Appendix B

# GIS Data Documentation and Methods

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This appendix provides metadata about the data sets used for the geographic information system (GIS) analysis of the Legacy Parkway project. *Metadata* is information about data, such as the sources used to compile data and the methods used to gather data. The metadata in this appendix includes a brief description of the sources of data applied in the GIS analysis and a description of the methods used to interpret the data and other information about the data used. In addition, the appendix summarizes the results and conclusions of the GIS analysis.

## B.1 Sources of Data Used in GIS Analysis

### B.1.1 Project Study Area: Wetland/Wildlife Habitats

#### *Data*

Title: Wetland/Wildlife Habitats

Source: Dataset compiled by Jones & Stokes

Primary Sources: Wetland delineation report prepared for the final environmental impact statement (Final EIS) for the Legacy Parkway project (Baseline Data Inc. et al. 1998), land cover data from the Final EIS, and additional field evaluation

GIS Dataset Publication Date: 12/1/03

#### *Content Description Abstract*

The wetland/wildlife habitat dataset is the base dataset for the analysis of impacts on wetland/wildlife habitat in the project study area. The data were classified by habitat types: emergent marsh, wet meadow, mudflat/pickleweed, open water, riparian, cropland, pasture, scrub, and developed/urban. The data sources used in the compilation of the dataset were the wetland delineation from the Final EIS, which was used to map the wetland habitat types (emergent marsh, mudflat/pickleweed, wet meadow); aerial photography and field visits (2003), which were used to map riparian habitat; and the land cover dataset from the Final EIS, which was used to map the land cover or upland habitat types (cropland, pasture, scrub, and urban). The Final EIS land cover dataset was correlated (or *crosswalked*) with the wetland/wildlife habitat types (Table B-1).

## *Mapping Methods*

### Open Water, Emergent Marsh, Wet Meadow, and Mudflat

A detailed description of the mapping of these four wildlife habitat types can be found in the *Legacy-West Davis Highway Wetland Delineation* technical report (Baseline Data Inc. et al. 1998). The methods are also discussed in Subappendix B1 of the Final EIS. A brief description of the mapping methods is provided below.

Aerial photography was obtained for the project area in late March 1997. The aerial photographs were converted into digital orthophotos and enlarged, creating 80 individual 8.5 X 11-inch photographs that cover the entire project study area (scale 1 inch = 50 feet [ft]). Habitats were mapped during field sampling in 1997, and boundaries were digitized to produce the habitat map.

All of the wetlands were assigned a hydrogeomorphic methodology (HGM) wetland classification (riverine, lacustrine, slope, or depressional). Some of the wetlands were also assigned an HGM wetland cover type (marsh, wet meadow, vegetated, and un-vegetated playa [special aquatic site of mudflat], open water, upland). These HGM wetland cover types were the basis for assigning wildlife habitat types. Because the subclasses (wetland cover types) more accurately account for wildlife use of the project study area, they are used for this analysis.

On July 18, 2003, Justin Dolling, Ella Sorensen, and Byron Parker evaluated the wetland maps. Based on their extensive personal knowledge and experience with wildlife and habitats in the study area, they made minor adjustments to the habitat type boundaries. On July 30, 2003, field review of the mapping units (polygons) was conducted by Justin Dolling, Ella Sorensen, and Byron Parker. Some of the polygons were not assigned the HGM wetland cover types; these polygons were assigned wildlife habitats types based on aerial photographs, local knowledge, and site visits. In June 2004, the wildlife technical team responsible for reviewing and making recommendations on the general technical analysis approach and methods used in this wildlife technical memorandum identified a misclassified open water polygon. To have corrected that misclassification would have resulted in only minor changes in the acreage of each type of habitat directly affected and would not have changed the conclusion about the alternatives. In addition, the open water polygon in question was not a delineated wetland and would not impact the wetlands analysis or any calculations of wetland impacts. The wildlife technical team therefore decided not to make any changes to the dataset.

### Riparian

Based on the 1997 aerial photography, Justin Dolling, Ella Sorensen, and Byron Parker initially delineated riparian habitats. Justin Dolling and Mike Perkins conducted field review and verification of the boundaries of this wildlife habitat type on October 22, 2003. Riparian habitat type was determined by visually estimating the amount of vegetation directly influenced by stream hydrology. Best professional judgment was used to estimate the extent of hydrologic connection. Key locations along each waterway in the project study area were visited. Onsite inspections were then compared to aerial images[1] to delineate the total amount of riparian coverage. All vegetation associated with stream hydrology was mapped, including trees, shrubs, grasses, forbs, emergent plants, and flowing water. Natural waterways that

[1] The scale of the 1997 photographs was 1:1,200. The 2003 aerial photographs were used for Jordan River, Mill Creek, and Farmington Creek mapping in the field. The riparian habitats identified on the 2003 photos were screen digitized on the 1997 aerial photographs at a 1:1,200 scale.

**Table B-1.** Crosswalk of Land Use Classes: Final EIS Land Use Cover Classification and Legacy Parkway Wildlife Habitat Classification

| Final EIS Land Cover Classification | Legacy Parkway Wildlife Habitat Classification |
|---|---|
| | Scrub |
| Alfalfa | Cropland |
| Bldgs/Homes | Developed |
| Cattail/Bullrush | Emergent Marsh |
| Commercial | Developed |
| Corn | Cropland |
| Emergent Marsh | Emergent Marsh |
| Evaporation Pond | Open Water |
| Fallow | Pasture |
| Fruit | Cropland |
| Grain | Cropland |
| Grass Hay | Cropland |
| High-Density Bldgs/Homes | Developed |
| Idle | Cropland |
| Idle Spaces | Developed |
| Industrial | Developed |
| Low-Density Bldgs/Homes | Developed |
| Mudflat/Pickleweed | Mudflat/Pickleweed |
| Open Space | Developed |
| Open Spaces | Developed |
| Open Water | Open Water |
| Pasture | Pasture |
| Riparian | Riparian |
| Temporary Flood | Cropland |
| Transportation & Utilities | Developed |
| Vegetables | Cropland |
| Wet/Vegetation | Mudflat/Pickleweed |
| Wet Flats | Open Water or Pasture (subject to aerial photograph verification) |
| Wet Meadow | Wet Meadow |
| Developed | Developed |

contained some channel modification were included as riparian habitat. Cement-lined natural stream channels or human-made drains and ditches used to convey groundwater or intermittent amounts of surface water were not included in the riparian habitat category. Some riparian areas bordered delineated wetland areas. The boundaries of some of the delineated wetlands were realigned with the riparian habitat boundaries, resulting in small reductions of the overall delineated wetland area. Areas with an overstory of riparian and an understory of a wetland habitat type were classified as riparian.

### Cropland, Pasture, and Scrub

Cropland and pasture areas were identified using the land cover data from the Final EIS. The dataset compiled for this 2003 GIS analysis is a combination of the Final EIS land cover data and the Utah Department of Natural Resources (UDNR), Utah Division of Water Resources, water-related land use dataset, with updates from the local counties.

On September 25, 2003, Justin Dolling, Ella Sorensen, and Byron Parker conducted field review and verification of the unclassified upland polygons. Based on their extensive personal knowledge and experience with wildlife and habitats in the project study area, they assigned the polygons to the wildlife habitat category salt desert scrub. Areas identified as upland in the HGM classification system were also assigned the value of salt desert scrub.

### Developed/Urban Landscaping

Developed areas were identified using the land cover data from the Final EIS. The dataset compiled for this 2003 GIS analysis is a combination of the Final EIS land cover data and UDNR, Utah Division of Water Resources, water-related land use dataset, with updates from the local counties.

## *Habitat Descriptions*

### Open Water

Open water habitat consists of inundated or flooded areas with no emergent vegetation. The water in these areas may be fresh (ponds), brackish (estuaries), or saline (Great Salt Lake). The amount of open water habitat can vary tremendously with the rise and fall of the lake level. If periods of high-water inundation are long, the saline water of the lake will denude the vegetated habitats it covers, thereby converting shoreline emergent marshes and vegetated mudflats to open water habitat.

### Emergent Marsh

Emergent marsh is a wetland dominated by erect, herbaceous vegetation. Emergent marsh appears as grasslands or stands of reedy growth in areas that are flooded all or most of the year. Water depth in emergent marsh habitat varies but is not deep enough to restrict the growth of emergent plants. Vegetation commonly observed in these marshes include hard stem bulrush, (*Scirpus acutus*), alkali bulrush *(Scirpus maritimus),* three square bulrush (*Scirpus americanus* and *Scirpus pungens),* cattail *(Typha latifolia),* creeping spikerush (*Eleocharis palustris),* reed canary grass (*Phalaris arundinacea),* common reed (*Phragmites australis),* blister buttercup (*Ranunculus scleratus),* water buttercup (*Ranunculus aquatilis*), and Nebraska sedge (*Carex nebrascensis).*

These marshes are typically located in depressions where the ground surface drops below the level of the water table. Therefore, both groundwater and surface water may contribute to the hydrologic regime of emergent marshes. In the Great Salt Lake valley, these areas are generally inundated during the spring when the water table is high because of snowmelt and seasonal rain.

### Wet Meadow

Wet meadow habitat in the project study area is typically found in poorly drained depressions where the water table is within 20 inches of the surface at least part of the time and runoff is very slow. Early in the growing season, the water table commonly may be higher than the ground surface, causing inundation. However, in wet meadow habitat, this inundation occurs less frequently and for shorter duration than in emergent marshes. Agriculture and urbanization have also modified the hydrologic regime of wet meadows in the study area in the same way as of emergent marshes.

Plant species commonly observed in wet meadows in the study area include Baltic rush (*Juncus balticus*), clustered field sedge (C*arex praegracilis*), Nebraska sedge, rabbitfoot grass (*Polypogon monspeliensis),* foxtail barley (*Hordeum jubatum),* little barley (*Hordeum pusillum),* curly dock (*Rumex crispus),* and saltgrass (*Distlichlis spicata).*

### Mudflat/Pickleweed

Mudflats are typically barren or sparsely vegetated playas with deep or moderately deep poorly drained to very poorly drained clay soils. In the project study area, they are usually located in the lowest topographical areas that have internal drainage. After a rain, these mudflats collect much of the runoff from surrounding areas and form ephemeral pools. Most of this water is strongly alkaline because of evaporation, which brings salts in the soils to the surface. Vegetation found on mudflats in the project study area includes western seepweed (*Suaeda occidentalis*), slender seepweed *(Suaeda depressa*), and pickleweed (*Salicornia europea*).

### Riparian

Riparian habitat is habitat found along a freshwater watercourse. The riparian habitat in the project study area is generally severely degraded and is restricted to small patches of riparian vegetation along stream courses and irrigation canals. Remnant native vegetation in riparian areas includes Fremont cottonwood (*Populus fremontii*), box elder maple (*Acer negundo*), sandbar willow (*Salix exigua*), and narrowleaf cottonwood (*Populus angustifolia*). However, in many areas these species have been replaced by Russian olive (*Elaeagnus angustifolius*), Siberian elm (*Ulmus pumila*), and salt cedar (*Tamarix ramoisissima*).

The riparian habitat was mapped for the wetland/wildlife habitat map and was not part of the jurisdictional wetlands mapping conducted for the Final EIS.

### Pasture

Much of the farmland in the project study area consists of pasture. Pastures are generally located on flat or gently sloping lands and are vegetated with a mixture of perennial non-native grasses and legumes. Typical forage species planted in pastures include meadow brome (*Bromus riparius*), smooth brome (*B. inermis*), tall fescue (*Festuca arundinacea*), meadow fescue (*F. pratensis*), perennial ryegrass (*Lolium perenne*), creeping meadow foxtail (*Alopecurus arundinaceus*), intermediate wheatgrass (*Elymus hispidus*), tall wheatgrass (*E. elongatus),* and timothy (*Phleum pratense*). The height of the vegetation varies according to season, level of irrigation, drainage, fertilization, mowing, and livestock stocking levels, ranging from a few inches to 2 or more feet on fertile soils before grazing.

#### Cropland

Large tracts of cropland are located in the project study area. The major crops actively farmed on these lands include corn, wheat, sod, and alfalfa.

#### Salt Desert Scrub

The salt desert scrub wildlife habitat in the project study area occurs primarily in the saline upland areas. It is characterized by shadscale (*Atriplex confertifolia),* Gardner saltbush (*Atriplex gardneri),* and greasewood *(Sarcobatus vermiculatus).* This habitat in the project study area has been largely disturbed by free-range livestock grazing and other activities. Native grasses have been largely replaced by exotic grasses and forbs, including an abundance cheatgrass (*Bromus tectorum).* Japanese brome *(Bromus japonicus),* wheatgrass (*Elymus* spp.*),* bulbous bluegrass *(Poa bulbosa),* whitetop *(Caldaria draba),* storksbill (*Erodium cicutarium),* and gumweed, (*Grindelia squarrosa*) are also abundant throughout the project study area.

#### Developed/Urban

Developed habitat includes areas that are used for residential, commercial, or industrial purposes. Most of these areas are covered by pavement and buildings. However, much of the developed habitat (lawns, shrubs, and trees) in the project study area provides important food and shelter resources for a variety of wildlife.

## B.1.2 Project Alternative Footprints

### *Data*

Title: Project Alternative Footprints

Primary Sources: Utah Department of Transportation (UDOT) and HDR Engineering Inc.

GIS Dataset Publication Date: 12/1/03

### *Content Description Abstract*

The footprints of the project alternatives were provided by UDOT and HDR Engineering Inc. The data was used in the wildlife habitat analysis to calculate direct and indirect impacts.

### *Jones & Stokes Processing Steps*

1. Converted computer-aided design (CAD) dxf files to Arc/Info file format for GIS analysis.

## B.1.3 Project Study Area Boundary

### *Data*

Title: Project Study Area Boundary

Primary Sources: UDOT and HDR Engineering Inc.

GIS Dataset Publication Date: 12/1/03

### *Content Description Abstract*

The boundary of the project study area was provided by UDOT and HDR Engineering Inc. The boundary data was used in the wildlife habitat analysis to define the extent of the project study area analyzed.

### *Jones & Stokes Processing Steps*

1. Converted CAD dxf files to Arc/Info file format for GIS analysis.

2. The boundaries of the project study area were modified from those of the Final EIS. Jones & Stokes modified the project study area to include all the geographic extent of delineated wetlands from the Final EIS.

## B.1.4 Project Study Area: Inundation Zones

### *Data*

Title: Elevation-Based Inundation Zones

Source: Dataset compiled by Jones & Stokes

Primary Source: U.S. Geological Survey (USGS) 10-meter (m) digital elevation model (DEM) (available at: <http://agrc.utah.gov/agrc_sgid/dem.html>)

GIS Dataset Publication Date: 12/1/03

### *Content Description Abstract*

The elevation-based inundation zones for the project study area were based on the USGS 10-meter (m) DEM. A DEM is a digital file consisting of terrain elevations for ground positions at regularly spaced horizontal intervals. Contour lines were generated in 4-ft intervals for the compiled dataset. The 4-foot contour intervals were used to create the elevation-based inundation zones. The intervals range from <1,281 m (4,204 ft) to >1,286 m (4,220 ft). The <1,281-m (4204-ft) interval is the lowest interval because the lack of information about the bathymetry of Great Salt Lake in the DEM precluded identifying any lower intervals.

### *Jones & Stokes Processing Steps*

1. Merge the 10-m DEMs into a single file.
2. Fill the sinks and clean the edges of the quadrangles.
3. Change the elevation units from meters to feet.
4. Generate contours in 4-ft intervals.
5. Create a polygon dataset representing the inundation intervals.

## B.1.5 Potential Future Development in the Project Study Area

### *Data*

Title: Potential Future Development

Primary Sources: Future development from the Final EIS, UDOT, and HDR Engineering Inc.

GIS Dataset Publication Date: 8/1/04

### *Content Description Abstract*

Two categories of development were identified in the dataset: areas developed since 1997 (developed), and areas potentially developable in the future (developable).

### *Mapping Methods*

The concept underlying developable lands is that the uplands in the study area are desirable for intensive land use because they are readily accessible to I-15, I-215, I-80, and the communities they serve. Further, without the Legacy Parkway, these lands would be developed in accordance with local land use plans. During preparation of the Final EIS, the land use planners of the cities in the study area indicated they would allow development down to the Federal Emergency Management Agency (FEMA) 100-year floodplain.

Potential developable lands were identified by identifying all undeveloped land in the study area and eliminating all land below the FEMA 100-year floodplain. The resulting land was reviewed to determine whether access was available without having to obtain a 404 permit. If access required a 404 permit, the area was not considered developable. This was a somewhat conservative approach to identifying developable lands because FEMA regulates but does not prohibit development within the 100-year. In calculating potential future build-out, wetland habitat within the developed or developable categories was acknowledged as requiring a 404 permit or being potentially degraded if surrounding land uses were converted to developed.

The polygons provided identify all the land developed since the preparation of the Final EIS and all the developable land, as defined above.

### *Jones & Stokes Processing Steps*

1. Identified overlapping polygons. Where polygons overlapped, areas identified as developed and developable were considered developed.
2. Areas identified as protected were not included in calculations of developed or developable.

## B.1.6 Regional Study Area: Modified Hydrologic Units

### *Data*

Title: Regional Hydrologic Units

Source: Modifications to hydrologic unit boundaries by Jones & Stokes

Primary Sources: USGS and National Resources Conservation Service (NRCS) hydrologic units

GIS Dataset Publication Date: 1999

### *Content Description Abstract*

Jones & Stokes modified the hydrologic unit divisions of the dataset for the regional study area. The following description is from the hydrologic unit metadata, as provided by the Utah Automated Geographic Reference Center (available at: < http://www.ftw.nrcs.usda.gov/huc_data.html>).

This dataset is a complete digital hydrologic unit boundary layer to the subwatershed (12-digit) 6th level for the State of Utah. This dataset consists of geo-referenced digital data and associated attributes created in accordance with the *FGDC Proposal, Version 1.0 - Federal Standards For Delineation of Hydrologic Unit* Boundaries (Natural Resources Conservation Service 2002) (available at: <http://www.ftw.nrcs.usda.gov/huc_data.html>). Polygons are attributed with hydrologic unit codes for 4th level sub-basins, 5th level watersheds, 6th level subwatersheds, name, size, downstream hydrologic unit, type of watershed, non-contributing areas, and flow modification. Line features are attributed with the highest hydrologic unit code for each watershed, line source, and a metadata reference file.

### *Purpose*

The watershed and subwatershed hydrologic unit boundaries provide a uniquely identified and uniform method of subdividing large drainage areas. The smaller sized 6th-level subwatersheds (up to 250,000 acres) are useful for numerous application programs supported by a variety of local, state, and federal agencies. This dataset is intended to be used as a tool for water-resource management and planning activities, particularly for site-specific and localized studies requiring a level of detail provided by large-scale map information. The dataset will be appended to a larger, seamless, nationally consistent geospatial database as other states complete their portion of the watershed boundary dataset.

### *Jones & Stokes Processing Steps*

1. Divided hydrologic unit 16020309 from north to south. Assigned the western portion the name “Promontory Point West” and combined the eastern portion with Bear River hydrologic unit 16010204.

2. Combined hydrologic units 16010202 and 16010203 to create Cache Valley.

3. Combined the Bear River Bay portion of hydrologic unit 16020310 with Bear River hydrologic unit 16010204.

4. Combined hydrologic units 16020201, 16020203, 16020202 to create Lake Utah.

5. Selected the area in the hydrologic unit below an elevation of 1,433 m (4,700 ft). Used the USGS National Elevation Dataset (NED) as the elevation dataset.

6. Clipped all of the hydrologic units to the regional study area.

## B.1.7 Regional Estimated Historic Wetland/Wildlife Habitat

### *Data*

Title: Regional Estimated Historic Wetland/Wildlife Habitat

Primary Source: NRCS Soil Survey Geographic (SSURGO) data

Publication Date: Varies for each county. The most recent digital data was used from the NRCS web site (http://www.ncgc.nrcs.usda.gov/branch/ssb/products/ssurgo/); data was downloaded June 1, 2003.

### *Content Description Abstract*

The regional estimated historic wetland/wildlife habitat dataset provides a basic estimate of the historic wetland/wildlife habitat within the mapped area. The estimate is based on soils identified in the NRCS SSURGO dataset as supporting “the habitat element shallow water,” “habitat requirements for wetland wildlife,” or “the wildlife habitat element for wetland plants.” A soil class needs to be “good” for any of the categories to be included in the final dataset. In addition, for this GIS analysis, the soil types “Saltair” and “Playa” were included in the dataset.

The following descriptions are from SSURGO Data Base Data Use Information, United States Department of Agriculture Natural Resource Conservation Service, National Soil Survey Center, Miscellaneous Publication Number 1527 (available at: <http://www.ncgc.nrcs.usda.gov/branch /ssb/products/ssurgo/>).

The SSURGO database provides the most detailed level of soil geographic data and was designed primarily for natural resource planning and management for farm and ranch, landowner/user, township, county, or parish. Using the soil attributes, this database serves as an excellent source for determining erodible areas and developing erosion control practices; reviewing site development proposals and land use potential; making land use assessments and chemical fate assessments; and identifying potential wetlands and sand and gravel aquifer areas.

Using National Cooperative Soil Survey (NCSS) mapping standards, soil maps in the SSURGO database are made using field methods. Surveyors observe soils along delineation boundaries and determine map unit composition by field traverses and transects. Aerial photographs are interpreted and used as the field map base. Maps are made at scales ranging from 1:12,000 to 1:63,360. Typically, scales are 1:15840, 1;20,000, or 1:24,000. The maps, along with comprehensive descriptions, produce an attribute and spatial database for NCSS publications.

## B.1.8 Regional Study Area: Land Use/Land Cover

### *Data*

Title: Regional Land Cover Dataset

Source: Dataset compiled by Jones & Stokes

Primary Sources: USGS national land cover dataset (NLCD) and U.S. Fish and Wildlife Service (USFWS) national wetlands inventory (NWI) dataset.

### *Content Description Abstract*

The regional study area land use/land cover dataset is a combination of the USGS national land cover dataset (NLCD circa 1992) and the USFWS national wetlands inventory dataset (NWI 2001). Jones & Stokes combined and reclassified the two datasets to general wetland/wildlife habitat types.

### *USGS National Land Cover Dataset (NLCD)*

The following descriptions are from the NLCD metadata web site (available at: <http://edcwww.cr.usgs.gov/programs/lccp/natllandcover.html>).

Abstract: The data from the NLCD can be used in a GIS analysis for various purposes such as assessing wildlife habitat, water quality, pesticide runoff, and land use change. The state datasets are provided to USGS with a 300-m (984-ft) buffer beyond the state border to facilitate combining state files into larger regions. To use the NLCD correctly, the user must have a firm understanding of how the datasets were compiled and the resulting limitations of these data. The NLCD was compiled from Landsat Thematic Mapper (TM) satellite imagery (circa 1992) with a spatial resolution of 30 m (98 ft), and supplemented by various ancillary data (where available). The satellite imagery was analyzed and interpreted for the NLCD using very large, sometimes multi-state image mosaics (i.e., up to 18 Landsat scenes). The thematic interpretations were necessarily conducted from a spatially broad perspective, and a relatively small number of aerial photographs was used to ground truth the results. Furthermore, the accuracy assessments correspond to federal regions, which are groupings of contiguous states. Thus, the reliability of the data is greatest at the state or multi-state level. The statistical accuracy of the data is known only for the region.

Important Advisory: Users are cautioned to carefully scrutinize the data to determine whether the data are of sufficient reliability before attempting to use the dataset for larger-scale or local analyses. When making this determination, the user must keep in mind that the NLCD represents conditions in the early 1990s.

The Utah portion of the NLCD was created as part of a project area encompassing portions of Federal Region VIII, including the states of North Dakota, South Dakota, Wyoming, Montana, Utah, and

Colorado. The NLCD classification contains 21 different land cover categories with a spatial resolution of 30 m (98 ft). The NLCD was produced as a cooperative effort between the USGS and the U.S. Environmental Protection Agency (EPA) to produce a consistent, land cover data layer for the 48 conterminous states, using early 1990s Landsat TM data purchased by the Multi-Resolution Land Characterization (MRLC) Consortium. The MRLC Consortium is a partnership of federal agencies that produce or use land cover data. Partners include the USGS (National Mapping, Biological Resources, and Water Resources Divisions), U.S. EPA, U.S. Forest Service, and National Oceanic and Atmospheric Administration.

Purpose: The main objective of the NLCD project was to generate a generalized and nationally consistent land cover data layer for the entire conterminous United States. These data can be used as a layer in a GIS for various purposes, such as assessing wildlife habitat, water quality and pesticide runoff, and land use change.

### *USFWS National Wetlands Inventory*

The following description is from the national wetlands inventory (NWI) metadata as provided by the Utah Automated Geographic Reference Center (available at: <http://agrc.utah.gov/agrc_sgid/sgidintro.html>).

The NWI dataset represents wetland areas in Utah, as delineated by the NWI conducted by USFWS. Two methods were used to capture data for the NWI: conversion of USFWS digitized quads from Digital Line Graph (DLG) format and in-house digitizing of polygons from mylar overlays. The data is presented in a scale of 1:24,000. Data from the NWI was used for the Legacy Parkway GIS analysis to show the wetland areas in Utah as delineated by the NWI.

### *Jones & Stokes Processing Steps*

1. Crosswalked NLCD and NWI attributes to the wetland/wildlife habitat types used for the project study area in the wildlife technical memo (Tables B-2 and B-3).

2. Converted NWI data from vector to raster using the raster parameters from the NLCD dataset (30-meter grid, the same origin).

3. Combined the two datasets. Areas in the NWI dataset assigned a “NULL” value were assigned values from the NLCD dataset.

**Table B-2.** Crosswalk of Land Cover Types: USGS National Land Cover Classification and Legacy Parkway Wildlife Habitat Classification

| National Land Cover Classification | Legacy Parkway Wildlife Habitat Classification |
|---|---|
| Open Water | Open Water |
| Perennial Ice/Snow | Unclassified |
| Low Intensity Residential | Developed |
| High Intensity Residential | Developed |
| Commercial/Industrial/Transportation | Developed |
| Bare Rock/Sand/Clay | Unclassified |
| Quarries/Strip Mines/Gravel Pits | Developed |
| Transitional | Developed |
| Deciduous Forest | Forested Upland |
| Evergreen Forest | Forested Upland |
| Mixed Forest | Forested Upland |
| Shrubland | Scrub |
| Orchards/Vineyards/Other | Cropland |
| Grasslands/Herbaceous | Pasture |
| Pasture/Hay | Pasture |
| Row Crops | Cropland |
| Small Grains | Cropland |
| Fallow | Cropland |
| Urban/Recreational Grasses | Developed |
| Woody Wetlands | Riparian |
| Emergent Herbaceous Wetlands | Emergent Marsh |

## B.1.9 Regional Study Area: 1984 Lake Level

### *Data*

Title: Great Salt Lake 1984 Lake Level

Primary Source: University of Utah, Mapping and Monitoring Great Salt Lake Dynamics (1972–1996)

### *Content Description Abstract*

The 1984 Great Salt Lake Level is based on Landsat imagery used in the Mapping and Monitoring Great Salt Lake Dynamics (1972–1996) study conducted by the University of Utah. For a detailed explanation of the mapping process, refer to the *Mapping and Monitoring Great Salt Lake Dynamics Report*

**Table B-3.** Crosswalk of Land Unit Classes and Flood Regimes: National Wetland Inventory (NWI) Land Unit Classification and Legacy Parkway Wildlife Habitat Classification

| NWI Land Unit Class | NWI Flood Regime | Legacy Parkway Wildlife Habitat |
|---|---|---|
| Other | Temporarily Flooded | Open Water |
| Aquatic Bed | Seasonally Flooded - Saturated | Open Water |
| Aquatic Bed | Semi-permanently Flooded | Open Water |
| Aquatic Bed | Unknown Code | Open Water |
| Unconsolidated Bottom | Intermittently Exposed | Open Water |
| Open Water/Unknown Bottom | Semi-permanently Flooded | Open Water |
| Unconsolidated Bottom | Semi-permanently Flooded | Open Water |
| Open Water/Unknown Bottom | Permanently Flooded | Open Water |
| Aquatic Bed | Intermittently Exposed | Open Water |
| Unconsolidated Bottom | Seasonally Flooded | Open Water |
| Unconsolidated Bottom | Temporarily Flooded | Open Water |
| Unconsolidated Bottom | Unknown Code | Open Water |
| Unconsolidated Shore | Permanently Flooded | Open Water |
| Unconsolidated Shore | Seasonally Flooded | Open Water |
| Aquatic Bed | Seasonally Flooded | Open Water |
| Unconsolidated Shore | Semi-permanently Flooded | Open Water |
| Aquatic Bed | Permanently Flooded | Open Water |
| Unconsolidated Shore | Unknown Code | Open Water |
| Unconsolidated Bottom | Permanently Flooded | Open Water |
| Scrub/Shrub | Semi-permanently Flooded | Scrub |
| Scrub/Shrub | Temporarily Flooded | Scrub |
| Scrub/Shrub | Unknown Code | Scrub |
| Scrub/Shrub – Broad-Leaved Deciduous | Seasonally Flooded | Scrub |
| Scrub/Shrub – Broad-Leaved Deciduous | Temporarily Flooded | Scrub |
| Scrub/Shrub | Saturated | Scrub |
| Scrub/Shrub | Seasonally Flooded | Scrub |
| Forested | Temporarily Flooded | Riparian |
| Streambed | Seasonally Flooded | Riparian |
| Streambed | Semi-permanently Flooded | Riparian |
| Streambed | Temporarily Flooded | Riparian |
| Forested | Seasonally Flooded | Riparian |
| Forested | Unknown Code | Riparian |
| Forested – Broad-Leaved Deciduous | Seasonally Flooded | Riparian |

| NWI Land Unit Class | NWI Flood Regime | Legacy Parkway Wildlife Habitat |
|---|---|---|
| Forested – Broad-Leaved Deciduous | Temporarily Flooded | Riparian |
| Forested | Saturated | Riparian |
| Emergent | Permanently Flooded | Emergent Marsh |
| Emergent – Persistent | Semi-permanently Flooded | Emergent Marsh |
| Emergent | Intermittently Exposed | Emergent Marsh |
| Emergent | Semi-permanently Flooded | Emergent Marsh |
| Emergent | Unknown Code | Emergent Marsh |
| Emergent – Persistent | Temporarily Flooded | Emergent Marsh |

(University of Utah 1972–1996). In the Legacy Parkway analysis, the dataset was used as an example of high-water conditions in the regional analysis.

## B.1.10 Regional Study Area: Administrative Ownership

### *Data*

Title: Ownership Status

Source: Ownership types reclassified by Jones & Stokes

Primary Source: Administrative ownership information provided by Utah State University

GIS Dataset Publication Date: 5/30/2003

### *Content Description Abstract*

This dataset depicts the Bureau of Land Management (BLM) 1:100,000-scale land ownership quadrangle maps published by BLM between 1980 and 1989. The data were digitized for the USFWS Utah GAP Analysis project by the Remote Sensing and GIS Laboratories, Department of Geography and Earth Resources, Utah State University (GIS/USU). The Utah School and Institutional Trust Lands Administration (SITLA) revises these data regularly to reflect changes in state trust lands. Other information is edited and updated as needed but not on a regular schedule. For additional information on the data development, see the full metadata online (available at: <http://agrc.utah.gov/agrc_sgid/sgidintro.html *or* ftp://lands5.state.ut.us/pub/index.htm>).

### *Legacy Parkway Analysis*

For the Legacy Parkway analysis, the land ownership categories were generalized to evaluate the general trend of ownership in the Great Salt Lake Ecosystem (GSLE). Table B-4 shows the crosswalk from the original ownership categories to the Legacy Parkway generalized categories.

Lands that are public lands (BLM, state lands, wildlife management, Forest Service, National Parks, etc.) were categorized as “public.” The assumption is that these lands are unlikely to be sold or developed, and are managed for natural resources. Many of these lands have multiple uses; however, without further refinement on the mapping and detailed information about long-term management plans, it is not possible to evaluate the management for wildlife.

State trust lands were labeled as “public trust.” These lands are managed for twelve beneficiaries and have the potential to be developed or sold. For additional information on the definition of trust lands see the STILA web site (available at: <http://www.utahtrustlands.com/faqs.htm#What%20are%20Trust%20Lands>).

Lands that are either managed by private groups, such as The Nature Conservancy, or are private holdings on public lands were labeled “public/private.” Although these lands are not entirely publicly owned, they would most likely have a lower potential for development then private lands.

The Legacy Parkway Nature Preserve was not included in the ownership dataset as public ownership.

### *Jones & Stokes Processing Steps*

1. Crosswalked the ownership categories to the generalized categories (Table B-4).

## B.1.11 Regional Study Area: Population Density 2001, 2010, 2020, 2030

### *Data*

Title: Wasatch Front Regional Council Socioeconomic Projections

Source: Jones & Stokes calculated population density based primarily on Wasatch Front Regional Council socioeconomic projections GIS dataset.

GIS Dataset Publication Date: 12/2/03

### *Content Description Abstract*

The Wasatch Front Regional Council (WFRC) socioeconomic projections GIS data is based on traffic analysis zones. The dataset has projected future population for each traffic zone.

For the Legacy Parkway analysis, these data were converted into a potential density value and then categorized into high, moderate, and low population density (low = 0 people/acre, moderate = >0 and <2 people/acre, and high = >2 people/acre). The data were then combined with regional land cover data to evaluate the potential loss of wildlife habitat for the 29 years of population growth projected by the WFRC. The divisions were based on a visual inspection of the densities and available 2002 aerial photos of the project study area. Areas of >2 people/acre were generally areas of residential housing. The population density of >0 and <2 people/acre had only a few houses or a small development. Areas of 0 people/acre were open natural areas, cropland, or pasture with little or no development.

### *Jones & Stokes Processing Steps*

1. Calculated the people/acre for each year of population growth projected by the WFRC.

2. Visually inspected aerial photographs and population density values.

3. Reclassified polygons into high, moderate, low.

# B.2 GIS Methods and Analysis

## B.2.1 Project-Level Analysis Methods

### *Wildlife Habitat Mapping*

Wildlife habitats identified in the Final EIS included farmland, urban scrub, salt desert scrub, lowland riparian scrub, and wetlands (Section 3.13.2 of the Final EIS). Except for wetlands, which were fully delineated for the Final EIS (Baseline Data Inc. et al. 1998), this habitat classification did not consistently

**Table B-4.** Crosswalk of Ownership Types and Generalized Ownership Status

| Ownership Types | Generalized Ownership Status |
|---|---|
| Bankhead Jones | Public |
| Bankhead Jones/USFS | Public |
| BLM | Public |
| BLM/Bureau of Reclamation/State | Public |
| BLM/Bureau of Reclamation | Public |
| BLM/DOD | Public |
| BLM/power withdrawal and classifications | Public |
| BLM/protective withdrawal | Public |
| BLM/public water reserve | Public |
| USFS | Public |
| USFS/acquired land | Public |
| USFS/Bureau of Reclamation | Public |
| USFS/power withdrawal and classifications | Public |
| USFS/protective withdrawal | Public |
| Intermittent water | Water |
| Military reservations | Public |
| National parks/monuments/historic sites | Public |
| Native American reservations | Reservations |
| Private | Private |
| Private/Bureau of Reclamation/USFS | Public/private |
| Private/Bureau of Reclamation | Public/private |
| Private/DOD | Public/private |
| Private/USFS | Public/private |
| Private/leach pond | Water |
| Private/Native American | Public/private |
| Private/The Nature Conservancy | Public/private |
| Private/power withdrawal and classifications | Public/private |
| Private/protective withdrawal | Public/private |
| Private/public water reserve | Public/private |
| Private/USFS and BLM wilderness area | Public/private |
| Private/USFWS wildlife refuge | Public/private |
| Sovereign lands/wildlife management area | Public |
| Sovereign lands | Public |
| State trust | Public trust |

**Table B-4.** Continued 

| Ownership Types | Generalized Ownership Status |
|---|---|
| State park/recreation area | Public |
| State wildlife reserves | Public |
| State/DOD | Public |
| USFWS national wildlife refuge | Public |
| Water | Water |
| Wilderness area/protective withdrawal/USFS | Public |
| Wilderness area/USFS | Public |

allow clear delineation of all wildlife habitats discernable from aerial photographs of the project area. The wildlife habitat classification scheme was therefore updated for this GIS analysis to include the following readily identifiable habitats: open water, emergent marsh, wet meadow, mudflat/pickleweed, riparian, salt desert scrub, pasture, cropland, and developed/urban. The wildlife habitat types were determined by the wildlife technical team (WTT) (consisting of ecologists and biologists from FHWA, the Corps, and UDOT, and their representative technical consultants) to be appropriate for the analysis of existing wildlife habitats.

Using 1997 aerial photographs and existing GIS land use maps, UDOT and Utah Division of Wildlife Resources (UDWR) biologists, with assistance from local wildlife ecologists, mapped all areas of each of these habitats within the project study area. Most of the wetland habitats (emergent marsh, wet meadow, mudflat/pickleweed, open water) had been previously delineated for the Final EIS and only needed verification. The boundaries of other areas that had not been included in the original delineation submitted to the Corps (Baseline Data Inc. et al. 1998) to support the Clean Water Act Section 404 permit, such as riparian habitat, were also surveyed for this GIS analysis to more accurately define wildlife habitat.

Other upland areas such as scrub, pasture, cropland, and developed areas were best defined by existing GIS data layers used for the Final EIS. This information was based on the 1988 water-related land use data inventory conducted by the UDNR, Division of Water Resources, and the 1997 Davis County irrigated cropland data. However, for purposes of this analysis, the land use classifications in the dataset were consolidated by the WWT from specific land use categories into more general wildlife habitat categories, as described in Table B-4.

The maps of all of the wildlife habitats were integrated into a consolidated GIS map. The final wildlife habitat map was reviewed and approved both by the WTT and the science technical team (STT) (consisting of the WTT members and wildlife biologists and technical experts from USFWS, EPA, and UDNR.)

### Identification of Inundation Zones

The inundation zones were identified for this GIS analysis using an elevation band dataset created from a 10-meter USGS DEM. The elevation intervals were set at 4 ft, starting at the 1,281-m (4,204-ft) elevation and ending at the 1,286-m (4,220-ft) elevation. These intervals were selected based on the intervals defined in the *Great Salt Lake Comprehensive Management Plan Resource Document* (Department of Natural Resources 2000). The percentage of probability that the lake level would occur within these intervals was also obtained from this report.

The 10-m DEM was selected because it covered the entire study area, was the best available for the entire study area, and could be used to create the intervals defined in the *Great Salt Lake Comprehensive Management Plan Resource Document*. The national elevation dataset (30-meter DEMs), the high-resolution elevation data that was used in the Final EIS, as well as other contour datasets, were evaluated for use in this analysis but were not selected because of their lower levels of resolution, incomplete coverage of the project study area, and insufficient data (i.e., a single contour line rather than multiple contour lines).

### Evaluation of the Effect of Great Salt Lake Dynamics on Habitat Availability

The effects of Great Salt Lake dynamics in conjunction with the Legacy Parkway project on the availability of terrestrial habitat was evaluated by calculating (1) the total area of each available habitat in each inundation interval, and (2) the areal intersection of each right-of-way with mapped habitat patches in each interval. The inundation intervals were overlaid on the habitat map; any terrestrial habitat patch that occurred across adjacent intervals was divided along the interval boundary. The extent of habitat that would be affected by each alternative at the various lake levels (i.e., above each successive inundation interval) was calculated using the equations provided below.

The effects of Great Salt Lake dynamics in conjunction with the Legacy Parkway project on the availability of open water habitat was evaluated using the same equations as the terrestrial habitat impacts. However, open water habitats were assumed to be fresh water. Because rising lake levels introduce salinity to freshwater habitats as they are inundated, open water polygons that occurred across interval boundaries were assigned to the lower interval.

The following equations were used to evaluate the percentage of available habitat that would be affected by the project alternative and inundation in each inundation interval.

- Percentage of habitat affected by the proposed right-of-way and inundation in the 1,281 m (4,204 ft) interval = ((1x)+(13x-7x)/14x))*10))
- Percentage of habitat affected by the proposed right-of-way and inundation in the 1,281–1,283 m (4,204 – 4,208 ft) = ((1x+2x)+(13x-7x –8x)/14x))*10))
- Percentage of habitat affected by the proposed right-of-way and inundation in the 1,283–1,284 m (4,208–4,212 ft) = ((1x+2x+3x)+(13x-7x –8x-9x)/14x))*10))
- Percentage of habitat affected by the proposed right-of-way and inundation in the 1,284–1,285 m (4,212–4,216 ft) = ((1x+2x+3x+4x)+(13x-7x –8x-9x-10x)/14x))*10))
- Percentage of habitat affected by the proposed right-of-way and inundation in the 1,285–1,286 m (4,216 – 4,220 ft) = ((1x+2x+3x+4x+6x)+(13x-7x –8x-9x-10x-11x)/14x))*10))

<u>Definitions of the variables</u>

1x = acres of habitat in the study area in inundation interval 1,281m (4204 ft)

2x = acres of habitat in the study area in inundation interval 1,281–1,283 m (4204–4208 ft)

3x = acres of habitat in the study area in inundation interval 1,283–1,284 m (4208–4212 ft)

4x = acres of habitat in the study area in inundation interval 1,284–1,285 m (4,212–4,216 ft)

5x = acres of habitat in the study area in inundation interval 1,285 – 1,286m (4,216-4,220ft)

6x = acres of habitat in the study area in inundation interval >1,286 m (>4,220 ft)

7x = acres of habitat in the right-of-way in inundation interval 1,281 m (4,204 ft)

8x = acres of habitat in the right-of-way in inundation interval 1,281–1,283 m (4,204–4,208 ft)

9x = acres of habitat in the right-of-way in inundation interval 1,283–1,284 m (4,208–4,212 ft)

10x = acres of habitat in the right-of-way in inundation interval 1,284–1,285 m (4,212–4,216 ft)

11x = acres of habitat in the right-of-way in inundation interval 1,285–1,286 m (4,216–4,220 ft)

12x = acres of habitat in the right-of-way in inundation interval >1,286 m (>4,220 ft)

13x = total acres of habitat in the right-of-way

14x = total acres of habitat in the study area

## *Fragmentation Analysis: Patch Size, Nearest Neighbor Distances, and Perimeter-to-Area Ratio*

### Summary Statistics for Patch Size Distribution

The analysis of patch size in Chapter 3 describes the distribution of patch sizes and the summary statistics of mean and median patch size. In addition to those summary statistics, standard deviation and the coefficient of variation were calculated for each individual habitat (Table B-5) and for the generalized categories of upland and wetlands (Table B-6). The standard deviation and coefficient of variation were not included in the final analysis because the data are not normally distributed and the results did not provide additional information about the distribution of patch sizes that was not already described by the other metrics.

### Analysis and Summary Statistics for Nearest Neighbor Distances

The nearest neighbor distance and summary statistics are often used to determine the ability of species to move from patch to patch. If the nearest neighbor distances become too great, species cannot disperse among patches. In the case of Legacy Parkway, the road would divide the project study area into multiple contiguous areas (two landscapes [contiguous area on one side of the proposed alignment] under Alternatives A, C, and E; three landscapes under Alternative B) (Figure B-1). This division of the landscape presents some difficulty in calculating and interpreting the results because of the manner in which the nearest neighbor distances are calculated. If the proposed project alignments are simply added to the dataset and the nearest neighbor distances are calculated, then there is the potential for any patch that is divided by the proposed highway to result in an increase in the number of patches that are close together. Under the No-Build Alternative, the number of these close-together patches might be smaller because all of the patches are whole polygons (undivided by the proposed highway) and are further away from each other. The assumption is that the proposed highway would be a barrier to some species (species that cannot fly over the road or disperse through the culverts); the nearest neighbor distance can then be calculated for each individual landscape.

#### *Methods*

The nearest neighbor distances were calculated using the ArcView3.2 Patch Analyst extension. The nearest neighbor distances were calculated for the No-Build Alternative and for each contiguous area under each build alternative (FigureB-1).

#### *Discussion*

The nearest neighbor distances were calculated for each landscape, but the results can potentially be misleading. For upland habitats, nearest neighbor distance would decrease under the proposed build alternatives compared to the No-Build Alternative (Table B-7). The decrease in mean nearest neighbor distance might be expected to be a benefit for wildlife; however, that does not take into account that what is a single landscape under the No-Build Alternative would be two or three distinct areas under any of the build alternatives. For wetland habitats, mean nearest neighbor distances in the area east of the proposed alignments would increase under the proposed build alternatives, but the nearest neighbor distances would remain essentially the same in the western and northern areas. Open water would have larger mean nearest neighbor distances under the proposed build alternatives than the other habitats, but that reflects the low number of open water habitat patches in the study area. For open water habitat, mean nearest neighbor distance in the eastern area would increase under the proposed build alternatives and remain similar in the western sections; the mean nearest neighbor distances in the northern section of Alternative B would also be larger compared to the No-Build Alternative.

The majority of upland and wetland patches in the landscape under all proposed build alternatives would be within 50 m (164 ft) of another habitat patch.

## Mean Perimeter-to-Area Ratio

Perimeter-to-area ratio is often used to describe the complexity of the different shapes of habitat patches. Patches with low perimeter-to-area ratio tend to be fairly simple shapes with large core area. As the complexity of the shape increases, increasing edge area, the perimeter-to-area ratio increases. Changes in perimeter-to-area ratio affect wildlife in a variety of ways. Habitats with high perimeter-to-area ratios favor edge species and disadvantage species that require large core area. Some habitats inherently have high perimeter-to-area ratio; for example, some wetlands have long narrow areas that reflect the topography in which they are located. Perimeter-to-area ratio provides some useful information, but it should be interpreted in the context of the landscape in which the patches are located.

### *Methods*

The mean perimeter-to-area ratios for the generalized wetland, upland, and open water categories, as well as the more specific habitats, were calculated using the ArcView3.2 Patch Analyst extension. The calculations were conducted for the No-Build Alternative and each build alternative.

### *Discussion*

The results of the perimeter-to-area ratio calculations are inconclusive (Table B-8). For cropland, there would be very little change in the perimeter-to-area ratio. Other habitats such as emergent marsh, mudflat/pickleweed, open water, scrub, and wet meadow would have more complex shapes with the addition of the proposed highway. The perimeter-to-area ratio for pasture decreases with implementation of the build alternatives, indicating a decrease in the complexity of the shapes. Riparian has mixed results; some of the alternatives would result in more complex shapes than the No-Build Alternative, others less complex. Both pasture and cropland have fairly simple shapes under the No-Build Alternative, and the addition of the build alternatives would not greatly change the general simplicity of the habitat patches. The other habitat types are generally more complex in shape and often have smaller polygons, which would be divided with implementation of the build alternatives, increasing the perimeter-to-area ratio.

The final step in the evaluation of perimeter-to-area ratio is to evaluate individual species responses to the changes in ratio. Currently, data on the response of specific species to changes in ratio are unavailable for the species of concern in the study area. The literature indicates that effects have been found with change in perimeter-to-area ratio, but the results from this analysis cannot be evaluated for individual species. Overall, the effects of direct habitat loss would have a greater impact on wildlife species then the changes in the perimeter-to-area ratio.

**Table B-5.** Summary of Habitat Fragmentation Statistics by Habitat Type Resulting from Build Alternatives 

| Habitat Type | Alternative | | Number of Patches in Each Size Class | | | | | Summary Statistics (Acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | <1 | 1–10 | 10–50 | 50–100 | >100 | Number of Patches | Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
| Cropland | No Action | | 25 | 18 | 18 | 5 | 4 | 70 | 24.76 | 4.49 | 0.06 | 56.43 |
| | Alternative A | Patches Fragmented | 2 | 2 | 7 | 3 | 3 | | | | | |
| | | Total Patches | 30 | 22 | 19 | 8 | 3 | 82 | 19.46 | 4.33 | 0.04 | 34.94 |
| | Alternative B | Patches Fragmented | 3 | 6 | 11 | 5 | 4 | | | | | |
| | | Total Patches | 33 | 25 | 28 | 7 | 2 | 95 | 15.61 | 4.33 | 0.04 | 26.27 |
| | Alternative C | Patches Fragmented | 2 | 2 | 7 | 3 | 3 | | | | | |
| | | Total Patches | 32 | 26 | 21 | 4 | 5 | 88 | 18.34 | 3.35 | 0.05 | 37.84 |
| | Alternative E | Patches Fragmented | 2 | 1 | 6 | 1 | 3 | | | | | |
| | | Total Patches | 31 | 21 | 20 | 8 | 3 | 83 | 19.31 | 4.33 | 0.04 | 34.68 |
| Emergent Marsh | No Action | | 68 | 41 | 9 | 2 | 1 | 121 | 5.84 | 0.73 | 0.08 | 17.80 |
| | Alternative A | Patches Fragmented | 4 | 8 | 3 | | | | | | | |
| | | Total Patches | 77 | 45 | 7 | 2 | 1 | 132 | 5.19 | 0.62 | 0.08 | 16.99 |
| | Alternative B | Patches Fragmented | 18 | 9 | 4 | 1 | 1 | | | | | |
| | | Total Patches | 71 | 41 | 8 | 2 | 1 | 123 | 5.35 | 0.72 | 0.08 | 17.29 |
| | Alternative C | Patches Fragmented | 9 | 9 | 5 | 1 | | | | | | |
| | | Total Patches | 70 | 41 | 9 | 2 | 1 | 123 | 5.59 | 0.72 | 0.08 | 17.41 |
| | Alternative E | Patches Fragmented | 6 | 9 | 2 | | | | | | | |
| | | Total Patches | 76 | 40 | 9 | 2 | 1 | 128 | 5.33 | 0.60 | 0.08 | 17.26 |
| Mudflat/Pickleweed | No Action | | 211 | 61 | 6 | 1 | | 279 | 1.58 | 0.26 | 0.10 | 6.23 |
| | Alternative A | Patches Fragmented | 7 | 4 | | | | | | | | |
| | | Total Patches | 208 | 60 | 6 | 1 | | 275 | 1.58 | 0.25 | 0.10 | 6.26 |

| | | | Number of Patches in Each Size Class | | | | | Summary Statistics (Acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat Type | Alternative | | <1 | 1–10 | 10–50 | 50–100 | >100 | Number of Patches | Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
| | Alternative B | Patches Fragmented | 20 | 16 | 1 | | | | | | | |
| | | Total Patches | 224 | 56 | 5 | 1 | | 286 | 1.47 | 0.24 | 0.10 | 6.13 |
| | Alternative C | Patches Fragmented | 26 | 18 | 1 | | | | | | | |
| | | Total Patches | 221 | 54 | 6 | 1 | | 282 | 1.45 | 0.22 | 0.11 | 6.17 |
| | Alternative E | Patches Fragmented | 17 | 9 | | | | | | | | |
| | | Total Patches | 212 | 57 | 6 | 1 | | 276 | 1.53 | 0.24 | 0.10 | 6.25 |
| Open Water | No Action | | 25 | 12 | 4 | 1 | 1 | 43 | 7.27 | 0.69 | 0.07 | 20.92 |
| | Alternative A | Patches Fragmented | 2 | | 2 | 1 | | | | | | |
| | | Total Patches | 28 | 15 | 3 | 1 | 1 | 48 | 6.31 | 0.61 | 0.08 | 19.36 |
| | Alternative B | Patches Fragmented | 1 | 1 | 2 | 1 | | | | | | |
| | | Total Patches | 28 | 14 | 4 | | 1 | 47 | 6.09 | 0.74 | 0.08 | 18.97 |
| | Alternative C | Patches Fragmented | 2 | | 2 | | | | | | | |
| | | Total Patches | 28 | 14 | 4 | 1 | 1 | 48 | 6.31 | 0.64 | 0.08 | 19.40 |
| | Alternative E | Patches Fragmented | 2 | | 2 | 1 | | | | | | |
| | | Total Patches | 26 | 14 | 4 | 1 | 1 | 46 | 6.41 | 0.69 | 0.07 | 19.41 |
| Pasture | No Action | | 65 | 23 | 16 | 7 | 7 | 118 | 25.11 | 0.45 | 0.10 | 97.38 |
| | Alternative A | Patches Fragmented | 5 | 5 | 8 | 4 | 6 | | | | | |
| | | Total Patches | 84 | 45 | 19 | 3 | 7 | 158 | 17.42 | 0.79 | 0.12 | 81.73 |
| | Alternative B | Patches Fragmented | 2 | 6 | 8 | 5 | 6 | | | | | |
| | | Total Patches | 95 | 37 | 26 | 6 | 6 | 170 | 15.54 | 0.45 | 0.10 | 64.41 |
| | Alternative C | Patches Fragmented | 5 | 8 | 5 | 5 | 6 | | | | | |
| | | Total Patches | 79 | 35 | 25 | 4 | 6 | 149 | 18.55 | 0.83 | 0.11 | 83.92 |
| | Alternative E | Patches Fragmented | 4 | 5 | 6 | 6 | 6 | | | | | |

| Habitat Type | Alternative | | Number of Patches in Each Size Class: <1 | 1–10 | 10–50 | 50–100 | >100 | Summary Statistics (Acres): Number of Patches | Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total Patches | 85 | 39 | 19 | 7 | 5 | 155 | 17.71 | 0.72 | 0.11 | 82.02 |
| Riparian | No Action | | 9 | 16 | 1 | | | 26 | 2.73 | 1.61 | 0.03 | 3.62 |
| | Alternative A | Patches Fragmented | 5 | 6 | | | | | | | | |
| | | Total Patches | 9 | 16 | 1 | | | 26 | 2.58 | 1.61 | 0.03 | 3.57 |
| | Alternative B | Patches Fragmented | 5 | 10 | | | | | | | | |
| | | Total Patches | 15 | 13 | 1 | | | 29 | 2.25 | 0.92 | 0.04 | 3.50 |
| | Alternative C | Patches Fragmented | 5 | 9 | | | | | | | | |
| | | Total Patches | 9 | 15 | 1 | | | 25 | 2.64 | 1.61 | 0.03 | 3.61 |
| | Alternative E | Patches Fragmented | 5 | 7 | | | | | | | | |
| | | Total Patches | 5 | 16 | 1 | | | 22 | 3.04 | 2.04 | 0.03 | 3.71 |
| Scrub | No Action | | 57 | 29 | 6 | 1 | 1 | 94 | 13.64 | 0.49 | 0.19 | 104.57 |
| | Alternative A | Patches Fragmented | 3 | 2 | | | 1 | | | | | |
| | | Total Patches | 61 | 30 | 8 | 2 | 3 | 104 | 10.89 | 0.56 | 0.12 | 52.38 |
| | Alternative B | Patches Fragmented | 1 | 4 | 3 | | 1 | | | | | |
| | | Total Patches | 68 | 35 | 5 | 1 | 4 | 113 | 10.49 | 0.49 | 0.11 | 47.56 |
| | Alternative C | Patches Fragmented | 2 | 4 | 5 | | 1 | | | | | |
| | | Total Patches | 70 | 39 | 4 | 3 | 2 | 118 | 9.42 | 0.57 | 0.13 | 48.37 |
| | Alternative E | Patches Fragmented | 1 | 2 | | | 1 | | | | | |
| | | Total Patches | 66 | 31 | 8 | 2 | 3 | 110 | 10.33 | 0.49 | 0.12 | 50.08 |

| Habitat Type | Alternative | | Number of Patches in Each Size Class | | | | | Summary Statistics (Acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | <1 | 1–10 | 10–50 | 50–100 | >100 | Number of Patches | Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
| Wet Meadow | No Action | | 176 | 109 | 23 | 2 | 1 | 311 | 3.60 | 0.85 | 0.08 | 10.93 |
| | Alternative A | Patches Fragmented | 22 | 39 | 6 | 1 | 1 | | | | | |
| | | Total Patches | 200 | 97 | 22 | 2 | 1 | 322 | 3.26 | 0.71 | 0.08 | 10.50 |
| | Alternative B | Patches Fragmented | 35 | 43 | 10 | 2 | 1 | | | | | |
| | | Total Patches | 190 | 96 | 25 | 3 | | 314 | 3.26 | 0.72 | 0.06 | 8.26 |
| | Alternative C | Patches Fragmented | 30 | 38 | 7 | 1 | 1 | | | | | |
| | | Total Patches | 198 | 96 | 20 | 4 | | 318 | 3.23 | 0.71 | 0.07 | 8.75 |
| | Alternative E | Patches Fragmented | 27 | 40 | 5 | 1 | 1 | | | | | |
| | | Total Patches | 193 | 95 | 23 | 2 | 1 | 314 | 3.35 | 0.72 | 0.08 | 10.65 |

**Table B-6.** Summary of Habitat Fragmentation Statistics by Habitat Category Resulting from Build Alternatives



| Habitat Category | Alternative | | Number of Patches in Each Size Class: <1 | 1–10 | 10–50 | 50–100 | >100 | **Total Number of Patches** | Summary Statistics (acres): Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upland | No Action | | 147 | 70 | 40 | 13 | 12 | **282** | 21.20 | 0.79 | 0.11 | 91.82 |
| | Alternative A | Patches Fragmented | 10 | 9 | 15 | 7 | 10 | | | | | |
| | | Total Patches | 175 | 97 | 46 | 13 | 13 | **344** | 15.93 | 0.90 | 0.10 | 64.81 |
| | Alternative B | Patches Fragmented | 6 | 16 | 22 | 10 | 11 | | | | | |
| | | Total Patches | 196 | 97 | 59 | 14 | 12 | **378** | 14.05 | 0.84 | 0.09 | 52.16 |
| | Alternative C | Patches Fragmented | 9 | 14 | 17 | 8 | 10 | | | | | |
| | | Total Patches | 181 | 100 | 50 | 11 | 13 | **355** | 15.46 | 0.94 | 0.10 | 64.08 |
| | Alternative E | Patches Fragmented | 7 | 8 | 12 | 7 | 10 | | | | | |
| | | Total Patches | 182 | 91 | 47 | 17 | 11 | **348** | 15.76 | 0.79 | 0.10 | 63.95 |
| Wetlands | No Action | | 464 | 227 | 39 | 5 | 2 | **737** | 3.17 | 0.60 | 0.09 | 10.95 |
| | Alternative A | Patches Fragmented | 38 | 57 | 9 | 1 | 1 | | | | | |
| | | Total Patches | 494 | 218 | 36 | 5 | 2 | **755** | 2.96 | 0.48 | 0.09 | 10.67 |
| | Alternative B | Patches Fragmented | 78 | 78 | 15 | 3 | 2 | | | | | |
| | | Total Patches | 500 | 206 | 39 | 6 | 1 | **752** | 2.88 | 0.48 | 0.08 | 9.70 |
| | Alternative C | Patches Fragmented | 70 | 74 | 13 | 2 | 1 | | | | | |
| | | Total Patches | 498 | 206 | 36 | 7 | 1 | **748** | 2.93 | 0.45 | 0.08 | 9.96 |
| | Alternative E | Patches Fragmented | 55 | 65 | 7 | 1 | 1 | | | | | |
| | | Total Patches | 486 | 208 | 39 | 5 | 2 | **740** | 3.01 | 0.45 | 0.09 | 10.79 |

**Table B-6.** Continued

| Habitat Category | Alternative | | Number of Patches in Each Size Class | | | | | | Summary Statistics (acres) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | <1 | 1–10 | 10–50 | 50–100 | >100 | **Total Number of Patches** | Mean Patch Size | Median Patch Size | Patch Size Coefficient of Variance | Standard Deviation |
| Open Water | No Action | | 25 | 12 | 4 | 1 | 1 | **43** | 7.27 | 0.69 | 0.07 | 20.92 |
| | Alternative A | Patches Fragmented | 2 | | 2 | 1 | 0 | | | | | |
| | | Total Patches | 28 | 15 | 3 | 1 | 1 | **48** | 6.31 | 0.61 | 0.08 | 19.36 |
| | Alternative B | Patches Fragmented | 1 | 1 | 2 | 1 | 0 | | | | | |
| | | Total Patches | 28 | 14 | 4 | 0 | 1 | **47** | 6.09 | 0.74 | 0.08 | 18.97 |
| | Alternative C | Patches Fragmented | 2 | 0 | 2 | 0 | 0 | | | | | |
| | | Total Patches | 28 | 14 | 4 | 1 | 1 | **48** | 6.31 | 0.64 | 0.08 | 19.40 |
| | Alternative E | Patches Fragmented | 2 | 0 | 2 | 1 | 0 | | | | | |
| | | Total Patches | 26 | 14 | 4 | 1 | 1 | **46** | 6.41 | 0.69 | 0.07 | 19.41 |

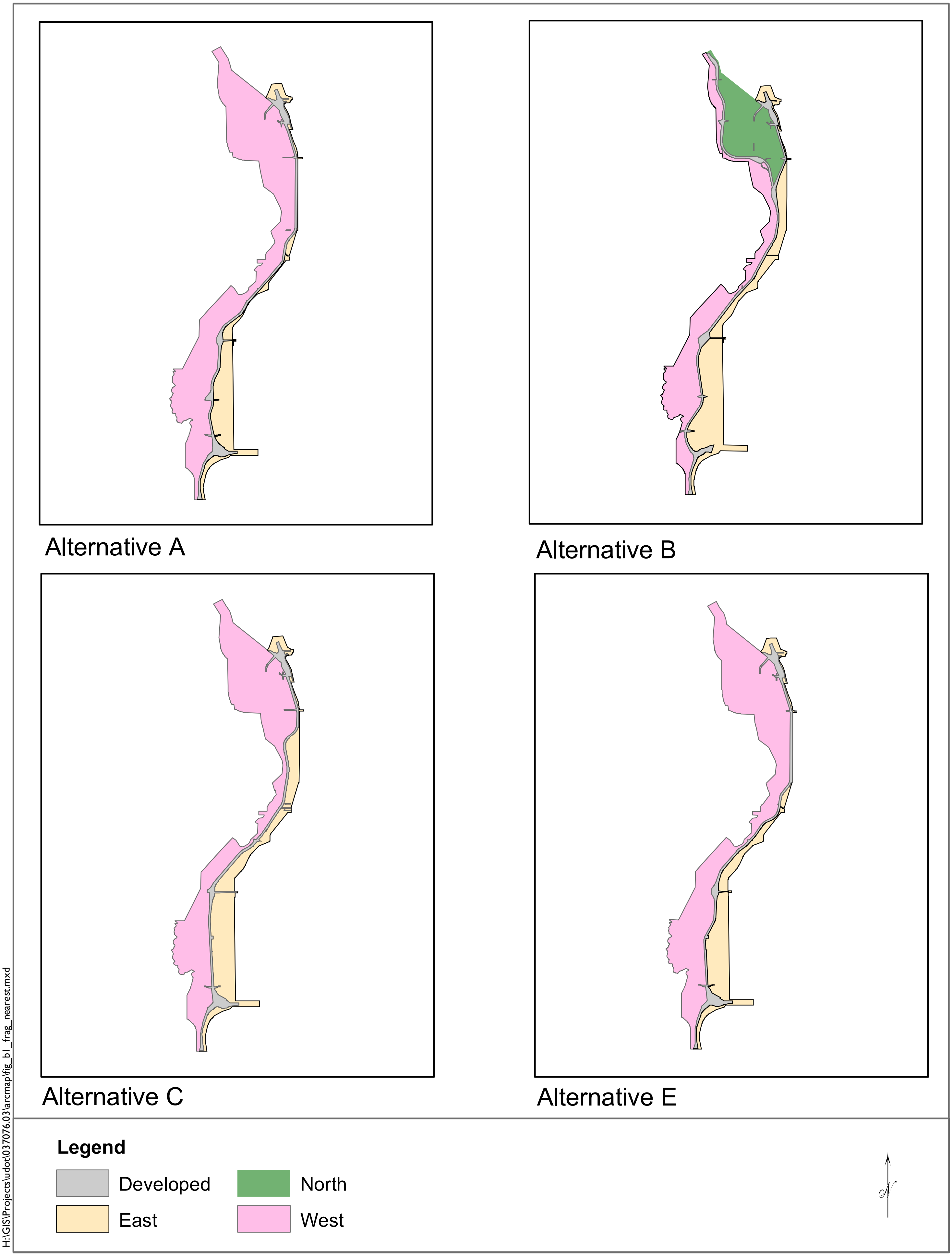




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**Figure B-1**
**Contiguous Area of Habitat After Implementation of Proposed Alternatives**

**Table B-7.** Nearest Neighbor Distance Distribution and Summary Statistics 

| | | | Nearest Neighbor Distance (meters) | | | | | Nearest Neighbor Summary Statistics (meters) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat | | Study Area | 0–10 | 10–20 | 20–50 | 5–100 | >100 | Mean | Median | Standard Deviation | Coefficient of Variation (CV) |
| Upland | No Action | Project Study Area | 92 | 34 | 22 | 2 | 4 | 99.05 | 57.75 | 155.63 | 157.12 |
| | Alternative A | East | 22 | 7 | 12 | 4 | 4 | 27.97 | 12.00 | 38.15 | 136.40 |
| | Alternative A | West | 78 | 38 | 25 | 4 | 3 | 17.00 | 9.00 | 26.92 | 158.36 |
| | Alternative B | East | 54 | 17 | 13 | 5 | 3 | 17.69 | 7.50 | 27.35 | 154.56 |
| | Alternative B | West | 69 | 13 | 17 | 3 | 4 | 17.14 | 7.50 | 27.57 | 160.85 |
| | Alternative B | North | 22 | 18 | 5 | 1 | 3 | 26.46 | 14.03 | 37.05 | 140.00 |
| | Alternative C | East | 48 | 18 | 14 | 4 | 3 | 18.01 | 8.75 | 27.82 | 154.48 |
| | Alternative C | West | 75 | 28 | 20 | 2 | 5 | 22.27 | 9.00 | 50.32 | 225.99 |
| | Preferred Alternative (E) | East | 32 | 15 | 11 | 3 | 4 | 22.54 | 10.06 | 34.38 | 152.54 |
| | Preferred Alternative (E) | West | 75 | 34 | 20 | 3 | 3 | 16.59 | 9.00 | 28.78 | 173.41 |
| Wetland | No Action | Project Study Area | 221 | 134 | 103 | 35 | 31 | 29.91 | 12.00 | 78.33 | 261.88 |
| | Alternative A | East | 20 | 9 | 25 | 12 | 21 | 87.58 | 35.78 | 123.60 | 141.14 |
| | Alternative A | West | 210 | 125 | 84 | 20 | 21 | 26.69 | 10.61 | 81.13 | 303.92 |
| | Alternative B | East | 53 | 40 | 37 | 18 | 18 | 44.54 | 17.13 | 77.75 | 174.56 |
| | Alternative B | West | 123 | 53 | 41 | 9 | 11 | 29.32 | 9.60 | 108.44 | 369.90 |
| | Alternative B | North | 45 | 46 | 33 | 7 | 7 | 26.46 | 14.03 | 37.05 | 140.00 |
| | Alternative C | East | 42 | 36 | 37 | 23 | 17 | 47.15 | 19.50 | 74.32 | 157.63 |
| | Alternative C | West | 181 | 94 | 74 | 17 | 18 | 27.75 | 10.61 | 87.64 | 315.79 |
| | Preferred Alternative (E) | East | 24 | 18 | 29 | 15 | 18 | 67.00 | 29.31 | 103.37 | 154.28 |
| | Preferred Alternative (E) | West | 192 | 110 | 83 | 28 | 18 | 27.62 | 11.42 | 82.84 | 299.89 |

| Habitat | | Study Area | Nearest Neighbor Distance (meters) 0–10 | 10–20 | 20–50 | 5–100 | >100 | Nearest Neighbor Summary Statistics (meters) Mean | Median | Standard Deviation | Coefficient of Variation (CV) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Open Water | No Action | Project Study Area | 9 | 12 | 8 | 3 | 13 | 154.07 | 17.13 | 301.51 | 195.70 |
| | Alternative A | East | 0 | 0 | 4 | 1 | 2 | 829.06 | 45.22 | 1643.28 | 198.21 |
| | Alternative A | West | 11 | 12 | 6 | 3 | 11 | 116.59 | 19.56 | 240.28 | 206.09 |
| | Alternative B | East | 0 | 0 | 4 | 0 | 5 | 751.89 | 112.06 | 1278.60 | 170.05 |
| | Alternative B | West | 9 | 10 | 4 | 3 | 7 | 145.06 | 18.55 | 537.81 | 370.75 |
| | Alternative B | North | 0 | 2 | 2 | 0 | 3 | 365.61 | 22.50 | 476.28 | 130.27 |
| | Alternative C | East | 0 | 0 | 4 | 0 | 4 | 519.45 | 281.52 | 702.55 | 135.25 |
| | Alternative C | West | 12 | 12 | 6 | 3 | 9 | 105.51 | 18.55 | 240.55 | 227.99 |
| | Preferred Alternative (E) | East | 0 | 0 | 4 | 0 | 2 | 524.15 | 45.22 | 820.07 | 156.46 |
| | Preferred Alternative (E) | West | 11 | 12 | 6 | 3 | 11 | 116.37 | 19.56 | 240.38 | 206.57 |

Note: The numbers of patches in each nearest neighbor distances classes will not total to the number in the project study area

**Table B-8**. Mean Perimeter-to-Area Ratio

| Alternative | Cropland | Developed | Emergent Marsh | Mudflat/ Pickleweed | Open Water | Pasture | Riparian | Scrub | Wet Meadow |
|---|---|---|---|---|---|---|---|---|---|
| Alternative A | 0.37 | 8.78 | 0.19 | 0.29 | 0.21 | 31.06 | 0.18 | 0.15 | 0.16 |
| Alternative B | 0.34 | 9.38 | 0.19 | 0.38 | 0.18 | 28.90 | 0.22 | 0.20 | 0.16 |
| Alternative C | 0.37 | 8.22 | 0.31 | 0.40 | 0.22 | 33.27 | 0.21 | 0.22 | 0.15 |
| Preferred Alternative (E) | 0.38 | 8.52 | 0.23 | 0.32 | 0.17 | 31.61 | 0.16 | 0.22 | 0.15 |
| No Build | 0.39 | 6.65 | 0.15 | 0.28 | 0.17 | 41.41 | 0.18 | 0.14 | 0.13 |

## B.2.2 Regional-Level Analysis Methods

### *Regional Study Area*

The regional study area was defined by the portion of the GSLE that included hydrologic units that drain to the eastern shore of Great Salt Lake, are below 1,433 m (4,700 ft), and for which GIS land use data are available. This area extends from the southern Utah Lake to the northern reaches of the Bear River in Utah. It does not include the upstream reaches of the Bear River beyond the Utah/Idaho border or Cache Valley. When appropriate, the data was analyzed at the regional study area and by hydrologic unit. The hydrologic units used in this series of analysis are modified versions of the USGS hydrologic units. The hydrologic units were generalized to reduce the number of units analyzed while still retaining the distinct geographic areas. The area below 1,433 m (4,700 ft) was included because the migratory species that use the habitats in the project study area are most likely to use habitat in this area. The 1,433-m (4,700-ft) elevation boundary identifies the approximate transition between the lowland habitat and the higher elevation habitats.

### *Regional Habitat Availability Analysis Methods*

The calculation of habitat availability in the regional study area provides a baseline of current conditions. This information can be used to compare current conditions to historic habitat availability as well as to evaluate potential future habitat loss at a regional scale.

A GIS-based analysis was conducted to determine the current habitat availability for the regional study area. To evaluate available habitat, the NLCD and the NWI datasets were combined to create a single land cover dataset, which includes wetlands for the regional study area. The NLCD represents land cover types and can be used for assessing wildlife habitat, water quality, pesticide runoff, and land use change. The NLCD land cover classes were crosswalked to the habitat classification used at the project study area scale analysis (Table B-2). The NWI dataset includes wetland areas in Utah as determined by the USFWS. The wetlands are categorized into several wetland classes and flooding regimes (Cowardin et al. 1979). The NWI data was mapped at a scale of 1:24,000. For this analysis the NWI classes were reclassified to match as closely as possible the wildlife habitat definitions used at the project study area-scale analysis, which used a finer scale of information (Table B-3).

The scale used for the regional study area mapping is a smaller geographic scale than that used for the project-level study area mapping. It is an appropriate scale for a regional analysis, but it results in a variation in the acres of wetland habitat calculated between the regional-level and the project-level analysis. Because of this variation in scale and the corresponding variation in area calculations between the two study areas, representative comparisons between the two acreages cannot necessarily be made.

### *Effects of the Dynamics of Great Salt Lake on Habitat Availability*

The effect of inundation on habitat availability is important on both the project level and the regional level. Analyzing the availability of habitat at different lake levels can identify the habitat areas that are more likely to be flooded and the habitats that are more likely to be available regardless of lake level.

Two different lake levels were used in this analysis. The low-water level was represented by the area classified as open water in the land cover dataset used in the habitat availability analysis. This dataset was used to represent the low lake level because the NWI and NLCD data was not mapped at lower water (i.e., it is not possible to extrapolate the available habitat beyond the mapped extent.) The high-water dataset was based on the University of Utah Mapping and Monitoring Great Salt Lake Dynamics (1972–1996) project 1984 lake level dataset. The 1984 lake level was the highest lake level in the university datasets that were provided (Figure B-2). The 1987 lake level was very similar to that compiled in 1984 but appeared to be lower from a visual inspection of the two datasets. The datasets should not be viewed as representing a specific inundation level, but rather as an example of low-water and high-water conditions.

# B.3 Results and Conclusions

The regional study is dominated by upland habitat at both low and high water. The wetland wildlife habitats represent a small portion of the regional study area. Emergent marsh represents 4 percent of the regional study area at low water and 2 percent at high water. Mudflat/pickleweed represents 15 percent at low water and 6 percent at high water. Wet meadow represents 9 percent at low water and 7 percent at high water. Table B-9 illustrates the variation in different habitat types across the region at low and high water.

**Table B-9.** Distribution of Available Habitat in Regional Study Area at Low and High Water

| | Low Water | | High Water | |
|---|---|---|---|---|
| Habitat Type | acres | % | acres | % |
| Cropland | 175,019 | 14 | 174,472 | 16 |
| Developed | 164,958 | 13 | 164,569 | 15 |
| Emergent Marsh | 48,586 | 4 | 21,200 | 2 |
| Mudflat/Pickleweed | 185,195 | 15 | 66,217 | 6 |
| Pasture | 330,198 | 26 | 328,137 | 31 |
| Riparian | 4,954 | <1 | 4,365 | <1 |
| Scrub | 211,684 | 17 | 208,280 | 20 |
| Forested Upland | 22,369 | 2 | 22,235 | 2 |
| Wet Meadow | 107,639 | 9 | 77,505 | 7 |
| Total Area | 1,250,602 | 100 | 1,066,981 | 100 |

Table B-10 illustrates the distribution of the habitat types in the region across each of the hydrologic units. For example, 46 percent of the mudflat/pickleweed habitat in the regional study area is located in the Bear River hydrologic unit, 13 percent is in the Jordan River, and 23 percent is in Tooele Valley; 55 percent of developed habitat in the region occurs in the Jordan River hydrologic unit, and 74 percent of the cropland is in the Bear River.

As the lake level fluctuates, the terrestrial habitats are converted to open water habitat, as shown in Table B-11. For example, 99 percent of the cropland in the Bear River hydrologic unit is available at high water, but only 38 percent of the mudflat/pickleweed available in the Bear River hydrologic unit is available at high water. Because the Bear River hydrologic unit contains 46 percent of the mudflat/pickleweed in the

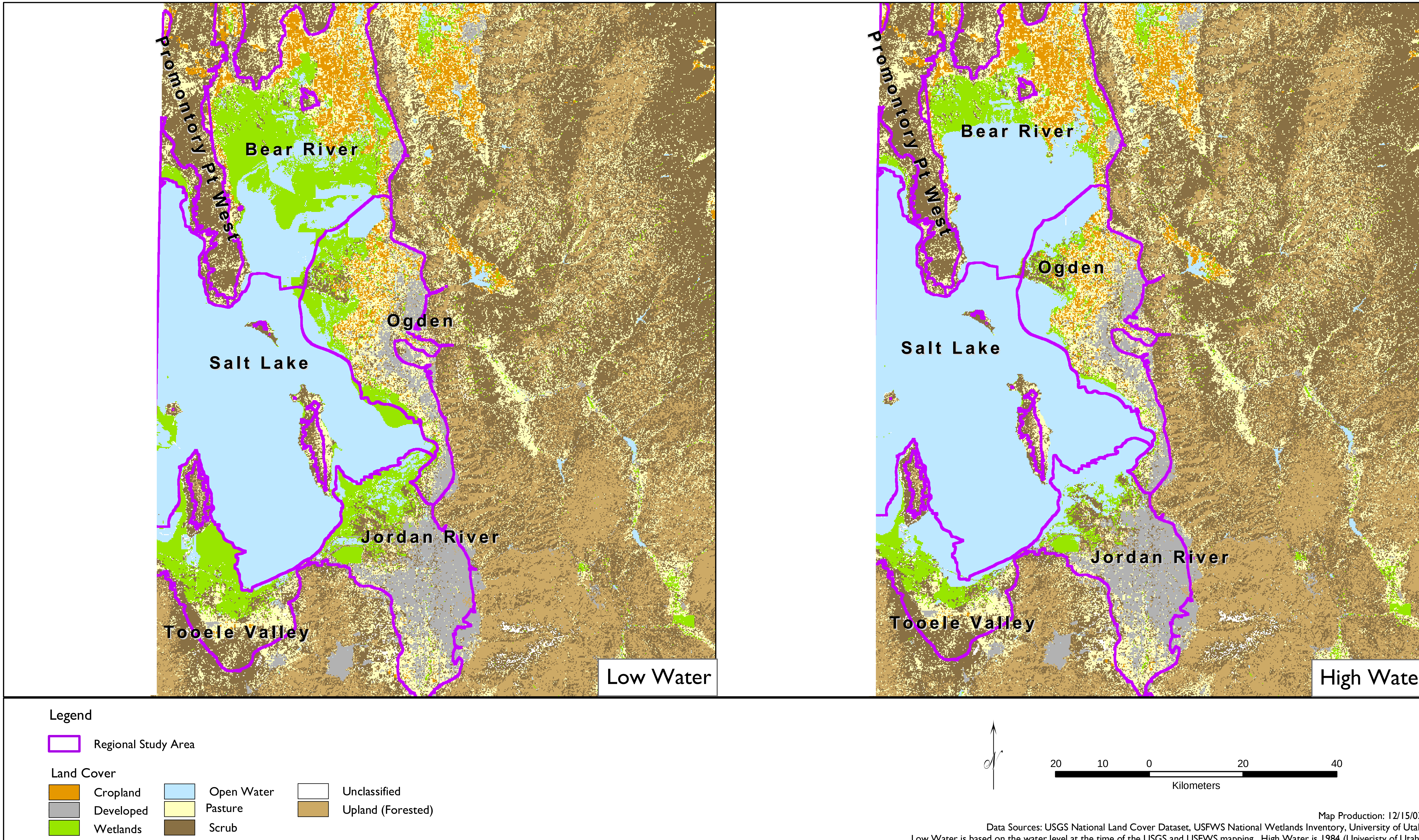


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**Figure B-2**
**Great Salt Lake High and Low Water Levels**

**Table B-10.** Distribution of Habitats by Hydrologic Unit at Low Water in the Regional Study Area

| | Bear River | | Jordan River | | Ogden | | Promontory Pt West | | Salt Lake | | Tooele Valley | | Utah Lake | | Study Area Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat Type | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % | Acres | % | Acres |
| Cropland | 84,507 | 74 | 627 | 1 | 22,987 | 20 | 1,047 | 1 | 0 | 0 | 589 | 1 | 3,985 | 4 | 113,742 |
| Developed | 5,180 | 3 | 87,588 | 55 | 40,650 | 25 | 8 | 0 | 77 | 0 | 3,163 | 2 | 22,750 | 14 | 159,416 |
| Emergent Marsh | 8,283 | 19 | 11,261 | 26 | 15,363 | 36 | 89 | 0 | 1,740 | 4 | 425 | 1 | 5,657 | 13 | 42,817 |
| Mudflat/Pickleweed | 84,797 | 46 | 24,065 | 13 | 13,045 | 7 | 3,747 | 2 | 14,608 | 8 | 43,120 | 23 | 1,533 | 1 | 184,915 |
| Pasture | 84,362 | 30 | 32,903 | 12 | 61,931 | 22 | 8,025 | 3 | 7,796 | 3 | 27,557 | 10 | 62,591 | 22 | 285,165 |
| Riparian | 1,566 | 42 | 188 | 5 | 1,490 | 40 | 32 | 1 | 59 | 2 | 188 | 5 | 205 | 6 | 3,728 |
| Scrub | 37,659 | 18 | 31,923 | 15 | 27,201 | 13 | 14,917 | 7 | 12,258 | 6 | 47,565 | 23 | 34,495 | 17 | 206,017 |
| Forested Upland | 433 | 2 | 8,053 | 36 | 4,905 | 22 | 1 | 0 | 598 | 3 | 2,231 | 10 | 5,864 | 27 | 22,084 |
| Wet Meadow | 44,377 | 45 | 8,601 | 9 | 17,201 | 17 | 819 | 1 | 887 | 1 | 13,265 | 13 | 13,989 | 14 | 99,139 |

**Table B-11.** Extent (acres) of Available Habitat in the Regional Study Area by Hydrologic Unit and Percentage Remaining at High Water

| Habitat Type | Bear River | | | Jordan River | | | Ogden | | | Promontory Pt West | | | Salt Lake | | | Tooele Valley | | | Utah Lake | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low Water | High Water | % | Low Water | High Water | % | Low Water | High Water | % | Low Water | High Water | % | Low Water | High Water | % | Low Water | High Water | % | Low Water | High Water | % |
| Cropland | 84,507 | 83,970 | 99 | 627 | 627 | 100 | 22,987 | 22,979 | 100 | 1,047 | 1,047 | 100 | 0 | 0 | 0 | 589 | 588 | 100 | 3,985 | 3,985 | 100 |
| Developed | 5,180 | 5,169 | 100 | 87,588 | 87,467 | 100 | 40,650 | 40,579 | 100 | 8 | 7 | 86 | 77 | 35 | 46 | 3,163 | 3,019 | 95 | 22,750 | 22,750 | 100 |
| Emergent Marsh | 8,283 | 3,509 | 42 | 11,261 | 2,428 | 22 | 15,363 | 3,302 | 21 | 89 | 89 | 100 | 1,740 | 118 | 7 | 425 | 327 | 77 | 5,657 | 5,657 | 100 |
| Mudflat/Pickleweed | 84,797 | 31,983 | 38 | 24,065 | 9,278 | 39 | 13,045 | 2,068 | 16 | 3,747 | 1,832 | 49 | 14,608 | 245 | 2 | 43,120 | 19,000 | 44 | 1,533 | 1,533 | 100 |
| Pasture | 84,362 | 82,785 | 98 | 32,903 | 32,835 | 100 | 61,931 | 61,841 | 100 | 8,025 | 8,015 | 100 | 7,796 | 7,632 | 98 | 27,557 | 27,404 | 99 | 62,591 | 62,591 | 100 |
| Riparian | 1,566 | 1,119 | 71 | 188 | 177 | 94 | 1,490 | 1,447 | 97 | 32 | 32 | 100 | 59 | 13 | 22 | 188 | 146 | 78 | 205 | 205 | 100 |
| Scrub | 37,659 | 36,326 | 96 | 31,923 | 31,421 | 98 | 27,201 | 26,808 | 99 | 14,917 | 14,888 | 100 | 12,258 | 11,698 | 95 | 47,565 | 46,977 | 99 | 34,495 | 34,495 | 100 |
| Forested Upland | 433 | 428 | 99 | 8,053 | 7,994 | 99 | 4,905 | 4,900 | 100 | 1 | 1 | 100 | 598 | 573 | 96 | 2,231 | 2,191 | 98 | 5,864 | 5,864 | 100 |
| Wet Meadow | 44,377 | 23,527 | 53 | 8,601 | 6,503 | 76 | 17,201 | 12,254 | 71 | 819 | 809 | 99 | 887 | 180 | 20 | 13,265 | 11,743 | 89 | 13,989 | 13,989 | 100 |

region, the conversion of 62 percent (52,814 acres) of this habitat to open water represents a large change in the availability of mudflat/pickleweed during high-water years. The percentage of change in habitat availability from low to high water illustrates the variation in the distribution of habitats within the hydrologic units. The temporary reduction in available habitat during high-water years varies by hydrologic unit and by habitat type. For example, cropland, developed, pasture, scrub, and upland habitat types in the Jordan and Ogden River hydrologic units are not affected by the lake level fluctuations, whereas emergent marsh, mudflat/pickleweed, and wet meadow habitats are converted to open water habitat as lake levels change. The data in Tables B-9, B-10, and B-11 can be used to identify which hydrologic units contain the most of each habitat type and the vulnerability the habitats in a hydrologic unit to the dynamics of Great Salt Lake.

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