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# *4.9 WETLANDS*

## INTRODUCTION

Wetlands are the transition zone between aquatic and upland habitats and USACE defines them as "those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and 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 (33 CFR 328.3b). Wetlands contribute numerous functions and values to society. For all wetland types, the economic value of wetland functions (flood attenuation, streambank stabilization, wildlife habitat, waste treatment, etc.) is about $7,635 per acre per year (Costanza et al. 1997, adjusted by Consumer Price Index to 2004 dollars by the NASA Consumer Price Index Inflation Calculator (NASA 2006)). Wetlands are present throughout the study area and are associated with natural drainages, seep areas, open water, and irrigation and roadside ditches.

In recognition of the importance of clean water and the ecological value of wetlands, in 1977 the U.S. Congress passed the Clean Water Act (CWA) to protect the physical, biological, and chemical quality of waters of the United States, including adjacent wetlands. The USACE Regulatory Program administers, and USEPA enforces, Section 404 of the Clean Water Act. Under Section 404, a USACE permit is required for the discharge of dredged or fill material into wetlands and waters of the United States. The CWA defines waters of the United States as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.

In addition to federal regulations, Colorado Senate Bill 40 requires that when any state agency plans include construction in a stream or its tributaries, the agency must receive certification from the Colorado Division of Wildlife that the project has minimized impacts to the stream and its riparian vegetation.

Public concerns expressed through the public involvement process regarding wetlands include adverse effects from roadway runoff, avoidance and minimization of wetland impacts, and replacement of functions and values of impacted wetlands. These concerns are addressed in **Section 4.8**, **Section 4.9.3**, and **Section 4.9.4**.

## 4.9.1 AFFECTED ENVIRONMENT

### 4.9.1.1 WETLANDS AND OPEN WATER

#### METHODS

USACE has developed the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) to standardize how the presence and boundaries of wetlands are determined. According to the manual, wetlands have the following three environmental characteristics:

1. Prevalence of wetland vegetation
2. Wetland hydrology
3. Hydric soils

Wetland vegetation, often called hydrophytic vegetation, is composed of plants that are adapted to or tolerate wet environments and are able to become established, grow, and reproduce in wet areas.

Wetland hydrology is present in areas where water has an overriding influence on the characteristics of vegetation and soils. These characteristics are commonly found in areas that are inundated (covered with water) or that have soils saturated continuously for at least 5 percent of the growing season (frost-free days) in most years (Environmental Laboratory 1987). In the Northwest Corridor study area, the frost-free season ranges from 126 to 142 days (NRCS 1980) and an area may have wetland hydrology if it is inundated or saturated for as few as 6.5 consecutive days during the growing season.

Hydric soils are soils that contain enough water during the growing season to allow anaerobic (lacking oxygen) conditions and characteristics to develop in their upper layers. Under anaerobic conditions, changes in soil chemistry produce characteristic indicators such as very dark soil, sulfidic (rotten egg) odor, or mottled soil.

In order to delineate wetlands in the Northwest Corridor study area, wetland scientists from the study team worked with the USACE Denver Regulatory Office to develop a process that worked with the alternatives screening process as it moved from general to specific alignments and alternatives.

During Level 2 screening, wetland scientists conducted preliminary wetland determinations for the entire study area. They identified approximately 2,142 acres of wetlands and 3,263 acres of waterbodies in the study area.

At the start of Level 3 screening, wetland scientists conducted more detailed wetland determinations within 100 feet of the proposed right-of-way of the build alternatives. They applied the reduced wetland assessment area for the remainder of screening. The scientists collected data on dominant vegetation, wetland plant associations (based on Colorado Natural Heritage Program's [CNHP] Field Guide to the Wetland and Riparian Plant Associations of Colorado [Carsey et al. 2003]), Cowardin wetland class (Cowardin et al. 1979), and basic wetland functions. Detailed wetland delineations and functional assessments were completed for representative wetlands in each wetland association. At the request of USACE, riparian areas were also mapped.

#### WETLANDS

Based on the detailed wetland determination studies, 173 wetland sites totaling approximately 61 acres are present within the reduced wetland assessment area. Wetlands are located throughout the landscape in association with natural drainages, seep areas, ponded sites, and irrigation and roadside ditches (see **Figure 4.9-1**, **Figure 4.9-2**, and **Figure 4.9-3**). The wetlands are distributed among five groupings of CNHP wetland plant associations, although some wetlands encompass several associations. From most to least common, the wetland plant associations are sandbar willow, cattail/bulrush, grass, sedge/rush, and peach-leaved willow. All of the wetland plant associations are in the Cowardin palustrine system (non-tidal wetlands dominated by trees, shrubs, and emergent vegetation). Wetland classes within the palustrine system include emergent (cattail/bulrush, grass, sedge/rush) and scrub-shrub (sandbar willow, peach-leaved willow). Some wetlands have areas of aquatic bed vegetation (algae, duckweed).

Level 3C Screening identified the following wetland plant communities:

- *Cattail/Bulrush Wetland Plant Association*—Cattail/bulrush wetlands are herbaceous marshes in the palustrine emergent wetland class. At their margins, most cattail/bulrush wetlands transition into smaller areas of grass, sedge/rush, and sandbar willow wetlands. Cattail/bulrush wetlands are commonly located at pond margins, in and adjacent to ditches, and in natural swales.
- *Sandbar Willow Wetland Plant Association*—Sandbar willow wetlands are palustrine scrub-shrub wetlands dominated by sandbar willow that may include areas of barren ground and grasses. Approximately half of the sites in this plant association also include areas of cattail/bulrush, sedge/rush, and grass plant associations. Sandbar willow wetlands are frequently associated with irrigation and roadside ditches. Well-developed willow wetlands are present along Clear Creek and Ralston Creek.
- *Grass Wetland Plant Association*—Grass wetlands are palustrine emergent wetlands dominated by inland saltgrass, foxtail barley, alkali muhly, and/or reed canarygrass. In the study area, the most common grass species are reed canarygrass, foxtail barley, fescue, and bentgrass. Some grass wetlands also include areas of cattail/bulrush, sedge/rush, and sandbar willow wetlands. Adjacent to the grass wetland at Van Bibber Creek east of SH 93 is a well-developed cottonwood riparian area. Grass wetlands are typically located on the banks of ditches and streams, but also occur in stormwater drainage basins and other depressions.

- *Sedge/Rush Wetland Plant Association*—Sedge/rush wetlands are palustrine emergent wetlands dominated by Emory sedge, Nebraska sedge, clustered field sedge, common spikerush, and/or arctic rush. This wetland type frequently grades into herbaceous marsh and grass wetland. Sedge/rush wetlands are typically located on ditch banks, but also occasionally occur in swale bottoms or at pond margins.
- *Peach-leaved Willow Plant Association*—Peach-leaved willow wetlands are palustrine scrub-shrub wetlands dominated by peach-leaved willow and may include three-square bulrush. The single peach-leaved willow wetland present in the study area is in an apparently abandoned ditch. Associated species included threesquare bulrush, reed canarygrass, cutleaf teasel, and purple loosestrife. Jefferson County has targeted this infestation of purple loosestrife for eradication.

**OPEN WATER**

Investigations also noted bodies of open water such as lakes, waterways, and ponds, which are non-wetland open waters, some of which fall under the jurisdiction of USACE. From north to south, natural waterways with flows or bed and bank characteristics crossed by proposed alignments are Rock Creek, Walnut Creek, Woman Creek, Big Dry Creek, Leyden Gulch, Van Bibber Creek, Tucker Gulch, Chimney Gulch, and Clear Creek as well as several unnamed drainages with an apparent connection to a known water of the United States. Seventeen ponds, including nine apparently without wetlands, are present in the study area; some ponds may be waters of the United States.

### 4.9.1.2 WETLAND FUNCTIONS

A variety of studies recognize that wetlands provide particular functions to the environment (Adamus et al., 1991; Adamus 1983; Smith et al. 1995). Wetland functions are the physical, chemical, and biological processes or attributes vital to the integrity of wetland systems (Adamus et al. 1991). Various researchers and methods recognize a variety of wetland functions that typically relate to water quality, biodiversity, hydrological, and ecological processes. Not all wetlands perform all functions and wetlands do not perform functions equally.

Wetland values, such as recreation and uniqueness, are attributes not necessarily important to the integrity of wetland systems; however, these attributes are perceived as being valuable to society (Adamus et al. 1991). Similar to functions, not all wetlands provide all values and the values provided are not necessarily equal. Knowledge of what functions wetlands in the study area provide is used to assess impacts and develop mitigation measures for unavoidable impacts.

Although CDOT is working to develop and implement a functional assessment method specific to Colorado, there is not a currently agreed upon quantitative assessment system for Colorado wetland functions and values. For the purposes of the Northwest Corridor study, scientists used the Montana Wetland Field Evaluation Form and Instructions (Berglund 1999) to evaluate functions of wetlands in the study area. The "Montana Method" uses a classification system that combines the USFWS wetland classification system (Cowardin et al., 1979) with a hydrogeomorphic (landscape) approach (Brinson 1993). The Montana Method provides a landscape context for the USFWS classification. It is a rapid functional assessment process designed primarily to address wetland resources associated with highways and other linear projects.

The Montana Method evaluates the following functions and values:

- Listed and proposed threatened and endangered species habitat
- Colorado Natural Heritage Program species habitat
- General wildlife habitat
- General fish and aquatic habitat
- Flood attenuation
- Short and long term surface water storage
- Removal of sediments, nutrients, and/or toxicants

- Sediment and/or shoreline stabilization
- Food chain support and/or production export
- Groundwater discharge and recharge
- Uniqueness
- Recreation and education potential

For each evaluated wetland, the method scores each function on a scale of 0.1 (lowest) to 1.0 (highest) "functional points." The maximum number of functional points is 12, or a score of 1.0 for each function and value evaluated. Typically, wetlands that are larger and more diverse receive more points.

A functional assessment was done for wetlands in the reduced wetland assessment area. Once the total functional points for each wetland were calculated, each wetland was assigned to one of four categories described in the Montana Method. The number of functional points ranges from 0.5 points to 8.9 points. Wetlands are assigned to the following categories based on total functional points and other criteria:

- Category I: Wetlands of exceptionally high quality that are generally rare in the state. Category I wetlands can provide primary habitat for federally listed threatened or endangered species; represent a high quality example of a rare wetlands type; provide irreplaceable ecological functions (for example, are not replaceable within a human lifetime, if at all); exhibit exceptionally high flood attenuation capability; or are assigned high ratings for most of the assessed functions and values.
- Category II: Wetlands that are more common than those in Category I that provide habitat for sensitive plants or animals, function at very high levels for wildlife/fish habitat, are unique in a given area, or are assigned high ratings for many of the assessed functions and values.
- Category III: Wetlands that are more common, generally less diverse, and often smaller and more isolated than those in Category I and II. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands.
- Category IV: Wetlands that are generally small, isolated, and lack vegetative diversity. These sites provide little in the way of wildlife habitat and are often directly or indirectly disturbed.

At the landscape level, the few larger wetlands associated with relatively undisturbed stream reaches (Woman, Walnut, Ralston, and Clear creeks) and natural drainages in less urbanized portions of the study area are Category I, II, and III wetlands. These wetlands frequently have an associated riparian area and, in the case of Woman, Walnut, and Clear creeks, they provide habitat for threatened species. The wetlands that occur on public property also may rate high for recreation and education potential values. Smaller, less structurally diverse wetlands associated with smaller drainages or drainages in more urbanized areas are primarily Category III and sometimes Category IV wetlands.

Wetlands associated with ditches, canals, and pond margins are primarily Category III wetlands. Along the larger ditches, such as Church Ditch, these wetlands have high structural diversity and are rated high to moderate for sediment/shoreline stabilization and other functions. Other wetlands associated with smaller ditches, canals, and pond margins have lower ratings because they are smaller and have less structural diversity.

Small wetlands in roadside ditches and culverts or narrow wetlands in isolated swales are primarily Category IV wetlands. These wetlands generally occur in disturbed, urbanized areas. Associated riparian areas are rarely present.

Wetland plant associations vary in their functional ratings. Sandbar willow wetlands along Clear Creek and Woman Creek have the highest ratings because they contain known (Category I) or potential (Category II) habitat for threatened and endangered species. The majority of the sandbar willow wetlands have medium functional points (Category III), although sandbar willow ditch wetlands are rated Category IV.

Cattail/bulrush wetlands have medium to low functional points. Most of these wetlands are in natural swales or adjacent to ponds. Cattail wetlands in ditches frequently have low points (Category IV). Some cattail wetlands are Category III based on larger size and prevalence of high functional points.

Grass wetlands generally have medium to low functional points (Category III and IV), except for those like Walnut Creek that are Category I because of threatened and endangered species habitat. Wetland functions and values of the sedge/rush wetlands have medium to low functional points (Category III and IV). These sites tend to be adjacent to ditches or in isolated portions of natural swales and are generally small size.

The single peach-leaved willow wetland is a Category III. This wetland occupies a small site in an apparently abandoned ditch at the toe of a steep highway embankment.

The acreage of each wetland category present within the reduced wetland assessment area of the alternatives was calculated (see **Table 4.9-1**). Additionally, the acreage of wetlands in each functional category within the reduced assessment area for each of the build alternatives was calculated (see **Table 4.9-2**). Because alternative alignments overlap in many areas, the acreage of many wetlands counts in more than one alternative.

***Table 4.9-1 Area of Wetlands in Each Functional Category within the Reduced Wetland Assessment Area.***

| Functional Category | Area |
|---|---|
| **Category I** | 1.49 acres |
| **Category II** | 6.81 acres |
| **Category III** | 46.54 acres |
| **Category IV** | 5.84 acres |

*Source: Compiled by Felsburg Holt and Ullevig and ERO Resources Corp., 2007.*

*Table 4.9-2 Area of Wetlands in Each Functional Category within the Reduced Wetland Assessment Area for the Build Alternatives.*

| Build Alternative | Category I Wetlands | Category II Wetlands | Category III Wetlands | Category IV Wetlands |
|---|---|---|---|---|
| **Freeway Alternative** | 0.65 acres | 0.20 acres | 13.14 acres | 2.00 acres |
| **Tollway Alternative** | 0.78 acres | 0.18 acres | 12.61 acres | 2.02 acres |
| **Regional Arterial Alternative** | 0.62 acres | 0.20 acres | 17.54 acres | 2.33 acres |
| **Combined Alternative (Recommended Alternative)** | 0.65 acres | 0.21 acres | 15.94 acres | 2.21 acres |

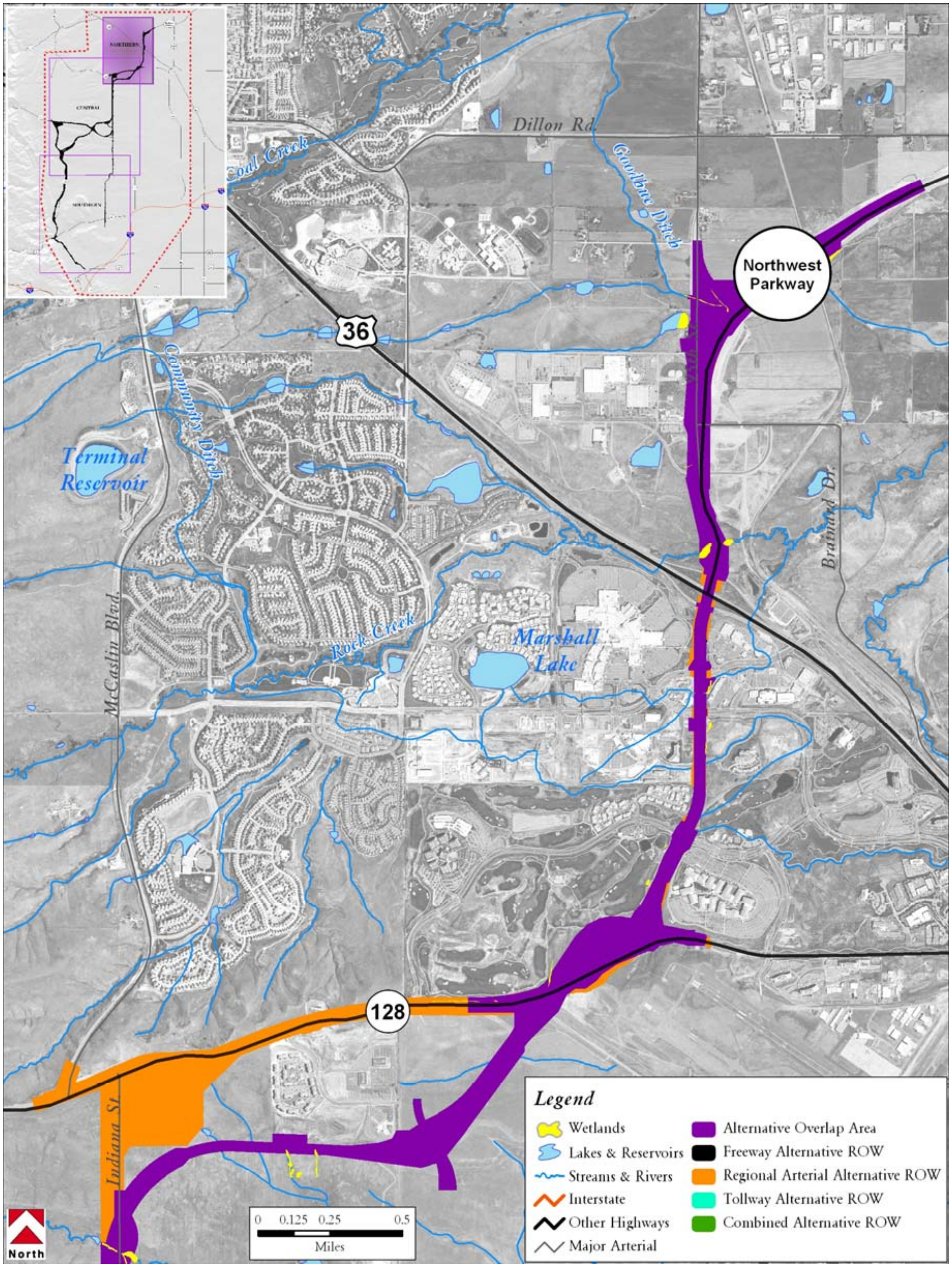
*Source: Compiled by Felsburg Holt and Ullevig and ERO Resources Corp., 2007.*

### 4.9.1.3 Riparian Areas

Riparian areas are present and located adjacent to most streams and many of the larger ditches. Typical trees and shrubs include native plains cottonwood, box elder, hawthorn, and chokecherry as well as non-native Russian-olive (noxious weed), elm, and green ash. There are about 36 riparian areas within the reduced wetland assessment areas.

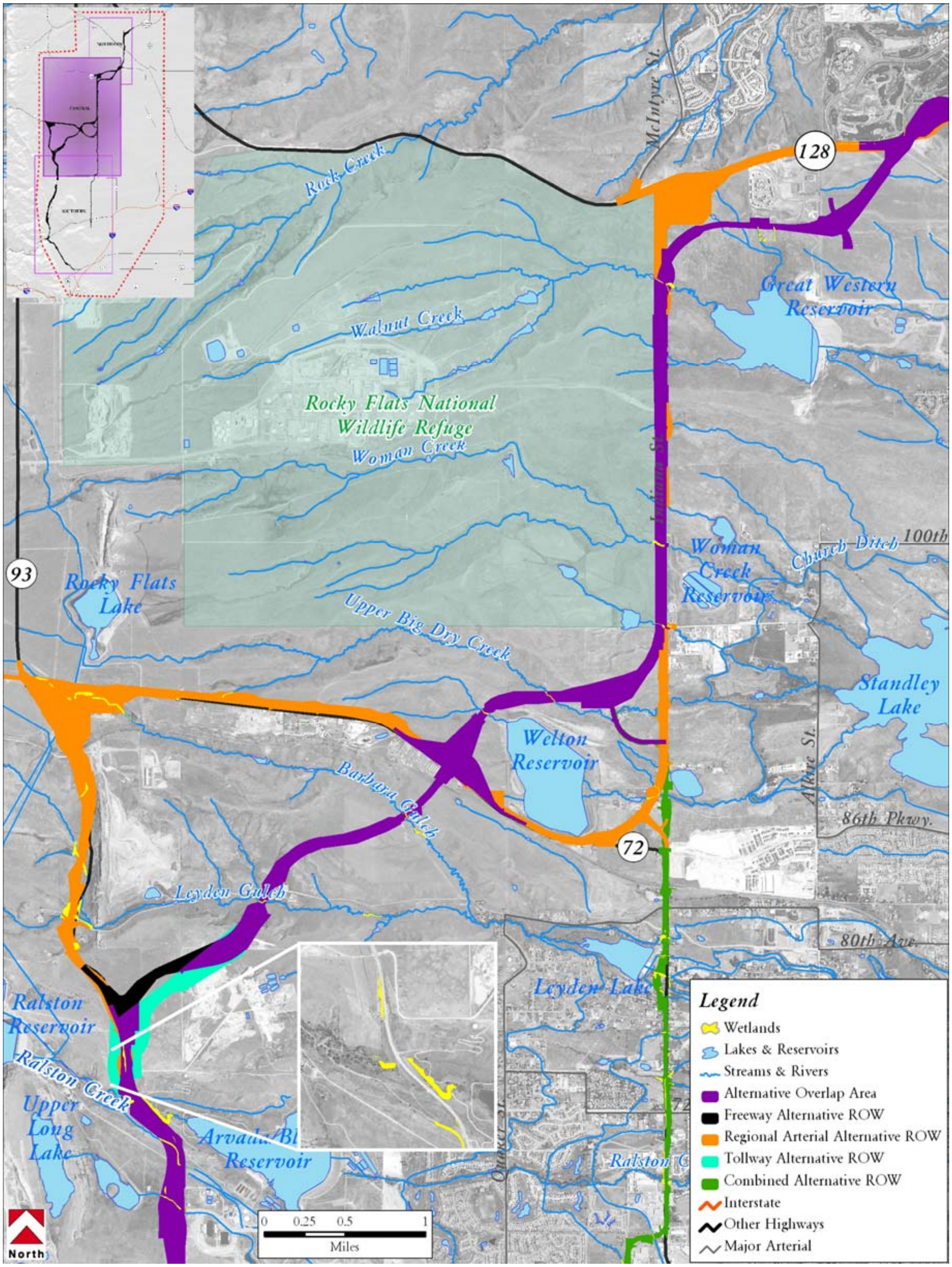
Northwest Corridor
A TRANSPORTATION ENVIRONMENTAL STUDY

*Figure 4.9-1 Wetlands in Study Area-Northern Portion*



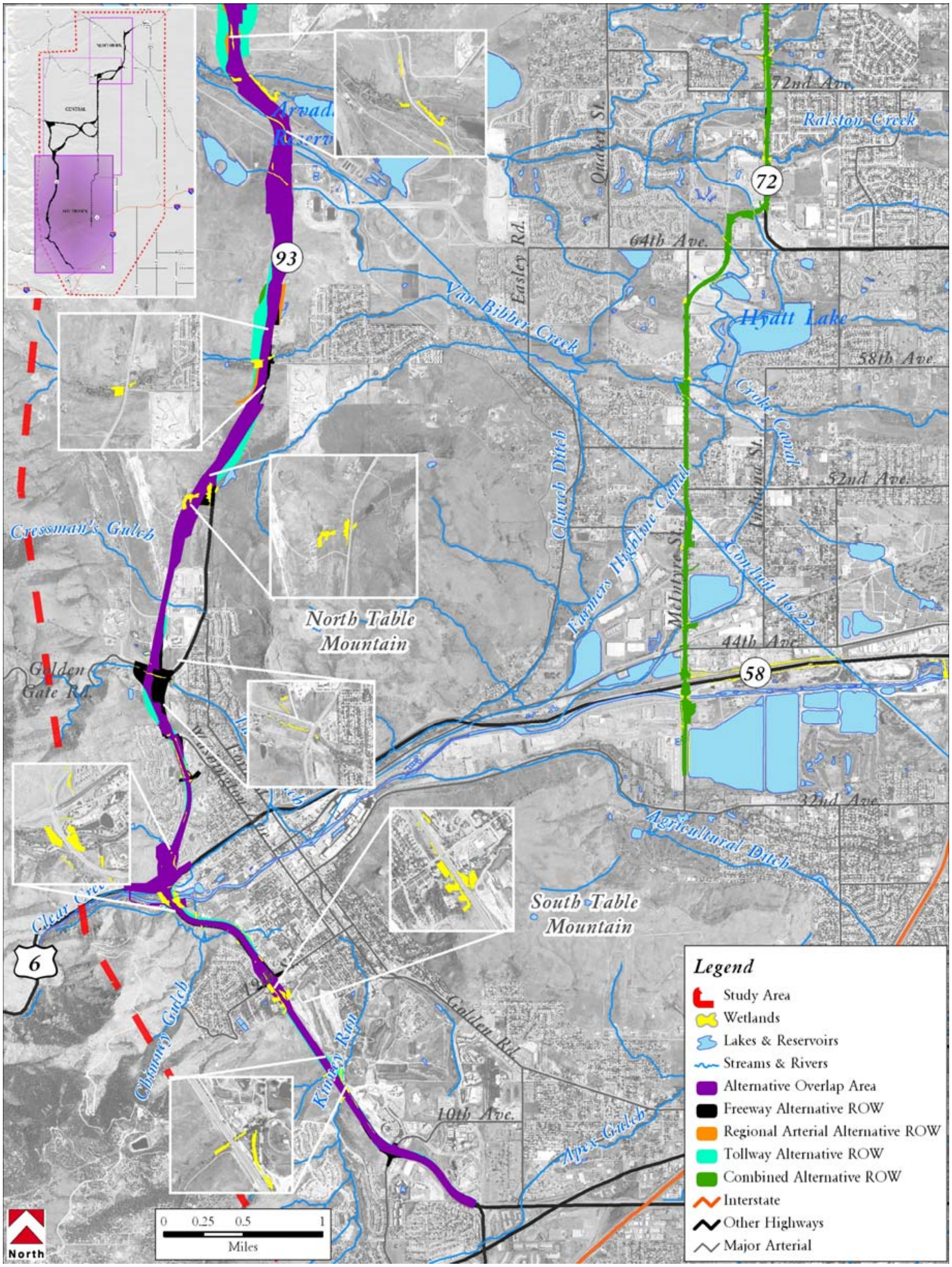

*Source: Compiled by FHU, 2006.*

***Figure 4.9-2 Wetlands in Study Area-Central Portion***




*Source: Compiled by FHU, 2006.*

Figure 4.9-3 Wetlands in Study Area-Southern Portion




*Source: Compiled by FHU, 2006.*

## 4.9.2 Environmental Consequences

Impacts to wetlands, open water, and riparian areas were based on impacts within 100 feet of the proposed right-of-way for each build alternative. Total direct impacts to wetlands are 15.98 acres for the Freeway Alternative, 15.60 acres for the Tollway Alternative, 20.69 acres for the Regional Arterial Alternative, and 19.00 acres for the Combined Alternative (Recommended Alternative). These wetland impacts include minor areas of open water that are likely waters of the United States, for example, stream crossings. Major areas of open water that are likely waters of the United States are tabulated separately. Wetland impacts are higher for the Regional Arterial Alternative and Combined Alternative (Recommended Alternative), which include a higher number of stream crossings. Direct impacts to wetlands, major areas of open water, and riparian areas are summarized and details on wetland impacts are presented (see **Table 4.9-1**). Since USACE requires a Clean Water Act Section 404 Individual Permit for impacts to waters of the United States and adjacent wetlands greater than 0.5 acre, any of the four build alternatives would require an Individual Permit.

*Table 4.9-3 Summary of Direct Impacts to Wetlands, Open Water and Riparian Areas*

| Alternative | Direct Impacts to Jurisdictional and Nonjurisdictional Wetlands | Direct Impacts to Jurisdictional and Nonjurisdictional Open Waters | Direct Impacts to Riparian Areas |
|---|---|---|---|
| **Total Freeway Alternative** | 15.98 acres | 0.67 acre | 10.61 acres |
| **Total Tollway Alternative** | 15.60 acres | 0.84 acre | 10.59 acres |
| **Total Regional Arterial Alternative** | 20.69 acres | 0.02 acre | 9.48 acres |
| **Total Combined Alternative (Recommended Alternative)** | 19.00 acres | 0.94 acre | 10.89 acres |

Note: The wetlands category also includes some assumed wetlands, based upon aerial photography areas that could not be ground surveyed.

*Source: Felsburg Holt & Ullevig, 2007.*

Assessing the build alternatives using only the acreage of direct impacts to wetlands does not take into account differences in the functional quality of the impacted wetlands. Using direct impacts means that impacts to high quality (Category I) wetlands are considered the same as impacts to low quality (Category IV) wetlands. For example, an acre of impacts to a solid stand of cattails in a roadside ditch is considered equivalent to an acre of impacts to a diverse wetland that provides habitat for a threatened species. This approach could result in a situation where the alternative with the fewest acres of impacts actually has the greatest adverse effect on wetland functions. A second way to assess wetland impacts is to weight the acres of impacts to reflect functional differences between wetlands.

One method to weight functional impacts is to use the functional points calculated by the Montana Method (see **Section 4.9.1.2**). For the weighted impact assessment, a functional assessment was done for each wetland that would be impacted by any of the build alternatives. The total functional points for each wetland was divided by the total possible functional points. This generated the percentage of possible functional points for each wetland, which was then used as the weighting factor. For example, a wetland with 5 functional points out of 12 possible points has 41 percent of the possible points. If 0.25 acres of the wetland would be impacted by one of the build alternatives, the weighting factor of 0.41 is multiplied by 0.25, for a weighted impact of 0.10 acres. The same area of impact (0.25 acres) to a wetland with 8 out of 12 functional points (66%) would result in 0.16 acres of weighted impacts. The percent of functional points ranged from 0.1 to 1.0. As a conservative measure, all Category I wetlands were weighted 1.0, even if their actual percentage of functional points was less than one. Weighted wetland impacts were calculated for each build alternative (see **Table 4.9-4**).

*Table 4.9-4 Summary of Weighted Impacts to Wetlands for Each Build Alternative*

| Alternative | Weighted Wetland Impacts |
|---|---|
| **Freeway Alternative** | 5.25 acres |
| **Tollway Alternative** | 5.20 acres |
| **Regional Arterial Alternative** | 7.14 acres |
| **Combined Alternative (Recommended Alternative)** | 6.32 acres |

*Source: Compiled by Felsburg Holt and Ullevig, 2007.*

The large difference between the acres of direct wetland impacts and weighted impacts for each build alternative reflects that the majority of wetlands in the reduced wetland assessment area and wetlands that would be impacted are lower quality Category III wetlands.

Impacts associated with the No Action Alternative, impacts common to the build alternatives, and impacts unique to each build alternative were determined.

#### 4.9.2.1 No Action Alternative

Some of the transportation projects identified as occurring under the No Action Alternative would likely result in direct and indirect impacts to wetlands and open water. Although the extent of these impacts is unknown, given the likely size of the footprints of these projects in relation to the proposed build alternatives, it is reasonable to assume that total impacts from the No Action Alternative would be less than the build alternatives.

#### 4.9.2.2 Impacts Associated with All Build Alternatives

All build alternatives would cause direct impacts to wetlands and bodies of open water within the alternative footprint as a result of fill placement caused by construction of transportation improvements such as roadway widening and realignment, new alignments, and intersection improvements. Roadside ditches, wet meadows, creeks, irrigation canals and ditches, and their associated wetlands would be impacted.

From north to south, the following major irrigation ditches and streams would be directly impacted by the proposed alignments for all build alternatives: Goodhue Ditch, Rock Creek, Walnut Creek, Woman Creek, Tucker Ditch, South Boulder Diversion Canal, streambanks adjacent to Ralston and Van Bibber creeks, Tucker Gulch, Church Ditch, Welch Ditch, streambanks adjacent to Clear Creek, Chimney Gulch, an unnamed tributary to Clear Creek, and Kinney Run. The amount of impact in each segment would vary among the build alternatives.

Although the acres of impacts to open waters range from 0.02 acres to 0.94 acres, none of the alternatives would impact more than an acre of open water, an insignificant amount in relation to the 3,263 acres of open water estimated to be present in the entire study area. There would be little difference between alternatives in the acres of impacts to riparian areas (9.49 acres to 10.89 acres).

Because impacts to open water and riparian areas are not significant discriminating factors between alternatives, the following discussion of impacts associated with each alternative focuses on wetland impacts.

### 4.9.2.3 Freeway Alternative

Based on preliminary design plans, the Freeway Alternative would directly impact approximately 15.98 acres of wetlands, 0.67 acre of open waters, and 10.61 acres of riparian areas. Considering wetland functions, the Freeway Alterative would impact 5.25 weighted acres.

The Freeway Alternative has the second least direct and weighted impacts on wetlands.

In addition to impacts common to all of the build alternatives, impacts to streams and major irrigation ditches associated with the Freeway Alternative would include new crossings of Barbara Gulch and Leyden Gulch.

### 4.9.2.4 Tollway Alternative

Based on preliminary design plans, the Tollway Alternative would directly impact approximately 15.60 acres of wetlands, 0.84 acre of open waters, and 10.59 acres of riparian areas. Considering wetland functions, the Tollway Alternative would impact 5.20 weighted acres.

The Tollway Alternative has the least direct and weighted impacts on wetlands.

In addition to impacts common to all of the build alternatives, impacts to streams and major irrigation ditches associated with the Tollway Alternative would include new crossings of Barbara Gulch and Leyden Gulch.

### 4.9.2.5 Regional Arterial Alternative

Based on preliminary design plans, the Regional Arterial Alternative would directly impact approximately 20.69 acres of wetlands, 0.02 acre of open water, and 9.48 acres of riparian areas. Considering wetland functions, the Regional Arterial Alternative would impact 7.14 weighted acres.

The Regional Arterial Alternative has the most direct and weighted impacts on wetlands.

In addition to impacts common to all of the build alternatives, impacts to streams and major irrigation ditches associated with the Regional Arterial Alternative would include disturbance to Barbara Gulch near the SH 72/SH 93 interchange and impacts to Leyden Gulch and its tributaries along SH 93.

### 4.9.2.6 Combined Alternative (Recommended Alternative)

Based on preliminary design plans, the Combined Alternative (Recommended Alternative) would directly impact approximately 19.00 acres of wetlands, 0.94 acre of open waters, and 10.89 acres of riparian areas. Considering wetland functions, the Combined Alternative would impact 6.32 weighted acres.

The Combined Alternative has the second most direct and weighted impacts on wetlands.

In addition to impacts common to all of the build alternatives, impacts to streams and major irrigation ditches associated with the Combined Alternative (Recommended Alternative) would include new crossings of Barbara Gulch and Leyden Gulch along the SH 93 and US 6 alignment. Widening along the Indiana Street and McIntyre Street alignment would impact Leyden Gulch below Leyden Reservoir, Farmers' Highline Canal, Croke Canal, Ralston Creek, Van Bibber Creek, and Clear Creek.

#### Indirect Effects

The build alternatives would cause indirect effects to wetlands located within and adjacent to areas of construction. The following indirect effects are common to all build alternatives.

The most general indirect effect would result from the increase in impervious surfaces caused by additional lanes or added roadway shoulders. The greater area of impervious surfaces could be expected to increase roadway runoff, surface flows in adjacent streams, erosion, and the creation of channels in wetlands that previously were channel free. New flows may contain pollutants associated with roadway runoff. Sediment from winter sanding operations, especially with additional roadway lanes, is likely to accumulate in wetlands and drainages. Deicers such as magnesium chloride, petroleum products, and other chemicals are likely to reduce water quality, and impact wetland plants and wildlife. Additional sediment and erosion can be expected during and after construction until bare fill and cut slopes are successfully revegetated.

Other indirect effects to wetlands would include the decrease or elimination of upland tree and/or shrub buffers between the proposed roadway and wetlands adjacent to Walnut Creek, Woman Creek, Leyden Gulch, Ralston Creek, Van Bibber Creek, and Clear Creek. Buffers filter pollutants before they reach wetlands, streams, and lakes as well as provide upland areas for wildlife.

Because proposed roadway alignments primarily follow existing roadways, many wetlands currently receive indirect effects from roadway activity and maintenance practices. However, the magnitude of indirect effects would increase with an increased area of roadway.

The Combined Alternative (Recommended Alternative) would cause additional indirect effects to Leyden Gulch, Ralston Creek, and Van Bibber Creek adjacent to the proposed roadway improvements along Indiana Street and McIntyre Street.

## 4.9.3 Suggested Mitigation

### 4.9.3.1 Avoidance and Minimization Measures

The project team considered wetlands and stream crossings in all levels of screening, including identifying the number of wetland acres in jeopardy of impact and the number of stream crossings for each alternative. In the design of alternatives, the project team made efforts to minimize impacts to wetlands and stream crossings by adjusting alignments and by incorporating provisions for structures, including bridges.

Impacts to wetlands and stream crossings should continue to be avoided and minimized as much as practical during the final design process, and the design should comply with the policy of Executive Order 11990 regarding impacts to wetlands.

The following specific Best Management Practices from the Erosion Control and Storm Water Quality Guide (CDOT, 2002) should be implemented during construction to reduce the potential for wetlands to be indirectly affected by sedimentation from accelerated erosion or by hazardous materials (e.g., fuel, equipment lubricants):

- All disturbed areas should be revegetated with native grass and forb species. Seed, mulch, and mulch tackifier should be applied in phases throughout construction.
- Where permanent seeding operations are not feasible due to seasonal constraints (e.g., summer and winter months), disturbed areas should have mulch and mulch tackifier applied to prevent erosion.
- Erosion control blankets should be used on steep, newly seeded slopes to control erosion and to promote the establishment of vegetation. Slopes should be roughened at all times and concrete washout contained.
- Temporary erosion control blankets should have flexible natural fibers.
- Erosion bales, erosion logs, silt fence, or other sediment control devices should be used as sediment barriers and filters adjacent to wetlands, surface waterways, and at inlets where appropriate.
- To minimize the loss of sand from the road surface during winter sanding operations, sediment catch basins should be included during construction and put in place permanently with continual maintenance.

- Where appropriate, slope drains should be used to convey concentrated runoff from top to bottom of the disturbed slopes. Slope and cross-drain outlets should be constructed to trap sediment.
- Storm drain inlet protection should be used where appropriate to trap sediment before it enters the cross-drain.
- Check dams should be used where appropriate to slow the velocity of water through roadside ditches and in swales.

Additionally, the following BMPs to minimize wetland impacts during construction should be employed:

- All wetland areas and water bodies not impacted by the project should be protected from unnecessary encroachment by temporary fencing. Sediment control, such as silt fence or erosion logs, should also be used where needed to protect the area from sediment. Siltation control devices (e.g., fences) should be placed on the down-gradient side of construction areas to prevent soil from entering wetland areas.
- No staging of construction equipment, equipment refueling, or storage of construction supplies should be allowed within 50 feet of a wetland or any water-related area.
- Standard erosion control measures should be observed and an erosion control plan should be developed prior to advertisement for inclusion in the construction bid plans. All bare fill or cut slopes adjacent to streams or intermittent drainages should be stabilized as soon as possible.
- No fertilizers, hydrofertilizers, or hydromulching should be allowed anywhere on the project.
- Work areas should be limited as much as possible to minimize construction impacts to wetlands.

### 4.9.3.2 COMPENSATORY MITIGATION

Although efforts would be made during alternative development to avoid and minimize impacts to wetlands and streams, impacts would result from the construction of any build alternative. Section 404 of the Clean Water Act would require compensatory mitigation for permanent, direct impacts to wetlands under the jurisdiction of USACE and to other waters of the United States. Additionally, at the direction of Executive Order 11990 and Department of Transportation Order 5660.1A, FHWA and CDOT should also mitigate for permanent, direct impacts to non-jurisdictional wetlands. In Colorado, all compensatory wetland mitigation would be implemented on a 1:1 basis based on acres of direct impacts.

Wetland mitigation could be implemented either onsite or offsite through wetland restoration or creation, or offsite through the purchase of mitigation credits from an USACE-approved wetland mitigation bank. Onsite mitigation could maintain the existing level of functions of impacted wetlands.

Under the Transportation Equity Act (TEA-21) of 1998, banking would be the preferred compensatory mitigation alternative for impacts associated with federally funded transportation projects. TEA-21 also states that "in the event that impacts affect specifically identified, locally important aquatic resource functions that a bank cannot provide (e.g., local flood water control, local water quality enhancement, habitat for species, etc.), consideration should be given to practical opportunities to replace these lost functions at or near the impact site(s)."

Success factors considered during mitigation analysis include the location of possible mitigation sites, adequacy and reliability of supportive hydrology, water rights issues, wetland functions, and seasonal timing of mitigation construction.

The process for selection and design of onsite wetland mitigation should take place during final design and should be completed prior to construction. All stakeholders in wetland mitigation including USACE, USEPA, CDOT, and affected municipalities and counties should be included in the process. The process should focus on wetland sustainability and appropriate replacement of wetland type and functions and is anticipated to include:

- Agency concurrence on wetland type and functions to be mitigated.
- Field review of all potential mitigation sites.
- Documentation of site ownership, hydrology (including groundwater monitoring as necessary), water rights, construction feasibility, long term potential to sustain wetlands of the desired type.
- Final site selection with approval of all stakeholders.
- Construction level design of the wetland mitigation area and, as necessary, inclusion of an upland tree and shrub buffer.
- Final design concurrence by all stakeholders.

Summary of proposed mitigation measures:

- All impacted wetlands should be mitigated on a 1:1 basis.
- When locally important aquatic resource functions cannot be replaced offsite, onsite mitigation could be considered.
- Impacts to wetlands adjacent to streams would most likely be mitigated onsite, as close to the location of impacts as possible.
- Impacts to wetlands not adjacent to streams would most likely be mitigated through the purchase of mitigation bank credits.
- Existing wetlands should be protected by BMPs for control of sedimentation and erosion, and/or by protective fencing.
- Riparian trees and shrubs should be replaced on a 1:1 basis per Senate Bill 40 guidelines.
- All stakeholders should be involved in selection of mitigation sites and designs if mitigation is located outside of a wetland mitigation bank or CDOT right-of-way.

In the case of temporary impacts, when construction of a particular area is completed, the fill should be removed and the wetland area should be re-graded as necessary and revegetated to restore the original wetland condition. If temporary impacts involve placement of fill over a wetland, the wetland should be covered with geotextile, straw, and two feet of fill. After completion of work, this material should be removed to an offsite location. It is likely that re-grading and revegetation would not then be required.

Indirect effects to wetlands (such as changing drainage patterns, increasing runoff volumes, changing wetland hydrology, and increasing delivery of non-point source pollution such as sediment, deicer, and petroleum products) could result from increasing the impervious surface area of the roadway. These effects should be avoided or minimized by implementing construction and post-construction BMPs such as maintenance and/or reestablishment of functional stream hydrology, as well as catchment and proper treatment of runoff and contaminated water.

### 4.9.4 SUMMARY

For any of the build alternatives, wetland impacts would occur at natural drainages, seep areas, open water, and irrigation and roadside ditches. Activities requiring placement of fill material in waters of the United States, including wetlands, would require obtaining a Clean Water Act Section 404 Individual Permit from USACE.

Using conservative methods, wetland scientists estimate that there are about 2,142 acres of wetlands and 3,263 acres of open water in the Northwest Corridor study area. The build alternatives would directly impact from 15.60 acres to 20.69 acres of wetlands, from 0.02 acres to 0.94 acres of open water, and from 9.48 acres to 10.89 acres of riparian areas. Functional assessments were performed on wetlands that would be directly impacted by each of the build alternatives. Functional assessments provide information on the quality of individual wetlands and on their ability to perform important ecological functions such as providing wildlife habitat and improving water quality. By using data from the functional assessments to weight the acreage of direct impacts, wetland scientists were able to determine the relative magnitude of impacts to wetland functions for each build alternative. Weighted impacts would range from 5.20 weighted acres to 7.14 weighted acres. For both direct and functionally-weighted wetland impacts, the build alternatives had the following rank from least to most wetland impacts: Tollway Alternative, Freeway Alternative, Combined Alternative (Recommended Alternative), Regional Arterial Alternative. Based on types of impacts and functional impacts, the build alternatives have little difference between them.

Wetland impacts should be mitigated onsite for areas with locally important functions and offsite at a wetland mitigation bank for impacts not meeting this criterion. Although all impacts to wetlands and other waters of the United States should be mitigated on a 1:1 basis, residual impacts on these resources are anticipated. Mitigation areas require time to develop complex plant communities and soil structures. Ecological functions should be reduced until the mitigation sites are fully developed. Not all mitigation areas succeed (National Research Council, 2001), but onsite mitigation would be monitored to assure permit compliance. Although purchased credits are for fully developed wetlands, use of a wetland mitigation bank has the effect of removing wetland functions from the area of impact.

# REFERENCES

Adamus, P.R. 1983. A method for wetland functional assessment; Volume II: FHWA assessment method. U.S. Dept. of Transportation, Federal Highway Administration. Rep. No. FHWA-IP-82-24.

Adamus, P.R., L.T. Stockwell, E.J. Clairain, Jr., M.E. Morrow, L.P. Rozas, and R.D. Smith. 1991. Wetland Evaluation Technique (WET). Volume I: Literature review and evaluation rationale. U.S. Army Corps of Engineers, Waterways Experiment Station. Wetlands Research Program, Technical Report WRP-DE-2.

Berglund, J. 1999. MDT Montana Wetland Assessment Method. Prepared for Montana Department of Transportation and Morrison-Maierle, Inc.

Brinson, M.M. 1993. A hydrogeomorphic classification of wetlands. U.S. Army Corps of Engineers, Waterways Experiment Station. Wetlands Research Program, Technical Report WRP-DE-4.

Carsey, K., G. Kittel, K. Decker, D.J. Cooper, and D. Culver. 2003. *Field Guide to the Wetland and Riparian Plant Associations of Colorado*. Fort Collins, CO: Colorado Natural Heritage Program.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. O'Neill, J. Paruelo, R. Raskin, P. Sutton, and M. van den Belt. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253–260.

Colorado Department of Transportation (CDOT). 2002. Erosion Control and Stormwater Management Guide

Cowardin, L.M. et al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. United States Fish and Wildlife Service. Biological services program; FWS/OBS-79/31.

National Research Council (NRC). 2001. Compensating for wetland losses under the Clean Water Act. National Academy Press. Washington, D.C.

National Space and Aeronautics Administration (NASA). 2006. Consumer Price Index (CPI) Inflation Calculator. http://www1.jsc.nasa.gov/bu2/inflateCPI.html.

Natural Resource Conservation Service (NRCS). 1980. Soil Survey of Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties. U.S. Department of Agriculture Colorado Agricultural Experiment Station

Smith, R.D., A. Amman, C. Baroldus, and M.M. Brinson. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices. U.S. Army Corps of Engineers, Waterways Experiment Station. Wetlands Research Program, Technical Report WRP-DE9.

Environmental Laboratory. 1987. Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station.

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