	0.9	0.54
	*	*	*	*	39.8	0.40	2.3	0.51
	*	*	*	*	*	*	0.6	0.13
Brewer's sparrow	*	*	*	*	39.8	0.71	0.9	0.76
	*	*	*	*	125.4	0.70	2.3	0.70
	*	*	*	*	*	*	0.6	0.43
Western meadowlark	*	*	*	*	125.4	0.30	2.3	0.27
	*	*	*	*	39.8	0.28	0.9	0.18
	*	*	*	*	*	*	0.6	0.14
Red-tailed hawk	*	*	*	*	165.3	0.10	2.3	0.77

* This species was not assessed for this habitat type.

The wetland habitats are found within the ecosystem impact analysis area between North Saratoga Road to a point near the southern project terminus at I-15. Two species were used to assess wetland habitat quality: red-winged blackbird and yellow-headed blackbird. All affected wetland habitat (11.7 acres) is of high quality (HSI = 0.72 to 0.80) for red-winged blackbird. However, about 10 acres of the wetland habitat are of an intermediate quality (HSI = 0.40 to 0.50) and 1.8 acres are of a high quality (HSI = 0.7) for the yellow-headed blackbird.

The riparian habitats that would be affected by this alternative are found at the Jordan River crossing about 1 mile north of Utah Lake and at Spring Creek. Three wildlife species were used to assess riparian habitat quality: red-winged blackbird, yellow-headed blackbird, and yellow warbler. All 9.6 acres of the affected riparian habitat are of intermediate quality (HSI = 0.50 to 0.68) for the two blackbird species and of low quality (HSI = 0.12 to 0.26) for the yellow warbler.

The ephemeral drainage habitat consists primarily of drainages that flow west to east and cut across the upland habitat, but also includes some partially channelized drainages that flow through agricultural land. The same four species were used to assess ephemeral drainage habitat quality as were used for the upland habitat. In general, the habitat quality of ephemeral drainages varied widely, which was reflected in the variable values for the four indicator species. About 84% of the affected ephemeral drainage habitat (3.1 acres of the 3.7 acres) is of high quality (HSI = 0.70 to 0.76) for Brewer's sparrow. For red-tailed hawk, 2.3 acres are of high quality as well, and the rest is not suitable habitat. For mule deer, 3.2 acres of ephemeral drainage habitat are of an intermediate quality (HSI = 0.51 to 0.54), and the other 0.6 acre is poor quality (HSI = 0.13). All ephemeral drainage habitat is of low quality (HSI = 0.14 to 0.27) for western meadowlark.

Wildlife Habitat Fragmentation and Roadway Mortality. The indirect impacts to wildlife under the Southern Freeway Alternative could include habitat fragmentation, barriers to wildlife movement, disturbance from increased traffic noise, and mortality from road kills. Under this alternative, one 20-acre wetland block would be split into three smaller pieces (see Table 15.5-22 below). A 740-acre wetland block along the shore of Utah Lake at the eastern end of 1900 South would have a small 10-acre piece separated from the main block.

The areas that are likely to have the greatest fragmentation from this alternative are irrigated agriculture lands. This land type was not evaluated in the HSI process because it is of limited value to wildlife. However, during the agency coordination process, representatives from USFWS said that some of this agricultural land near Utah Lake is used by wildlife. For this reason, agricultural land was incorporated into the habitat fragmentation analysis. Six large blocks of irrigated agriculture land, ranging from 285 acres to 777 acres, were identified that would be fragmented by this alternative. These areas are located between the Utah Lake wetlands and the urbanized area surrounding Lehi and to the west of the Jordan River. Although these areas are largely agricultural, a network of farm roads and rapidly developing housing developments has already begun to fragment these areas. Five of the six blocks would be fragmented into two parts, with the pieces ranging from 90 acres to 620 acres. The other 285-acre block, which is located at the terminus of the alternative where it would connect to I-15, would be fragmented into three pieces, with the smallest piece being 5 acres and the largest piece 190 acres.

In total, eight existing blocks with an average size of 557 acres would be fragmented into 18 pieces with an average size of 230 acres.

Table 15.5-22. Wildlife Habitat Fragmentation Impacts from the Utah County Alternatives

Habitat Type	Block No.	Southern Freeway		2100 North Freeway		Arterials	
		Block Acreage	Block Piece Acreage[a]	Block Acreage	Block Piece Acreage[a]	Block Acreage	Block Piece Acreage[a]
Irrigated agriculture	1			430	100 / 295	430	120 / 295
	2	645	375 / 210				
	3	740	490 / 220			740	265 / 465
	4	750	160 / 555			750	555 / 170
	5	777	115 / 620			777	120 / 630
	6	500	365 / 90			500	380 / 105
	7	285	5 / 190 / 10			285	270
Wetlands	4	740	710 / 10			740	720 / 15
	5	20	5 / 2 / 1			20	10 / 1 / 1
		Existing	**After**	**Existing**	**After**	**Existing**	**After**
Number of Blocks		8	18	1	2	8	16
Maximum / Minimum Block Size		777 / 20	710 / 1	430	295 / 100	777 / 20	720 / 1
Average Block Size		557	230	430	198	565	258

[a] The combined acreage for the block pieces might be less than the original block total because some habitat would be converted to right-of-way.

Because this area is already disturbed, the adverse effects of fragmentation caused by the alternative would be minor. However, the habitat values of the remaining fragmented habitat pieces would be further reduced due to the effects of disturbance, including noise. The exact amount of disturbance cannot be quantified because the impact depends on the affected species and the habitat type. This noise impact is described further in the next section.

The Southern Freeway Alternative would not fragment the ephemeral drainage habitats or riparian habitats. Wildlife movements could be reduced during construction due to the additional noise from and movement of construction crews and equipment. However, once the freeway is completed (which would include bridges that carry the freeway over these habitats), wildlife movements through these habitats could return to near preconstruction levels. Some wildlife migration and dispersal through these areas (such as that of mammals and birds) might not completely return to preconstruction levels because of the noise and movement of vehicles along the new, raised freeway. Roadway mortality is discussed in more detail in Section 15.5.3.1, General Impact Information.

As part of proposed improvements to Redwood Road from Bangerter Highway in Salt Lake County south to Saratoga Springs, UDOT has proposed wildlife crossings under Redwood Road. These crossings are located at about Milepost (MP) 38 and MP 36.5 (at Beef Hollow on Camp Williams). Redwood Road runs east of and parallel to the Southern Freeway Alternative, so the freeway alternative would include wildlife crossings in the same locations as those along Redwood Road as well as appropriate wildlife fencing with escape ramps.

As part of proposed improvements to Redwood Road from Bangerter Highway in Salt Lake County south to Saratoga Springs, UDOT has identified areas along SR 68 where accidents (strikes) have occurred involving vehicles and wild animals. The Southern Freeway Alternative would parallel several miles of this portion of SR 68. Wildlife strikes with vehicles traveling on the Southern Freeway Alternative are expected to be similar in magnitude to those on SR 68. The majority of the strikes with wild animals occurred around the Camp Williams area (between MP 35 and MP 40) where the gap between the foothills and the Jordan River is at its narrowest. For this 5-mile stretch, 123 wildlife strikes were reported between 2001 and 2005. Only 17 such wildlife strikes were reported for the 5-mile stretch south of Camp Williams between agricultural fields and the Jordan River.

Wildlife Noise Impacts. Noise from the Southern Freeway Alternative would increase ambient noise levels by 5 dBA to more than 15 dBA, depending on the distance from the freeway, topography, and other factors (see Chapter 13, Noise). It is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species are disturbed at even greater distances.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

The Southern Freeway Alternative is located partially within a less densely populated/developed area where constant urban-type background noises are typically lower than in urban areas to the north near central Lehi. Because of

existing lower noise levels, the Southern Freeway Alternative would have a greater increase in the noise levels near Utah Lake. This increase in noise levels could change basic behaviors of wildlife species such as the ability of wildlife species to attract mates, social cohesion, predator avoidance, prey detection, and navigation, and these changes could lead to decreases in species abundance and distribution.

During construction there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts to Wildlife. In general, the water quality impacts to wildlife from the Southern Freeway Alternative would be similar to those from the 5800 West Freeway Alternative. There is a greater potential for impacts from the Southern Freeway Alternative because this alternative crosses the Jordan River and several other creeks and is near Utah Lake.

Threatened, Endangered, and Sensitive Species. The Southern Freeway Alternative would affect 0.05 acre of known occupied habitat for the federally listed, threatened Ute ladies'-tresses. This alternative would also affect 1.48 acres of potential Ute ladies'-tresses habitat. The Southern Freeway Alternative would also cross the Jordan River, American Fork Creek, and Spring Creek, which might have habitat for the June sucker. The alternative would span these water bodies and therefore would have no direct effect on habitat loss for the June sucker. Operational stormwater runoff would be treated and detained according to applicable water quality regulations before it is discharged into waterways that could support habitat for the June sucker. In addition, appropriate measures would be implemented to ensure that the water quality of these water bodies is not affected during construction or operation of the alternative. Therefore, no effect would occur to the June sucker. See Chapter 14, Water Quality, for a discussion of the water quality impacts to the Jordan River, American Fork Creek, and Spring Creek.

Utah sensitive species listed for Utah County could be affected by the Southern Freeway Alternative (see Table 15.4-4 above). These species are the California floater, southern Bonneville pyrg, southern leatherside chub, burrowing owl, ferruginous hawk, long-billed curlew, bobolink, short-eared owl, fringed myotis, and western red bat.

Any impacts to the uplands could affect the burrowing owl, ferruginous hawk, bobolink, and short-eared owl. This habitat is common throughout this region

and much of it is disturbed, so individual birds could move to other areas to hunt if disturbed by construction or noise. Only the burrowing owl might use these uplands for nesting if there are badger or prairie dog burrows available. However, the only known burrowing owl nesting sites in the ecosystem impact analysis area are in Salt Lake County. The Southern Freeway Alternative would affect about 379 acres of irrigated farmlands and pastures, which are a secondary habitat for the long-billed curlew and primary habitat for bobolink. However, this type of habitat is common throughout the agricultural areas of northern Utah.

The Southern Freeway Alternative would affect riparian habitat along the Jordan River and Spring Creek, which could provide habitat for the western red bat and fringed myotis. Both bat species are considered rare in Utah. The amount of riparian habitat removed by this alternative, 9.6 acres, would decrease the amount of habitat for these species.

The four state-listed aquatic organisms, two snails and two fish (southern Bonneville pyrg, California floater, southern leatherside chub, and June sucker), are unlikely to be adversely affected by this alternative because best management practices would be followed during construction to avoid impacts to water quality. One of the snail species, southern Bonneville pyrg, has been recorded at only one location: Mill Pond. Although this location is connected to the impact analysis area by Spring Creek, the species has not been recorded outside of Mill Pond. In addition, the other snail species, California floater, is thought to be extirpated from its historical range in and around Utah Lake. The expected impacts to the southern leatherside chub would be the same as those for the endangered June sucker. For these reasons, state listed species of concern would not be adversely affected by the Southern Freeway Alternative.

Migratory Birds

USFWS has identified birds of conservation concern that occur in conservation regions throughout North America (USFWS 2002). The MVC project lies within Bird Conservation Region 9, the Great Basin. Constructing the Southern Freeway Alternative would probably not cause substantive, long-term effects to adult birds due to their mobility. However, if construction takes place during the avian breeding season, it could cause the destruction of bird nests, eggs, and/or young.

A wide variety of bird species could be affected by Southern Freeway Alternative construction during the breeding season. Migratory birds that could be directly affected by project construction include the ferruginous hawk, burrowing owl, short-eared owl, long-billed curlew, red-winged and yellow-headed blackbirds, sage sparrow, western meadowlark, Brewer’s sparrow, horned lark, bobolink, golden eagle, and scrub jay.

The Southern Freeway Alternative would have direct adverse impacts to 11.7 acres of wetlands habitat, 9.6 acres of riparian habitat, and 165 acres of upland habitat. Because these impacts would occur within the freeway footprint and immediately adjacent to the freeway, they would affect individual birds but not bird populations. Long-term noise effects could reduce the use of habitat near the roadway. These noise impacts would be similar to those described in the sections titled Wildlife Noise Impacts on pages 15-61 and 15-104.

Jurisdictional Wetlands

As discussed in Section 15.4.1.3, Jurisdictional Wetlands, the wetland analysis includes total wetland acreage impacts, impacts to wetland function, impacts to high-quality wetlands, and impacts to rare and irreplaceable wetlands.

Wetland Acreage Impacts. Under the Southern Freeway Alternative, there would be about 93.43 acres of primary wetland impacts and 218.24 acres of secondary wetland impacts (see Table 15.5-23 below).

Impacts to Wetland Function. The loss of wetland function due to the Southern Freeway Alternative was calculated using the acreage of impact in Table 15.5-23 below multiplied by the FCI_{Hydro} functional capacity values. This alternative would result in a direct loss of 67.83 FCU and an indirect loss of 73.84 FCU (see Table 15.5-24 below). As shown in that table, the total primary and secondary impacts to wetland functions from the Southern Freeway Alternative would be 141.67 FCU.

Table 15.5-23. Total Acres of Wetland Impact from the Utah County Alternatives

Type of Impact	WFU 1	WFU 4	WFU 6	WFU 7	WFU 24	WFU 25	LFU 1	LFU 3	LFU 5	LFU 6	LFU 8	Total (acres)
Southern Freeway Alternative												
Primary	49.19	0.01	0.00	0.00	0.00	7.59	9.45	0.95	13.16	7.73	5.35	**93.43**
Secondary	147.06	3.35	0.00	0.00	0.00	5.27	22.13	8.32	19.75	5.27	7.09	**218.24**
Total	208.83	3.45	0.00	0.00	0.00	12.86	31.58	9.27	32.91	13.00	12.44	**311.67**
2100 North Freeway Alternative												
Primary	0.00	0.00	8.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.23	**12.87**
Secondary	0.00	0.00	12.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.86	**18.84**
Total	0.00	0.00	21.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.09	**31.71**
Arterials Alternative												
Primary	35.96	0.00	3.97	0.00	0.94	0.00	6.27	2.93	1.36	0.05	4.23	**55.71**
Secondary	131.58	0.00	14.70	0.80	0.08	0.00	20.45	9.33	7.89	0.94	5.86	**191.63**
Total	170.22	0.00	18.83	0.80	1.02	0.00	26.72	12.26	9.25	0.95	10.09	**247.34**

Table 15.5-24. Wetland Impacts Measured in Lost FCUs in Utah County

Type of Impact	WFU 1	WFU 4	WFU 6	WFU 7	WFU 24	WFU 25	LFU 1	LFU 3	LFU 5	LFU 6	LFU 8	Total (FCU)
Southern Freeway Alternative												
Primary	37.78	0.01	0.00	0.00	0.00	2.30	8.04	0.60	8.63	6.35	4.12	**67.83**
Secondary	46.91	0.99	0.00	0.00	0.00	1.06	9.12	2.32	7.51	2.64	3.29	**73.84**
Total	84.69	1.00	0.00	0.00	0.00	3.36	17.16	2.92	16.14	8.99	7.41	**141.67**
2100 North Freeway Alternative												
Primary	0.00	0.00	6.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.26	**10.05**
Secondary	0.00	0.00	6.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02	**8.09**
Total	0.00	0.00	12.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.28	**18.14**
Arterials Alternative												
Primary	27.62	0.00	3.12	0.00	0.17	0.00	5.34	1.86	0.89	0.04	3.26	**42.30**
Secondary	31.71	0.00	5.03	0.00	0.01	0.00	7.34	2.73	0.77	0.08	1.68	**49.35**
Total	59.33	0.00	8.15	0.00	0.18	0.00	12.68	4.59	1.66	0.12	4.94	**91.65**

Impacts to High-Quality Wetlands. Table 15.5-25 lists the functional losses to wetland units that are considered to be high-functioning. The Southern Freeway Alternative would result in a primary loss of 45.82 FCU and a secondary loss of 56.03 FCU. The total primary and secondary impacts from this alternative to the wetland functions of high-quality wetlands would be 101.85 FCU.

Table 15.5-25. Impacts to High-Functioning Wetland Units in Utah County

Type of Impact	WFU 1	WFU 6	LFU 1	Total (FCU)
Southern Freeway Alternative				
Primary	37.78	0.00	8.04	**45.82**
Secondary	46.91	0.00	9.12	**56.03**
Total	84.69	0.00	17.16	**101.85**
2100 North Freeway Alternative				
Primary	0.00	6.79	0.00	**6.79**
Secondary	0.00	6.07	0.00	**6.07**
Total	0.00	12.86	0.00	**12.86**
Arterials Alternative				
Primary	27.62	3.12	5.34	**36.08**
Secondary	31.71	5.03	7.34	**44.08**
Total	59.33	8.15	12.68	**80.16**

Impacts to Rare and Irreplaceable Wetlands. Table 15.5-26 lists the total lost acreage of peat-forming wetlands, which are considered irreplaceable since new Peteetneet soils and their associated wetlands develop very slowly. Under this alternative, there would be about 2.56 acres of primary impacts to Peteetneet soils and 9.87 acres of secondary impacts. The total primary and secondary impacts would be 12.43 acres of Peteetneet soil impacts.

Table 15.5-26. Impacts to Peteetneet Soils in Utah County (acres)

Alternative	Primary Impacts	Secondary Impacts	Total
Southern Freeway	2.56	9.87	**12.43**
2100 North Freeway	0.00	0.00	**0.00**
Arterials	1.46	3.99	**5.45**

Impacts to Linear Aquatic Features. These waters include linear aquatic features such as canals and ditches, ephemeral washes, and riparian areas. Since the functional assessment model was not designed to evaluate the condition of these linear features, the impacts were determined by measuring the length of the linear features within the right-of-way footprint. The Southern Freeway Alternative would affect about 74 feet of canal, 3,392 feet of ephemeral washes, and 12,343 feet of riparian area (see Table 15.5-27).

Table 15.5-27. Impacts to Linear Aquatic Features in Utah County (feet)

Alternative	Canal	Ephemeral Wash	Riparian	Total
Southern Freeway	74	3,392	12,343	**15,809**
2100 North Freeway	0	3,154	7,506	**10,660**
Arterials	204	3,434	12,033	**15,671**

Southern Freeway Alternative with Tolling Option

Under the Southern Freeway Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative. Therefore, the impacts to ecosystem resources would be the same as those from the Southern Freeway Alternative. However, with slightly less traffic on the MVC, there would be less risk of wildlife strikes on the freeway as well as a slight reduction in adverse impacts caused by traffic noise.

Summary of Ecosystem Impacts from the Southern Freeway Alternative

The Southern Freeway Alternative would adversely affect about 11.7 acres of high-quality wetland habitat and more than 9.6 acres of moderate- to high-quality riparian habitat for red-winged blackbird. It also would adversely affect more than 125 acres of high-quality upland habitat for mule deer and Brewer's sparrow. About 3 acres of ephemeral drainage habitat of high quality for Brewer's sparrow would also be affected. Table 15.5-28 below summarizes the wildlife HSV impacts for the Southern Freeway Alternative and the Tolling Option.

Wildlife habitat fragmentation caused by the Southern Freeway Alternative would increase the number of small habitat blocks. Roadway mortality would increase as a result of construction and operation of the MVC, although the exact amount cannot be quantified. Higher noise levels would further indirectly adversely affect wildlife. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species are disturbed at even

greater distances. This alternative would affect somewhat-disturbed wildlife habitat, and the impacts would occur at the eastern edge of habitats that extend far to the west outside the ecosystem impact analysis area.

Table 15.5-28. Impacts from the Southern Freeway Alternative and Tolling Option on Habitat Suitability Values

Species	Freeway Only (No Tolling Option)				Freeway with Tolling Option			
	Wet	Rip	Upl	Dra	Wet	Rip	Upl	Dra
Red-winged blackbird	9	6.5			9	6.5		
Yellow-headed blackbird	5	6			5	6		
Yellow warbler		1				1		
Mule deer			129	2			129	2
Brewer's sparrow			116	2.5			116	2.5
Western meadowlark			49	1			49	1
Red-tailed hawk			16.5	2			16.5	2

Wet = Wetlands, Rip = Riparian Areas, Upl = Uplands, Dra = Drainages
HSV = HSI × Acres Affected

The Southern Freeway Alternative would affect 0.05 acre of known occupied habitat for the federally listed, threatened Ute ladies'-tresses and 1.48 acres of potential Ute ladies'-tresses habitat. The Southern Freeway Alternative would not adversely affect state listed species of concern.

Table 15.5-29 summarizes the jurisdictional wetland impacts for the various analytical methods used. The Southern Freeway Alternative would adversely affect 311.67 acres of jurisdictional wetlands (primary and secondary impacts combined), including 12.43 acres of irreplaceable wetlands (Peteetneet soils). In addition, it would result in the loss of 141.67 wetland FCU, including 101.85 FCU of high-functioning wetlands. The Southern Freeway Alternative would also affect 15,809 linear feet of linear aquatic features.

Table 15.5-29. Summary of Wetland Impacts in Utah County

Alternative	Total Primary Impacts (acres)	Total Secondary Impacts (acres)	Impacts to Wetland Function (FCU)	Impacts to High-Functioning Wetlands (FCU)	Impacts to Peteetneet Soils (acres)
Southern Freeway	93.43	218.24	141.67	101.85	12.43
2100 North Freeway	12.87	18.84	18.41	12.86	0.00
Arterials Alternative	55.71	191.63	91.65	80.16	5.45

Chart 15-4 and Chart 15-5 are graphical representations of the summary findings in Table 15.5-29 above.

Chart 15-4. Summary of Wetland Impacts (acres) – Utah County Alternatives

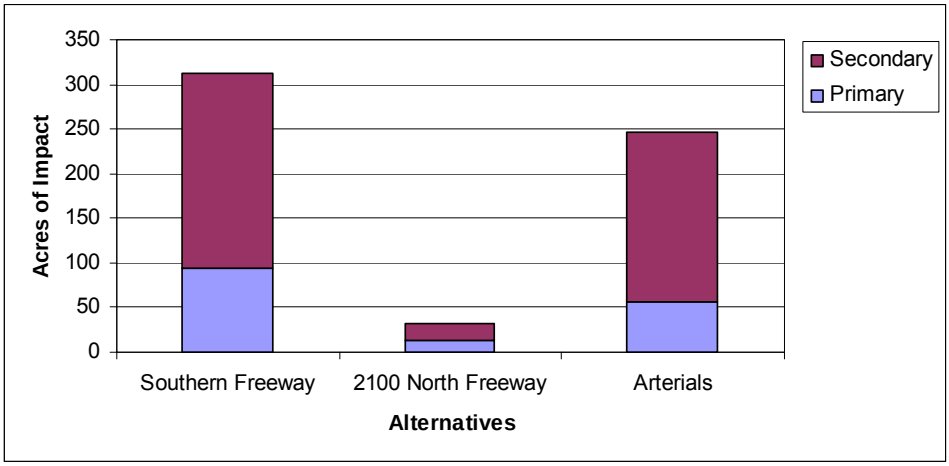
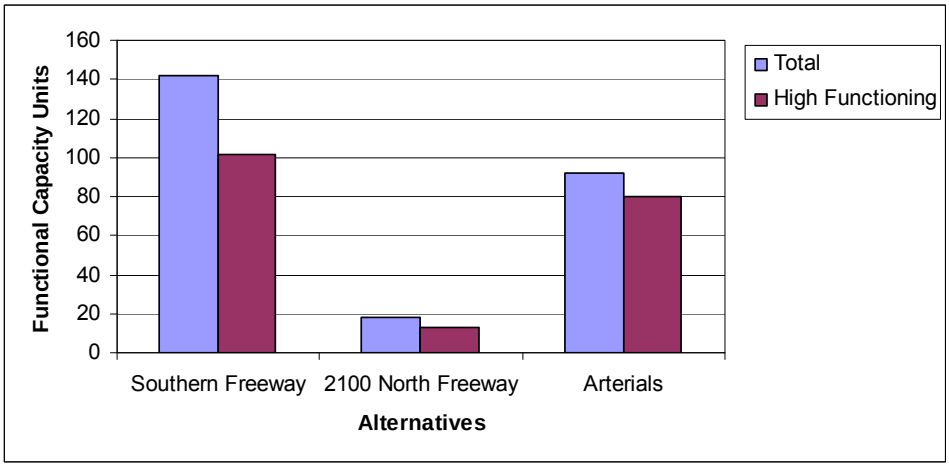


Chart 15-5. Summary of Wetland Impacts (Functional Units) – Utah County Alternatives



15.5.4.2 2100 North Freeway Alternative

As described in Chapter 2, Alternatives, this alternative would consist of a freeway extending from the Utah County line to SR 73 in Saratoga Springs and a lateral freeway extending east along 2100 North to I-15 in Lehi.

Wildlife

This alternative would result in the loss and alteration of wildlife habitat. Direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, habitat fragmentation, and incidental mortality of resident wildlife.

Habitat Loss (HSI Analysis). The 2100 North Freeway Alternative would adversely affect three wildlife habitat types: riparian habitat, uplands, and ephemeral drainages. No wetland habitat would be affected by this alternative. This alternative would adversely affect 167 acres of upland habitat, 7 acres of riparian habitat, and 3.3 acres of ephemeral drainages (see Table 15.5-30 below).

The upland habitat areas that would be affected by the 2100 North Freeway Alternative extend from the Salt Lake County–Utah County line to just north of 2100 North. This habitat is within the foothills and rolling dry croplands on the east side of the Oquirrh Mountains. Four wildlife species were used to assess upland habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. About 77% (about 128 acres out of 167 acres) of the affected upland habitat is of high quality (HSI = 0.7 to 0.9) for mule deer and Brewer's sparrow. The other approximately 39 acres of upland habitat are of low to intermediate quality (HSI = 0.4) for mule deer, but are fairly valuable as habitat (HSI = 0.71) for Brewer's sparrow. However, for the western meadowlark and red-tailed hawk, all of the affected 167 acres of uplands are of low quality (HSI = 0.1 to 0.3).

The ephemeral drainage habitat consists primarily of drainages that flow west to east and cut across the upland habitat, but also includes some partially channelized drainages that flow through agricultural land. The same four species were used to assess ephemeral drainage habitat quality as were used for the upland habitat. In general, the quality of ephemeral drainages varied widely, which was reflected in the variable habitat values for the four indicator species. About 89% of the affected drainage habitat (3 acres of the 3.4 acres) is of high quality (HSI = 0.70 to 0.77) for Brewer's sparrow, although the rest is of an intermediate quality (HSI = 0.43). For the red-tailed hawk, 2.4 acres of the drainage habitat is of high quality (HSI = 0.77), and the remaining acreage is not considered habitat for the red-tailed hawk (HSI = 0). For the mule deer, 3 acres

of ephemeral drainage habitat are of intermediate quality (HSI = 0.51 to 0.54), and about 0.4 acre is of poor quality (HSI = 0.13). All of the drainage habitat is of low quality (HSI = 0.14 to 0.27) for the western meadowlark.

The riparian habitats that would be affected by this alternative are found in one location at the Jordan River crossing northwest of Lehi. Three wildlife species were used to assess riparian habitat quality: red-winged blackbird, yellow-headed blackbird, and yellow warbler. All 7 acres of the affected riparian habitat are of intermediate quality (HSI = 0.5 to 0.6) for the two blackbird species and of low quality (HSI = 0.26) for the yellow warbler.

Table 15.5-30. Impacts to Wildlife Habitat from the 2100 North Freeway Alternative Using Acres of Impact and Habitat Suitability Index (HSI) Values

	Riparian		Upland		Drainage	
Species	Acres	HSI	Acres	HSI	Acres	HSI
Red-winged blackbird	7	0.60	*	*	*	*
Yellow-headed blackbird	7	0.50	*	*	*	*
Yellow warbler	7	0.26	*	*	*	*
Mule deer	*	*	127.8	0.90	0.6	0.54
	*	*	39.3	0.40	2.4	0.51
	*	*	*	*	0.4	0.13
Brewer's sparrow	*	*	127.8	0.71	0.6	0.76
	*	*	39.3	0.70	2.4	0.70
	*	*	*	*	0.4	0.43
Western meadowlark	*	*	127.8	0.30	2.4	0.27
	*	*	39.3	0.28	0.6	0.18
	*	*	*	*	0.4	0.14
Red-tailed hawk	*	*	167.1	0.10	2.4	0.77

* This species was not assessed for this habitat type.

Wildlife Habitat Fragmentation and Roadway Mortality. The indirect impacts to wildlife under the 2100 North Freeway Alternative could include habitat fragmentation, barriers to wildlife movement, disturbance from increased traffic noise, and mortality from road kills. This alternative would fragment one block of irrigated agriculture land and no wetlands. The one irrigated agriculture block would be fragmented into two pieces (295 acres and 100 acres). The habitat values of the fragmented habitat pieces would be further reduced due to the effects of disturbance, including noise. This impact is described in the next section. Such impacts would cause an overall reduction in habitat block size, an increase in the perimeter-to-area ratio of blocks and associated edge effects,

reduced connectivity between habitat blocks, and an introduction of barriers to dispersal for some species. Roadway mortality is discussed in more detail in Section 15.5.3.1, General Impact Information.

The potential wildlife crossings would be the same as those for the Southern Freeway Alternative where the alignments are the same through Camp Williams.

Wildlife Noise Impacts. Noise impacts to wildlife from the 2100 North Freeway Alternative would be similar to those from the Southern Freeway Alternative except that the 2100 North Freeway Alternative would have fewer impacts to wildlife because of the shorter length of the alternative and the lack of wetland impacts. However, parts of the east-west portion of this alternative, between Redwood Road and the Jordan River, cross areas with low human population and road density and a very open terrain. Therefore, operation of the MVC in these areas would result in a large increase in noise levels (at least 10 dBA to 15 dBA). It is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species experience disturbance at even greater distances.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

Because of existing lower-than-ambient noise levels and in combination with the proposed action, the 2100 North Freeway Alternative would increase ambient noise levels, with the result that either species that use currently use this part of the ecosystem impact analysis area would move to areas with lower noise levels or the abundance and distribution of species would decrease locally as a result of increased noise levels.

During construction there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts to Wildlife. In general, the water quality impacts to wildlife from the 2100 North Freeway Alternative would be similar to those from the 5800 West Freeway Alternative. However, the 2100 North Freeway Alternative would cross the Jordan River, which could increase the potential for runoff.

Threatened, Endangered, and Sensitive Species

No federally listed threatened or endangered species have been identified within or adjacent to the right-of-way for the 2100 North Freeway Alternative. Therefore, this alternative would not affect federally listed threatened, endangered, or candidate species.

Utah sensitive species listed for Utah County that could be affected by the 2100 North Freeway Alternative include burrowing owl, ferruginous hawk, long-billed curlew, bobolink, short-eared owl, fringed myotis, and western red bat. The impacts to these species would be the same as the impacts from the Southern Freeway Alternative. This alternative would affect about 138 acres of irrigated agriculture land, which is a secondary habitat for the long-billed curlew and a primary habitat for the bobolink.

Migratory Birds

The impacts to migratory birds from the 2100 North Freeway Alternative would be similar to those from the Southern Freeway Alternative, although the impacts would be somewhat lower because there would be no direct impacts to the Utah Lake wetlands. In general, the shorter length of this alternative would also reduce impacts to migratory birds.

A golden eagle nest is located about 2.3 miles from the nearest part of the 2100 North Freeway Alternative. Across Jordan River from the golden eagle nest is an active mining operation that operates during the day. In addition, operational buildings for the Jordan Narrows Dam are north of the nest. The golden eagle pair has successfully nested and raised young in this location with the constant daytime background noise from the gravel mining pit and dam operations.

According to USFWS, eagles are unlikely to be disturbed by routine use of roads, homes, and other facilities if such use predates the eagles' successful nesting in a given area. Therefore, in most cases, ongoing existing uses can continue with the same noise levels with little risk of disturbing eagles (USFWS 2007).

To avoid disturbing nesting eagles, USFWS recommends keeping distances between the activity and the nest, maintaining landscaped buffers, and avoiding certain activities during the breeding season (USFWS 2007). The buffer areas

minimize visual and auditory impacts associated with activities near nest sites. USFWS classifies projects according to eight categories designated A to H. The MVC project would be classified as a Category A project, which includes construction of roads. Because the golden eagle nest is about 2.3 miles from the 2100 North Freeway Alternative, the golden eagle pair should not be affected by increases in noise levels or visible human activities during construction and operation of the alternative.

Jurisdictional Wetlands

As discussed in Section 15.4.1.3, Jurisdictional Wetlands, the wetland analysis includes total wetland acreage impacts, impacts to wetland function, impacts to high-quality wetlands, and impacts to rare and irreplaceable wetlands.

Wetland Acreage Impacts. Under the 2100 North Freeway Alternative, there would be about 12.87 acres of primary wetland impacts and 18.84 acres of secondary wetland impacts (see Table 15.5-23 above).

Impacts to Wetland Function. The loss of wetland function due to the 2100 North Freeway Alternative was calculated using the acreage of impact in Table 15.5-23 above multiplied by the FCI_{Hydro} functional assessment values. This alternative would result in a direct loss of 10.05 FCU and an indirect loss of 8.09 FCU (see Table 15.5-24 above). The total primary and secondary impacts to wetland functions from this alternative would be 18.14 FCU.

Impacts to High-Quality Wetlands. Table 15.5-25 above lists the functional losses to wetland units that are considered to be high functioning. The 2100 North Freeway Alternative would result in a direct loss of 6.79 FCU and an indirect loss of 6.07 FCU. The total primary and secondary impacts from this alternative to the wetland functions of high-functioning wetlands would be 12.86 FCU.

Impacts to Rare and Irreplaceable Wetlands. As shown in Table 15.5-26 above, this alternative would not affect any rare or irreplaceable wetlands.

Linear Aquatic Features. These waters include linear aquatic features such as canals and ditches, ephemeral washes, and riparian areas. Since the functional assessment model was not designed to evaluate the condition of these linear features, the impacts were determined by measuring the length of the linear features within the right-of-way footprint. The 2100 North Freeway Alternative would affect 3,154 feet of ephemeral washes and 7,506 feet of riparian area (see Table 15.5-27 above).

2100 North Freeway Alternative with Tolling Option

Under the 2100 North Freeway with Tolling Option, the overall facility design would not change compared to the non-tolled alternative. Therefore, the impacts to ecosystem resources would be the same as those from the 2100 North Freeway Alternative. However, with slightly less traffic on the MVC, there would be less risk of wildlife strikes on the freeway as well as a slight reduction in adverse impacts caused by traffic noise.

Summary of Ecosystem Impacts from the 2100 North Freeway Alternative

The 2100 North Freeway Alternative would adversely affect about 7 acres of intermediate-quality riparian habitat for red-winged and yellow-headed blackbirds. It also would adversely affect more than 128 acres of high-quality upland habitat for mule deer and 167 acres of high-quality habitat for Brewer's sparrow. About 2.4 acres of ephemeral drainage habitat of high quality for the red-tailed hawk and 3 acres of ephemeral drainage habitat of high quality for Brewer's sparrow would also be adversely affected. Table 15.5-31 summarizes the wildlife HSV impacts for the 2100 North Freeway Alternative and the Tolling Option.

Table 15.5-31. Impacts from the 2100 North Freeway Alternative and Tolling Option on Habitat Suitability Values

	Freeway Only (No Tolling Option)			Freeway with Tolling Option		
Species	Rip	Upl	Dra	Rip	Upl	Dra
Red-winged blackbird	4			4		
Yellow-headed blackbird	3.5			3.5		
Yellow warbler	2			2		
Mule deer		131	2		131	2
Brewer's sparrow		117	2		117	2
Western meadowlark		49	1		49	1
Red-tailed hawk		17	2		17	2

Rip = Riparian, Upl = Uplands, Dra = Drainages
HSV = HSI × acres affected

The 2100 North Freeway Alternative would fragment one large block of irrigated agriculture land. Roadway mortality would increase as a result of construction and operation of the MVC. There would be adverse impacts from higher noise levels, although it is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the

affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the freeway, depending on the species. Certain sensitive species are disturbed at even greater distances.

The 2100 North Freeway Alternative would not affect federally listed threatened, endangered, or candidate species or state listed species of concern.

Table 15.5-29 above summarizes the jurisdictional wetland impacts for the various analytical methods used. The 2100 North Freeway Alternative would adversely affect 31.71 acres of jurisdictional wetlands (primary and secondary impacts combined), but there would be no impacts to irreplaceable wetlands. In addition, it would result in the loss of 18.14 wetland FCU, including 12.86 FCU of high-functioning wetlands. The 2100 North Freeway Alternative would also affect 10,660 linear feet of linear aquatic features.

15.5.4.3 Arterials Alternative

As described in Chapter 2, Alternatives, this alternative would consist of a series of arterial roadways throughout northern Utah County. The combination of arterials includes a freeway segment from the Utah County line to SR 73 and arterial roadways at Porter Rockwell Boulevard, 2100 North, and 1900 South.

Wildlife

This alternative would result in the loss and alteration of wildlife habitat. Direct impacts could include the loss of food sources and cover, temporary and/or permanent displacement, habitat fragmentation, and incidental mortality of resident wildlife.

Habitat Loss (HSI Analysis). The Arterials Alternative would adversely affect four wildlife habitat types: wetlands, riparian habitat, uplands, and ephemeral drainages. This alternative would have the greatest impact to upland habitat (189.7 acres), followed by riparian areas (14.7 acres), wetlands (11.5 acres), and ephemeral drainages (3.6 acres) (see Table 15.5-32 below).

The wetland habitats are found within the ecosystem impact analysis area between North Saratoga Road and a point near the southern terminus at I-15. Two species were used to assess wetland habitat quality: the red-winged blackbird and the yellow-headed blackbird. All affected wetland habitat (11.5 acres) is of high quality (HSI = 0.72 to 0.80) for the red-winged blackbird. Most of the wetland habitat (10.2 acres) is of an intermediate quality (HSI = 0.40 to 0.50) for the yellow-headed blackbird, with the exception of 1.3 acres that are of high value (HSI = 0.70) for this species.

Table 15.5-32. Impacts to Wildlife Habitat from the Arterials Alternative Using Acres of Impact and Habitat Suitability Index (HSI) Values

	Wetland		Riparian		Upland		Drainage	
Species	Acres	HSI	Acres	HSI	Acres	HSI	Acres	HSI
Red-winged blackbird	3.6	0.80	6.6	0.68	*	*	*	*
	1.3	0.78	-	0.66	*	*	*	*
	6.6	0.72	8.1	0.60	*	*	*	*
Yellow-headed blackbird	1.3	0.70	-	0.70	*	*	*	*
	6.6	0.50	6.6	0.60	*	*	*	*
	3.6	0.40	8.1	0.50	*	*	*	*
Yellow warbler	*	*	8.1	0.26	*	*	*	*
	*	*	6.6	0.13	*	*	*	*
	*	*	-	0.12	*	*	*	*
Mule deer	*	*	*	*	135.4	0.90	0.6	0.54
	*	*	*	*	54.3	0.40	2.3	0.51
	*	*	*	*	*	*	0.7	0.13
Brewer's sparrow	*	*	*	*	54.3	0.71	0.6	0.76
	*	*	*	*	135.4	0.70	2.3	0.70
	*	*	*	*	*	*	0.7	0.43
Western meadowlark	*	*	*	*	135.4	0.30	0.6	0.27
	*	*	*	*	54.3	0.28	2.3	0.18
	*	*	*	*	*	*	0.7	0.14
Red-tailed hawk	*	*	*	*	189.7	0.10	2.3	0.77

* This species was not assessed for this habitat type.

The riparian habitats that would be affected by this alternative are found in four locations: at three Jordan River crossings from the southern part of Salt Lake County south to just north of Utah Lake, and at Spring Creek. Three wildlife species were used to assess riparian habitat quality: red-winged blackbird, yellow-headed blackbird, and yellow warbler. All 14.7 acres of the riparian habitat affected are of intermediate quality (HSI = 0.50 to 0.68) for the two blackbird species and of low quality (HSI = 0.13 to 0.26) for the yellow warbler.

The upland habitat is located along stretches of the alternative starting at the Salt Lake County–Utah County line and extending south to about 2100 North, and also near the southern project terminus. This habitat is primarily within the foothills and rolling dry croplands on the east side of the Oquirrh Mountains. Four wildlife species were used to assess upland habitat quality: mule deer, Brewer's sparrow, western meadowlark, and red-tailed hawk. About 71% (about 135 acres out of 190 acres) of upland habitat affected is of high quality (HSI = 0.7 to 0.9) for mule deer and Brewer's sparrow. The other approximately 54 acres of upland habitat are of low to intermediate quality (HSI = 0.4) for mule

deer, but are still valuable as habitat (HSI = 0.71) for the Brewer's sparrow. However, for western meadowlark and red-tailed hawk, all of the affected 190 acres of uplands are of low quality (HSI = 0.1 to 0.3).

The ephemeral drainage habitat consists primarily of drainages that flow west to east and cut across the upland habitat, but includes partially channelized drainages that flow through agricultural land. The same four species were used to assess ephemeral drainage habitat quality as were used for the upland habitat. In general, the habitat quality of ephemeral drainages varied widely, which was reflected in the variable values for the four indicator species. About 80% of the affected drainage habitat (2.9 acres of the 3.6 acres) is of high quality (HSI = 0.70 to 0.77) for Brewer's sparrow, with the remaining 0.7 acre of intermediate quality (HSI = 0.43). For the red-tailed hawk, 2.3 acres of ephemeral drainage habitat are of high quality, with the remainder being not suitable (HSI = 0). For the mule deer, 2.9 acres of drainage habitat are of an intermediate quality (HSI = 0.51 to 0.54), with 0.7 acre being of poor quality (HSI = 0.13). All of the drainage habitat is of low quality (HSI = 0.14 to 0.27) for the western meadowlark.

Wildlife Habitat Fragmentation and Roadway Mortality. The indirect impacts to wildlife under the Arterials Alternative could include habitat fragmentation, barriers to wildlife movement, disturbance from increased traffic noise, and mortality from road kills. These indirect impacts would be similar to those from the Southern Freeway Alternative. This alternative would fragment six blocks of irrigated agriculture land into 11 pieces. The existing irrigated agriculture block sizes range from 430 acres to 777 acres, with the pieces ranging from 105 acres to 630 acres. The Arterials Alternative would fragment two wetland blocks into five smaller pieces, similar to the Southern Freeway Alternatives. In total, eight existing blocks with an average size of 565 acres would be fragmented into 16 pieces with an average size of 258 acres. This alternative would have a slightly narrower roadway width than the Southern Freeway Alternative and lower traffic speeds, which could result in less wildlife mortality and habitat fragmentation compared to that alternative. Roadway mortality is discussed in more detail in Section 15.5.3.1, General Impact Information.

The potential wildlife crossings would be the same as those for the Southern Freeway Alternative where the alignment is the same as the Arterials Alternative through Camp Williams.

Wildlife Noise Impacts. Noise impacts to wildlife from the Arterials Alternative would be similar to those from the Southern Freeway Alternative because the two alternatives share many of the same segments. Even though the Arterials Alternative would consist of a narrower roadway than the Southern Freeway

Alternative, any noise differences between the two would have similar impacts to wildlife. It is not known exactly how the roadway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the roadway, depending on the species. Certain sensitive species are disturbed at even greater distances.

Such impacts from increases in noise levels could cause an overall reduction in habitat block size, reduce connectivity between habitat blocks, and introduce barriers to dispersal for some species. The reduced habitat block size could decrease the habitat resources available to wildlife, which in turn would reduce the local carrying capacity. These changes could reduce the ecological buffering capacity of the blocks and thus affect wildlife (listed, sensitive, non-listed, and migratory species).

Because of existing lower-than-ambient noise levels and in combination with the proposed action, the Arterials Alternative would increase ambient noise levels, with the result that either species that use currently use this part of the ecosystem impact analysis area would move to areas with lower noise levels or the abundance and distribution of species would decrease locally as a result of increased noise levels.

During construction, there would be temporary short-term increases in ambient noise levels from construction activities. Construction noise would result from pile driving or drilled shaft construction (proofing or vibrating) into bedrock substrate for construction of bridges, noise associated with construction activities (for example, clearing, grading, excavation, and shaft drilling), and noise associated with construction equipment moving to and from the project site.

Water Quality Impacts to Wildlife. In general, the water quality impacts to wildlife from the Arterials Alternative would be similar to those from the 5800 West Freeway Alternative. However, there is a greater potential for impacts from the Arterials Alternative because the alternative crosses the Jordan River and several other creeks and is near Utah Lake.

Threatened, Endangered, and Sensitive Species

The Arterials Alternative would not affect known federally listed occupied habitat for the threatened Ute ladies'-tresses, although it could affect 0.03 acre of the surrounding potential habitat for Ute ladies'-tresses. The impacts to the endangered June sucker and Utah sensitive species would very similar to those from the Southern Freeway Alternative, except that the Arterials Alternative

would affect less irrigated agriculture land; this land type is a secondary habitat for the long-billed curlew and is a primary habitat for the bobolink.

Migratory Birds

The impacts to migratory birds from the Arterials Alternative would be similar to those from the Southern Freeway Alternative, although these impacts would be somewhat lower because of the slightly narrower roadway width and slightly lower traffic speeds. The noise impacts to nesting migratory birds would be similar to those from the Southern Freeway Alternative. The impacts to the golden eagle nest at the Jordan River Narrows would be the same as those from the 2100 North Freeway Alternative.

Jurisdictional Wetlands

As discussed in Section 15.4.1.3, Jurisdictional Wetlands, the wetland analysis includes total wetland acreage impacts, impacts to wetland function, impacts to high-quality wetlands, and impacts to rare and irreplaceable wetlands.

Wetland Acreage Impacts. Under the Arterials Alternative, there would be about 55.71 acres of primary impacts to wetlands and 191.63 acres of secondary impacts (see Table 15.5-23 above).

Impacts to Wetland Function. The loss of wetland function was calculated using the acreage of impact in Table 15.5-23 above multiplied by the FCI_{Hydro} functional assessment values. The Arterials Alternative would result in a primary loss of 42.30 FCU and a secondary loss of 49.35 FCU (see Table 15.5-24 above). The total primary and secondary impacts to wetland functions from this alternative would be 91.65 FCU.

Impacts to High-Quality Wetlands. Table 15.5-25 above lists the functional losses to wetland units that are considered to be high-functioning. The Arterials Alternative would result in a primary loss of 36.08 FCU and a secondary loss of 44.08 FCU. The total primary and secondary impacts from this alternative to the wetland functions of high-functioning wetlands would be 80.16 FCU.

Impacts to Rare and Irreplaceable Wetlands. Table 15.5-26 above presents the total lost acreage of peat-forming wetlands, which are considered irreplaceable since new Peteetneet soils and their associated wetlands develop very slowly. Under this alternative, there would be about 1.46 acres of primary impacts to Peteetneet soils and 3.99 acres of secondary impacts. The total primary and secondary impacts to Peteetneet soils would be 5.45 acres.

Linear Aquatic Features. These waters include linear aquatic features such as canals and ditches, ephemeral washes, and riparian areas. Since the functional

assessment model was not designed to evaluate the condition of these linear features, the impacts were determined by measuring the length of linear features within the right-of-way footprint. The Arterials Alternative would affect 204 feet of irrigation canals and ditches, 3,434 feet of ephemeral washes, and 12,033 feet of riparian area (see Table 15.5-27 above).

Arterials Alternative with Tolling Option

Under the Arterials Alternative with Tolling Option, the overall facility design would not change compared to the non-tolled alternative. Therefore, the impacts to ecosystem resources would be the same as those from the Arterials Alternative. However, with slightly less traffic on the MVC, there would be less risk of wildlife strikes on the roadway as well as a slight reduction in adverse impacts caused by traffic noise.

Summary of Ecosystem Impacts from the Arterials Alternative

The Arterials Alternative would adversely affect about 14.7 acres of high-quality riparian habitat for red-winged blackbird, and about 6.6 acres of high-quality riparian habitat for yellow-headed blackbird. It also would adversely affect more than 135.4 acres of high-quality upland habitat for mule deer and 189.7 acres of high-quality upland habitat for Brewer's sparrow. About 2.3 acres of ephemeral drainage habitat of high quality for the red-tailed hawk and 2.9 acres of ephemeral drainage habitat of high quality for Brewer's sparrow also would be affected. Table 15.5-33 below summarizes the wildlife HSV impacts for the Arterials Alternative and the Tolling Option.

Table 15.5-33. Impacts from the Arterials Alternative and Tolling Option on Habitat Suitability Values

	Arterials Alternative Only (No Tolling Option)				Arterials Alternative with Tolling Option			
Species	Wet	Rip	Upl	Dra	Wet	Rip	Upl	Dra
Red-winged blackbird	9	9			9	9		
Yellow-headed blackbird	6	8			6	8		
Yellow warbler		3				3		
Mule deer			144	2			144	2
Brewer's sparrow			133	2			133	2
Western meadowlark			56	1			56	1
Red-tailed hawk			19	2			19	2

Wet = Wetlands, Rip = Riparian Areas, Upl = Uplands, Dra = Drainages
HSV = HSI × acres affected

The Arterials Alternative would fragment eight habitat blocks with an average size of 565 acres into 16 pieces with an average size of 258 acres. Impacts from higher noise levels would occur as well. The habitat fragmentation could cause barriers to wildlife movement, disturbance from increased traffic noise, and mortality from road kills. It is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the roadway, depending on the species. Certain sensitive species are disturbed at even greater distances.

The Arterials Alternative would not affect any known federally listed threatened, endangered, or candidate species' habitat, but could affect a small amount (0.03 acre) of potential habitat for the threatened Ute ladies'-tresses. The Arterials Alternative would not adversely affect any state listed species of concern.

Table 15.5-29 above summarizes the jurisdictional wetland impacts for the various analytical methods used. The Arterials Alternative would adversely affect 247.34 acres of jurisdictional wetlands (primary and secondary impacts combined), including 5.45 acres of impacts to irreplaceable wetlands. In addition, it would adversely affect 91.65 wetland FCU, including 80.16 FCU of high-functioning wetlands. The Arterials Alternative also would affect 15,671 linear feet of linear aquatic features.

15.5.4.4 Comparison of Ecosystem Impacts from the Utah County Alternatives

The Arterials Alternative would have a greater adverse impact to the functional values of wetland habitat than would the other two Utah County alternatives. The Arterials Alternative would also have slightly higher impacts to the functional values of riparian habitat than would the other two alternatives. It also would have greater adverse impacts to high-quality upland habitat for mule deer, Brewer's sparrow, red-tailed hawk, and meadowlark than would the other two alternatives (see Table 15.5-34 and Chart 15-6 below).

Table 15.5-34. Summary of Impacts to Habitat Suitability Values from the Utah County Alternatives

	Southern Freeway[a]				2100 North Freeway[a]				Arterials[a]			
Species	**Wet**	**Rip**	**Upl**	**Dra**	**Wet**	**Rip**	**Upl**	**Dra**	**Wet**	**Rip**	**Upl**	**Dra**
Red-winged blackbird	**9**	6.5			*	4			**9**	**9**		
Yellow-headed blackbird	5	6			*	3.5			**6**	**8**		
Yellow warbler		1				2				**3**		
Mule deer			129	2			131	2			**144**	2
Brewer's sparrow			116	2			117	2			**130**	2
Western meadowlark			49	1			49	1			**56**	1
Red-tailed hawk			16.5	2			17	2			**19**	2

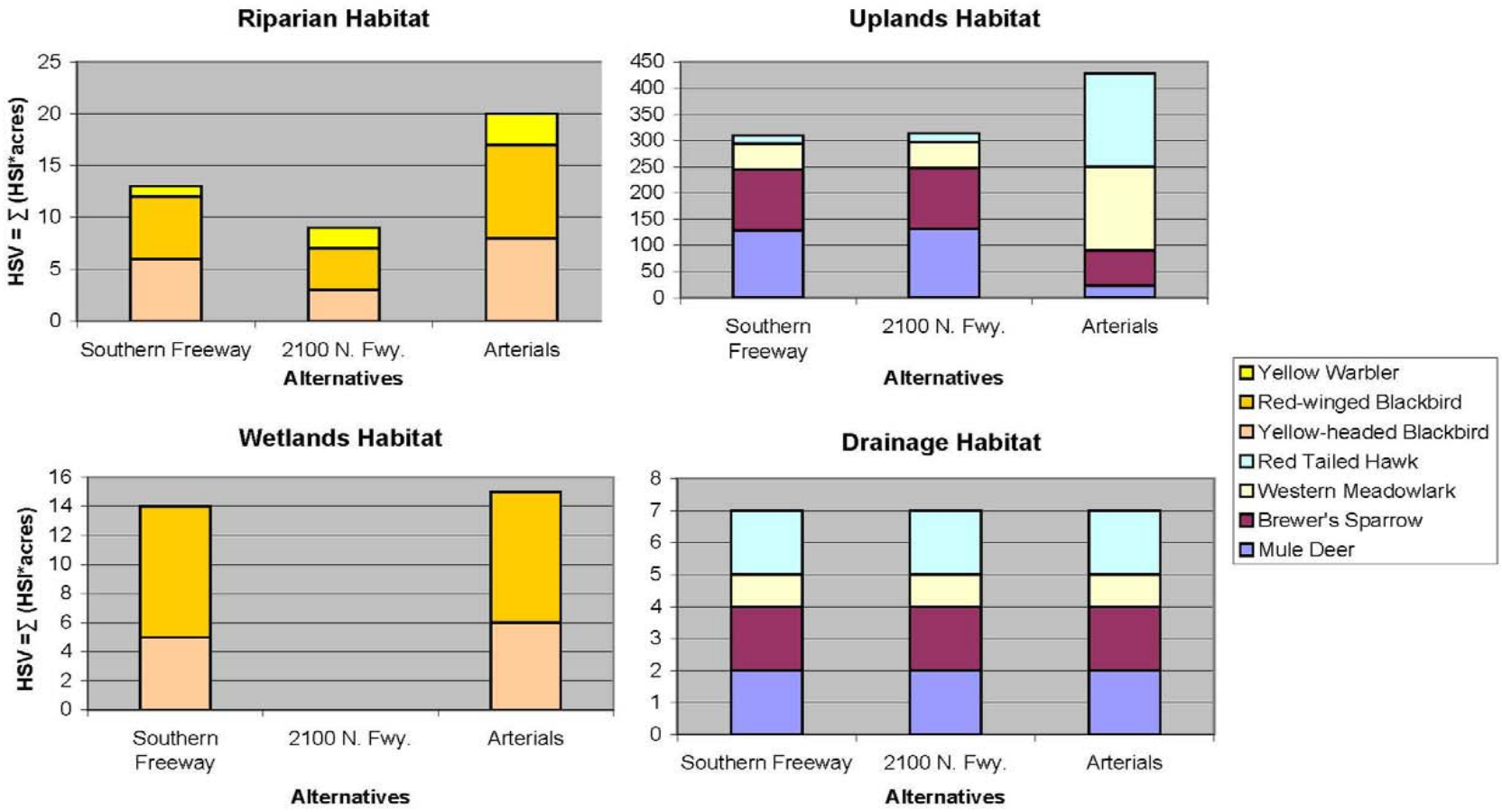
Bold indicates highest values by alternative.

Wet = Wetlands, Rip = Riparian Areas, Upl = Uplands, Dra = Drainages

[a] Units are in Habitat Suitability Values (HSV = HSI × Acres Affected).

* No wetlands wildlife habitat would be affected by this alternative.

Chart 15-6. Comparison of Habitat Suitability Values for the Utah County Alternatives



The 2100 North Freeway Alternative would have the least impacts on habitat fragmentation and roadway mortality, while the other two alternatives would have impacts that are similar to each other's. Similarly, the 2100 North Freeway Alternative would cause the fewest barriers to movement as well as the least disturbance from increased traffic noise and mortality from road kills. It is not known exactly how highway noise would affect the local density and reproductive capacity of individual species that currently use habitats in the impact analysis area. Highly noise-sensitive species might leave the affected areas, while others could have less reproductive success. The distance at which highway noise could affect bird species extends from less than 125 feet to much greater than 3,500 feet from the roadway, depending on the species. Certain sensitive species are disturbed at even greater distances.

The Southern Freeway Alternative would adversely affect one known location of the federally listed, threatened Ute ladies'-tresses, as well as potential habitat for this species. The Arterials Alternative would not adversely affect the one known Ute ladies'-tresses population in the ecosystem impact analysis area, but would adversely affect a small amount of its potential habitat. The 2100 North Freeway Alternative would not affect any population or habitat of a federally listed species. None of the alternatives would adversely affect any state listed species of concern.

Of the three Utah County alternatives, the Southern Freeway Alternative would adversely affect the greatest acreage of wetlands, wetland FCU, high-functioning wetlands FCU, irreplaceable wetlands, and linear aquatic features with the 2100 North Freeway Alternative affecting the least amount of these resources.

15.5.5 Mitigation Measures

15.5.5.1 Wildlife and Wildlife Habitat

Wildlife Crossings

As part of improvements to Redwood Road from Bangerter Highway in Salt Lake County south to Saratoga Springs, UDOT has proposed wildlife crossings. Redwood Road parallels the MVC alternatives and therefore the MVC project would include wildlife crossings in the same locations as the Redwood Road project. The crossings include one north of Camp Williams at MP 38 and two on Camp Williams (MP 36.5 and MP 35.4). The proposed crossing location at MP 36.5 would occur at Beef Hollow, which the MVC project would span with a bridge. The other crossing types would be similar to those proposed for Redwood Road by including fencing with escape ramps and an underpass with fencing to funnel the wildlife to the crossing location.

In addition to wildlife crossings, UDWR recommended that wildlife fencing with escape ramps should be installed along the Salt Lake County alignment south of 12600 South from Riverton to Camp Williams. Additional analysis of the wildlife fencing will be conducted during the final design phase of the project in coordination with UDWR and USFWS.

Rivers and creeks in the MVC study area such as the Jordan River, Spring Creek, American Fork Creek, and Dry Creek will be spanned so that the water course will not be altered and no fish habitat will be affected.

Wildlife

Raptor nests within the range of disturbance of project activities (USFWS Utah Field Office 2002) will be surveyed before construction if the construction will occur during the nesting season. USFWS recommends identifying nests before trees leaf out and surveying again after nesting has begun to determine which nests are active and what species are using them. If an active raptor nest is identified, UDOT will coordinate with USFWS and/or UDWR to determine appropriate buffer distances and the duration in which construction may need to be modified given the species and nest location.

Vegetation

Temporary impacts to vegetation will be mitigated immediately after construction to prevent further, permanent effects. Mitigation will include the following measures:

- Compacted soils will be ripped, stabilized, and reseeded with native seed mixes.
- Weed-control practices and monitoring will accompany revegetation efforts until the native plant communities are successfully re-established.
- The contractor will be required to follow noxious weed mitigation and control measures identified in the most recent version of UDOT's Special Provision Section 02924S, Invasive Weed Control.
- Strictly following Best Management Practices (BMPs) will also reduce the potential for weed infestations.
- Reseeding with native plants, followed by monitoring seedlings and invasive species until the vegetation has re-established, will mitigate direct-disturbance impacts and reduce the potential for weed invasions. UDOT will be responsible for monitoring and determining when vegetation becomes re-established.

- Time tree and shrub removal to occur during the non-nesting season (about September 1 to April 30). If this is not possible, conduct preconstruction surveys to determine whether active bird nests are present. Leave active nests in the area untouched until the young have fledged.
- Removal of riparian vegetation will be minimized to the greatest extent practicable. UDOT will revegetate temporarily affected riparian areas with native riparian plant mixes that include willows and cottonwoods.

Water Quality

The following mitigation measures were specifically mentioned by the Utah Department of Environmental Quality (UDEQ). These measures are intended to reduce erosion and apply to all areas along the project that are proposed for construction. In addition to these measures, where appropriate, UDOT's Utah Pollutant Discharge Elimination System Phase II manual will be used.

- **Cut-and-Fill Slopes.** Provide erosion control on all cut-and-fill slopes by applying compost or mulch to the slope or through other means. Establish native vegetation on the slope where possible. Where possible, provide vegetated filter strips. Vegetated filter strips are UDEQ's preferred water quality treatment measures for the impact analysis area. Vegetation in filter strips slows the velocity of the stormwater enough that larger suspended particles settle out, metals can be taken up by the organic material in the soil, and the dissolved metal cations can be exchanged in the clay minerals in the soils or removed by the vegetation. The reduction in velocity also allows more time for oil and grease to volatilize, photodegrade, biodegrade, or be taken up by organic components in the vegetation or soils.
- **Detention Ponds.** Detention ponds will be provided for water quality treatment where it is necessary to detain runoff to reduce its peak flow rate. The proposed detention pond locations are shown in Figure 14-8 through Figure 14-13, Proposed Detention Pond Locations.

  In addition to reducing peaks and velocities in streams, detention ponds have the added benefit of reducing the levels of TSS, total dissolved solids (TDS), and metals in highway runoff.
- **Vegetated Bioswales.** Vegetated swales will be constructed to provide additional water quality treatment before the runoff is released into detention ponds to remove heavy metals, help reduce levels of TSS and TDS, and slow runoff into detention ponds.

BMPs will be implemented during roadway construction under the action alternatives. FHWA and UDOT will use a number of BMPs to ensure that wetland/riparian areas are protected from adjacent sediment sources (such as adjacent cut-and-fill activities). The BMPs that will be used to curb soil erosion could include, but are not limited to, the following:

- Silt fencing
- Straw bales or sediment logs
- Geo-fabric (erosion control matting)
- Check dams
- Seeding
- Mulching
- Contour scarification
- Contour strip seeding
- Contour berming
- Pads for construction equipment (to be used in wetland areas)

Additionally, bank stabilization will likely be needed where construction activities overlap with the riparian area. Banks will be stabilized through the use of bioengineering techniques such as streambank willow plantings. The Utah Division of Water Quality recommends the use of vegetative or bioengineered materials rather than riprap to control erosion whenever possible.

After construction, wetland/riparian areas will be restored by FHWA and UDOT or a qualified subcontractor. Seed mixes and plantings will consist of native species. The appropriate seed mixes and plantings will be prescribed on a site-specific basis by the agency land manager when applicable. USACE has recommended that the BMPs listed in the USFWS *Recommended Best Management Practices for Work in Utah Streams* (August 18, 2003) should be used as guidance when working near wetlands.

Roadway Maintenance

A large reduction in TDS can be achieved by following proper roadway maintenance procedures. As noted in Chapter 6 of the UDOT Stormwater Management Plan UPDES Phase II measures, pollution prevention and good housekeeping can prevent and reduce pollutants from being discharged to downstream waters. UDOT has standard operating procedures for roadway maintenance. Proper roadway maintenance BMPs are as follows:

- **Snow Removal and De-icing Practices.** Apply only the minimum quantity of de-icing agent necessary to remove ice from roadway facilities. Provide training to employees and document training efforts.
- **Salt Pile Storage.** Properly cover stockpiles of salt to prevent storm runoff from contacting the material and migrating to downstream drainage facilities and receiving waters.
- **Street Sweeping.** Remove particulates and debris from paved roadway surfaces. All state paved roadways in urbanized and rural areas will be swept at least once per year. Material collected will be properly disposed of at local landfills. Street-sweeping efforts help to remove fine particulate matter and other pollutants before being discharged into storm drain systems and downstream receiving waters.
- **Spill Prevention and Response Plan.** Implement an established set of policies and procedures to provide instruction and guidance in case of a hazardous material discharge or spill.

15.5.5.2 Wetlands

Before constructing the selected alternatives, UDOT will conduct a wetland delineation in compliance with Section 404 of the Clean Water Act. The total acreage of jurisdictional wetlands identified during this process and the results of the functional assessment will determine the type and amount of mitigation required to offset impacts to waters of the U.S. For example, mitigation could include creating new wetlands from uplands, restoring wetlands in areas that have become uplands, and enhancing and/or preserving existing wetlands. The typical acreage-based mitigation ratios for concurrent mitigation efforts of mitigated area to impact area used by USACE's Utah regulatory office for these activities are 2:1 for creation, 1.5:1 for restoration, 5:1 for enhancement, and 10:1 for preservation. These ratios have been determined based on the likelihood of success and compliance with the federal policy of "no net loss of wetlands." However, if a mitigation bank is developed before the wetland impacts occur, then these ratios could be different.

Using the results of the wetland functional assessment, mitigation ratios based on functional "lift" can be developed to modify these ratios. Functional lift refers to a measure of functional improvement that theoretically could be attained through mitigation by creation, restoration, or enhancement. It takes into account the functionality of a wetland as measured by the wetland assessment model in relationship to its size. For example, mitigating impacts to 10 acres of low-functioning wetlands might not require creating 20 acres of new wetlands if site selection and hydrology show the potential to create high-functioning wetlands. In this case, a function-based mitigation ratio for creation could be less than 2:1 given the increase in wetland function provided by the new wetlands relative to the 10 acres of affected, low-functioning wetlands.

These mitigation ratios are applied to a larger mitigation plan and associated Section 404 Individual Permit application. Typically, as part of a permit process, an applicant is required to conduct an alternatives analysis. Since all alternatives in this EIS are considered practicable, this EIS fulfills this requirement.

Further avoidance and minimization are also necessary as part of impact mitigation. The planning and design process for the MVC project avoided and minimized impacts to wetlands and waters of the U.S. by shifting the alignments and constructing retaining walls to the extent possible while complying with engineering specifications, such as minimum radius of curvature.

In addition to the MVC project, UDOT is planning for other projects in Salt Lake and Utah Counties that could affect wetlands and require mitigation. To mitigate these impacts, UDOT is investigating the possibility of developing a wetland mitigation bank that will cover the combined mitigation needs of these projects. To identify locations for potential wetland mitigation banks, UDOT held a workshop on March 9, 2007. The purpose of the workshop and the associated report (UDOT 2007) was to identify some general locations that could be developed as wetland mitigation sites for project-related impacts.

To help identify the best locations for potential mitigation sites, UDOT invited resource agencies, university professors, and non-governmental organizations to a wetland identification workshop. The people who were invited to the meeting included both local and regional experts in wetland and biological resources and those interested in resource conservation. About 15 people attended the meeting, including representatives from the following organizations:

- The Nature Conservancy
- Utah Division of Wildlife Resources
- Utah Reclamation, Mitigation, and Conservation Commission
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- Utah Department of Transportation
- Utah Transit Authority

The sites identified in the meeting are listed in Table 15.5-35 and Table 15.5-36 below and shown in Figure 15-23 and Figure 15-24, Potential Wetland Mitigation Areas. As a result of the workshop and additional coordination, UDOT is proceeding with implementing a wetland bank northeast of Utah Lake to mitigate Utah County projects including the MVC. This bank is in the area of wetland UTC 1 listed in Table 15.5-36 below. It is expected that construction of this bank will begin in 2009. UDOT is still reviewing potential sites in Salt Lake County to mitigate wetland impacts in that county. UDOT plans to conduct a formal wetland delineation once FHWA makes a decision on a Preferred Alternative in Salt Lake and Utah Counties. Once UDOT conducts a formal wetland delineation for the MVC project, UDOT and USACE will perform a more detailed analysis to determine how much mitigation, and what type of mitigation, will be required.

FHWA and UDOT will require the construction contractor to limit ground and wetland disturbance to the area necessary for the highway improvement. However, if the contractor disturbs more than the area required for improvement, the contractor will have to mitigate for the impact. To mitigate these temporary impacts associated with compacted soil, wetland areas will be ripped to break up any compacted layers. Where vegetation is disturbed or destroyed, the contractor will reseed these areas with a seed mix of native wetland plants approved by the appropriate agency. Additionally, the contractor will take steps to ensure that noxious weeds are not introduced into wetland plant communities. BMPs required by FHWA and UDOT will require that construction equipment entering the highway construction site be washed to remove noxious weed seeds.

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Table 15.5-35. Potential Salt Lake County Wetland Mitigation Sites

Wetland Site Number and Name	Importance	Types of Wetland Mitigation	Comments
SLC 1 – Playa Wetlands South of I-80	High – Playa wetlands are difficult to create, so preservation and enhancement of these existing wetlands are important.	Preservation, enhancement, and restoration	This area is under development pressure. This area is next to the Utah Division of Wildlife Resources' Lee Kay Center for Hunter Education which, if combined with preservation of the playa wetland, would provide a large continuous block of protected land in Salt Lake County.
SLC 2 – Wasatch Stream Restoration	Low – A mitigation site at this location would restore flood attenuation, restore some wildlife habitat, and provide open space.	Enhancement and restoration	This site would include restoring some of the streams coming from the Wasatch Mountains. The area around the streams is heavily modified. Restoration could provide flood benefits and human open-space values. Streams include Big Cottonwood, Little Cottonwood, Bell's Canyon/ Dimple Dell, and Parley's Canyon.
SLC 3 – UDOT Jordan River Mitigation Site	Medium – A mitigation site at this location would allow continued expansion of a functioning wetland mitigation site on the Jordan River. The site provides flood value and habitat.	Enhancement and restoration	Building onto this existing site would create a larger functioning wetland complex, which would provide improved habitat values. The potential for success is high. Expanding the site would provide additional public open space.
SLC 4 – Special Area Management Plan	High – The area is under some development pressure. There are important playa wetlands along the Great Salt Lake.	Preservation and enhancement	The recommended conservation area was identified north of I-80 and south of the Great Salt Lake.
SLC 5 – Salt Lake City International Airport	Medium to High – A mitigation site at this location would improve altered hydrology, restore some wildlife habitat, and provide open space.	Preservation, enhancement, and restoration	UDOT would explore the opportunity to work with the Salt Lake City International Airport to provide a larger combined wetland area.

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Table 15.5-36. Potential Utah County Wetland Mitigation Sites

Wetland Site Number and Name	Importance	Types of Wetland Mitigation	Comments
UTC 1 – Utah Lake North Shore	High – The site was ranked number 1 by the group for wetland mitigation. Development pressure could result in loss of the wetlands. The area includes rare fen soils and the threatened Ute ladies'-tresses. This area is the least-protected of the areas around Utah Lake.	Preservation, enhancement, restoration, and creation	The site could include a combination of preservation along Utah Lake with restoration of Spring Creek and American Fork Creek. The City of American Fork has designated an area for preservation along Utah Lake that could be available for purchase. There is a potential to include upland habitat along the creeks. Additional sites in this area could include the Pleasant Grove spring complex near I-15. Removal of existing farm drainage features would help restore wetland habitat.
UTC 2 – Jordan River Corridor	Medium – Much of the natural habitat along the Jordan River has been affected by farming and urban development.	Enhancement and restoration	Building this site would expand the Lehi mitigation site along the Jordan River. Much of the land along the Jordan River is privately held as farmland, but there is a high potential for future urban development along the shoreline.
UTC 3 – Vineyard	Medium – This site contains important and rare Histosol soils and habitat for threatened Ute ladies'-tresses. USFWS commented that UTC 3 and UTC 4 should be considered as important to mitigate as UTC 5.	Enhancement and restoration	Histosols are low-density, acidic soils with a high proportion of organic material. The soils are formed mainly in cold climates and under waterlogged conditions. Removing fill over the Histosol soils can re-establish the wetlands with good results.
UTC 4 – Skipper Bay	Medium – This site contains important and rare Histosol soils and habitat for threatened Ute ladies'-tresses. USFWS commented that UTC 3 and UTC 4 should be considered as important to mitigate as UTC 5.	Preservation and restoration	This site includes the inland areas around the Orem Golf Course and the existing Kari Smith mitigation site managed by The Nature Conservancy. This site could potentially expand onto the Nature Conservancy site, which would provide a larger wetland block under protection. Other site characteristics are similar to those for UTC 3.
UTC 5 – Provo Bay	High – The site was ranked number 2 by the group for wetland mitigation.	Preservation and enhancement	
UTC 6 – Hobble/Dry Creek Unit	Medium – The area contains habitat for threatened Ute ladies'-tresses.	Preservation and enhancement	Building this site would expand onto an existing wetland mitigation site. This area includes a June Sucker Recovery Program area.

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Wetland Site Number and Name	Importance	Types of Wetland Mitigation	Comments
UTC 7 – Lincoln Beach	High – The site was ranked number 3 by the group for wetland mitigation. The area provides important wetland complexes and wildlife habitat values.	Preservation and restoration	This site could possibly include the restoration of Spanish Fork Creek as it enters Utah Lake.
UTC 8 – South Utah Lake Inland	Low – Some of the area is protected by two existing wetland mitigation sites. A high water table makes development difficult.	Preservation and enhancement	

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15.5.6 Cumulative Impacts

As part of the MVC EIS process, scoping meetings were held with the public and resource agencies to help identify issues to be analyzed in the EIS. The comments received during the public and agency scoping period were reviewed to determine if any significant issues were identified. The public and agencies identified the loss of wildlife habitat and wetlands as main concerns. Chapter 25, Cumulative Impacts, provides a detailed analysis of the potential cumulative impacts to wildlife habitat and wetlands. Provided below is a summary of that analysis.

Wildlife habitat, wetlands, rivers, and lakes in the Salt Lake, Utah, and Tooele Valleys (Jordan River hydrologic unit, Utah Lake hydrologic unit, and Tooele Valley hydrologic unit, respectively) have been extensively altered as a result of urban and agricultural development during the past century. In the three valleys, there has been about a 55% reduction in wetlands and wildlife habitat (Jones & Stokes 2005). The extent of estimated historic wetlands and wildlife habitats and the current conditions are listed below (Jones & Stokes 2005).

- About 45% of the estimated historic wetlands and wildlife habitats are still available in the area.
- The remaining wetland habitat is estimated below.
    - Salt Lake Valley – 38% (37,333 acres)
    - Utah Valley – 17% (11,100 acres)
    - Tooele Valley – 80% (56,379 acres)

Based on National Wetlands Inventory data, Salt Lake County has about 7,900 acres of wetlands remaining from the historic estimate of 19,500 acres. Utah County has about 11,018 acres remaining out of the historic estimate of 66,200 acres. This is a loss of about 64% and 83%, respectively.

The expected 40,000 acres of new development between now and 2030 will result in adverse impacts to upland habitat and some wetland habitat. The main contributor will continue to be urban growth that will occur between 2002 and 2030 in the two counties. This growth and development will occur with or without the MVC project. Overall, based on project estimates of population growth and densities, there will continue to be a trend of conversion of wetlands and wildlife habitat to increasingly dense levels of development.

All of the MVC alternatives would result in a loss of wildlife habitat and wetlands. The approximately 500 acres of affected wildlife habitat would be less than 1.5% of what could be lost to anticipated development (about 40,000 acres by 2030). With the continued development along the Wasatch Front, much of the

existing wildlife habitat on the valley floors would be lost. Because the steep topography limits some development in the foothills, these areas would experience fewer impacts to wildlife habitat.

All MVC alternatives would result in impacts to some wetlands, and up to 125 acres could be affected (direct impacts). Although other planned transportation projects could also result in impacts to wetlands, urban growth, regardless of the construction of roads and rails, will likely cause the greatest impact to wetlands between 2002 and 2030. However, all projects that are subject to a Section 404 individual permit are required to identify the least environmentally damaging practicable alternative, which is the goal of the wetland assessment component of this EIS process. In addition, all projects are required to complete a wetland delineation from which mitigation is determined through avoidance, minimization, and/or some form of creation, restoration, or enhancement of wetlands. No data are available on the exact amount of wetlands to be converted to urban uses because each project is treated independently by USACE. It is expected that all impacts resulting from the roadway itself will have to be mitigated for (through creation, restoration, or enhancement of wetlands) within the general vicinity of the project to satisfy the federal policy of no net loss of wetland acres and/or function.

15.5.7 Summary of Impacts

Table 15.5-37 below summarizes the impacts to wildlife habitat resources (in HSV units) from each combination of alternatives and options in Salt Lake County and Utah County.

Table 15.5-38 below summarizes the impacts to jurisdictional wetlands from each combination of alternatives and options in Salt Lake County and Utah County.

Table 15.5-37. Summary of Impacts to Habitat Suitability Values from the Combined Alternatives

	Playas		Uplands				Drainages				Wetlands		Riparian Areas		
Alternative[a]	American Avocet	Black-necked Stilt	Brewer's Sparrow	Western Meadow-lark	Mule Deer	Red-tailed Hawk	Brewer's Sparrow	Western Meadow-lark	Mule Deer	Red-tailed Hawk	Red-wing Blackbird	Yellow-headed Blackbird	Red-wing Blackbird	Yellow-headed Blackbird	Yellow Warbler
5800 West Freeway / 5600 West Transit / Southern Freeway															
Dedicated Transit	38	25	171	63	189	24	5	2	4	3	9	5	7	6	1
Mixed Transit	38	25	171	63	189	24	5	2	4	3	9	5	7	6	1
5800 West Freeway / 5600 West Transit / 2100 North Freeway															
Dedicated Transit	38	25	172	63	191	24	5	2	4	3	0	0	4	4	2
Mixed Transit	38	25	172	63	191	24	5	2	4	3	0	0	4	4	2
5800 West Freeway / 5600 West Transit / Arterials															
Dedicated Transit	38	25	185	70	204	26	5	2	4	3	9	6	9	8	3
Mixed Transit	38	25	185	70	204	26	5	2	4	3	9	6	9	8	3
7200 West Freeway / 5600 West Transit / Southern Freeway															
Dedicated Transit	69	69	220	84	252	31	4	2	3	3	9	5	4	6	1
Mixed Transit	69	69	220	84	252	31	4	2	3	3	9	5	4	6	1
7200 West Freeway / 5600 West Transit / 2100 North Freeway															
Dedicated Transit	69	69	221	84	254	31	4	2	3	3	0	0	9	4	2
Mixed Transit	69	69	221	84	254	31	4	2	3	3	0	0	9	4	2

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Alternative[a]	Playas		Uplands				Drainages				Wetlands		Riparian Areas		
	American Avocet	Black-necked Stilt	Brewer's Sparrow	Western Meadow-lark	Mule Deer	Red-tailed Hawk	Brewer's Sparrow	Western Meadow-lark	Mule Deer	Red-tailed Hawk	Red-wing Blackbird	Yellow-headed Blackbird	Red-wing Blackbird	Yellow-headed Blackbird	Yellow Warbler
7200 West Freeway / 5600 West Transit / Arterials															
Dedicated Transit	69	69	234	91	267	33	4	2	3	3	9	6	9	8	3
Mixed Transit	69	69	234	91	267	33	4	2	3	3	9	6	9	8	3

The results in the table summarize the combined total impact for both the Salt Lake County and Utah County alternatives. The total impact includes both roadway and transit.

Habitat Suitability Values (HSV) = HSI × Acres Affected

[a] Dedicated Transit = Dedicated Right-of-Way Transit; Mixed Transit = Mixed-Traffic Transit

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Table 15.5-38. Summary of Wetland Impacts from the Combined Alternatives

Alternative[a]	Total Primary Impacts (acres)	Total Secondary Impacts (acres)	Impacts to Wetland Function (FCU)	Impacts to High-Functioning Wetlands (FCU)	Impacts to Rare or Irreplaceable Wetlands (acres)
5800 West Freeway / 5600 West Transit / Southern Freeway					
Dedicated Transit	123.62	307.42	180.66	109.72	67.57
Mixed Transit	123.61	307.26	180.59	109.69	67.52
5800 West Freeway / 5600 West Transit / 2100 North Freeway					
Dedicated Transit	43.06	108.02	57.83	20.73	55.14
Mixed Transit	43.05	107.86	57.76	20.70	55.09
5800 West Freeway / 5600 West Transit / Arterials					
Dedicated Transit	85.90	280.81	130.64	88.03	60.59
Mixed Transit	85.89	280.65	130.57	88.00	60.54
7200 West Freeway / 5600 West Transit / Southern Freeway					
Dedicated Transit	124.03	381.76	191.93	140.27	153.51
Mixed Transit	124.02	380.22	191.78	140.26	154.29
7200 West Freeway / 5600 West Transit / 2100 North Freeway					
Dedicated Transit	43.47	182.36	69.10	51.28	141.08
Mixed Transit	43.46	180.82	68.95	51.27	141.86
7200 West Freeway / 5600 West Transit / Arterials					
Dedicated Transit	86.31	355.15	141.91	118.58	146.53
Mixed Transit	86.30	353.61	141.76	118.57	147.31

[a] Dedicated Transit = Dedicated Right-of-Way Transit; Mixed Transit = Mixed-Traffic Transit

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