# Chapter 21: Cumulative Impacts

## 21.1 Introduction

In 2020, the Council on Environmental Quality (CEQ) issued revised regulations for implementing the National Environmental Policy Act (NEPA), which apply to any NEPA process begun after September 14, 2020. The initial Notice of Intent to develop this Little Cottonwood Canyon Environmental Impact Statement (EIS) was published in 2018, and the NEPA process for this EIS has been ongoing since that time. For this reason, the Utah Department of Transportation (UDOT) is conducting the cumulative impact analysis for this EIS based on CEQ's previous (pre-2020) implementing regulations, and all citations in this and other chapters of the EIS refer to the prerevision version of the NEPA regulations.

**What are cumulative impacts?**

Cumulative impacts are the impact to the environment resulting from the incremental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions.

Note that, sometime in 2022, CEQ's cumulative impact guidance might revert to the guidance used in this EIS. CEQ proposes to revise 40 Code of Federal Regulations (CFR) Section 1508.1(g)(3) by restoring, with minor modifications, the definition of *cumulative impacts* from the 1978 NEPA regulations.

Those regulations require an assessment of cumulative impacts as part of the NEPA process. The regulations ensure that the proposed State Route (S.R.) 210 Project and other federal, state, and private actions will be evaluated with regard to cumulative impacts. Cumulative impacts are defined by the CEQ regulations at 40 CFR Section 1508.7. The 1978 CEQ regulations define a *cumulative impact* as

> … the impact on the environment which results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

A cumulative impacts analysis considers the direct and indirect impacts of a proposed project in the context of impacts from other previous, ongoing, and anticipated future actions to determine whether the overall effect of these actions would be substantial.

## 21.2 Methodology for Determining Cumulative Impacts

UDOT's methodology for determining the cumulative impacts of the action alternatives for the S.R. 210 Project is based on the guidance *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997). This section provides a general overview of the methodology used to conduct the cumulative impacts analysis. The analyses of direct and indirect impacts are provided under the appropriate resource sections in this chapter.

### 21.2.1 Important Cumulative Impacts Issues Associated with the S.R. 210 Project

The S.R. 210 Project could affect resources either directly or indirectly. Resources can be elements of the physical environment, species, habitats, ecosystem parameters and functions, cultural resources, recreation opportunities, the structure of human communities, traffic patterns, or other economic and social conditions. However, according to CEQ's cumulative impacts guidance, the cumulative impacts analysis should be narrowed to focus on important issues at a national, regional, or local level. The analysis should look at other actions that could have similar effects and whether a particular resource has been historically affected by cumulative actions.

### 21.2.2 Cumulative Impact Concerns Identified during Scoping

Public and agency scoping meetings were held to help identify issues to be analyzed in this EIS. UDOT reviewed the comments received during the public and agency scoping periods to determine whether any important issues were identified. The public and agencies identified the following main concerns regarding cumulative impacts:

**What is scoping?**

Scoping is an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

- Continued degradation of the watershed in Little Cottonwood Canyon
- Further degradation to the ecosystem caused by increased visitation and development in Little Cottonwood Canyon
- Further reduction in solitude from increased recreation use on trails in the Wilderness Areas
- Impacts to regional air quality

### 21.2.3 Important Cumulative Impacts Issues and Analysis

The CEQ guidance document *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997) states that not all potential cumulative effects issues identified during scoping need to be included in a project's EIS. Some cumulative effects might be irrelevant or inconsequential to decisions about the project alternatives. The cumulative effects analysis should "count what counts," not produce superficial analyses of a long "laundry list" of issues that have little relevance to the effects of the project alternatives or to the eventual decision.

#### 21.2.3.1 Resources Not Requiring a Detailed Cumulative Impact Analysis

Listed below are the resources that could experience direct or indirect impacts from the action alternatives. Based on a review of these resources, UDOT determined that the potential direct and indirect impacts to these resources would be inconsequential to decisions about the action alternatives and do not pertain to issues of local, regional, or national importance.

- **Land Use and Planning.** As described in Chapter 3, *Land Use*, most of the project improvements would be adjacent to S.R. 210 in urban areas along Wasatch Boulevard and on mostly public lands in Little Cottonwood Canyon. The project as proposed would not induce land development that

would change adjacent land uses to S.R. 210. The property acquisition outside the right of way would not change the type or function of land uses surrounding S.R. 210 (these land uses are urban, recreation, wilderness, and open space). The S.R. 210 Project would have inconsequential changes the land use surrounding the existing roadway and in the region. The S.R. 210 Project would not contribute to cumulative issues important to the project decision or pertain to issues of local, regional, or national importance.

- **Community and Property Impacts.** As described in Chapter 4, *Community and Property Impacts*, none of the attributes or amenities that define the surrounding communities, such as cohesion, enjoyment of solitude, and community facilities and services, would be substantially changed by the action alternatives. Overall, none of the impacts to community resources except for recreation would contribute to cumulative issues important to the project decision or pertain to issues of local, regional, or national importance.
- **Air Quality.** As described in Chapter 10, *Air Quality*, overall the S.R. 210 Project would reduce congestion and travel time on S.R. 210 from Fort Union Boulevard to the town of Alta. The project as proposed would reduce personal vehicle use in the winter by 30% on S.R. 210 in Little Cottonwood Canyon. The reduction in congestion, travel time, and personal vehicle use would reduce overall vehicle emissions. In addition, the analysis showed that the S.R. 210 Project would not contribute to any new violations of, increase the frequency or severity of any existing violations of, or delay timely attainment of the National Ambient Air Quality Standards for particulate matter ($PM_{10}$ or $PM_{2.5}$).

  Aspects of the project (improvements to Wasatch Boulevard, improvements to S.R. 210 in Little Cottonwood Canyon, and a mobility hub at the gravel pit) are identified in the conforming regional transportation plan (WFRC 2019) as well as in the relevant transportation improvement program (WFRC 2020), which is a cumulative analysis of all proposed transportation projects in the Salt Lake Valley. Because the project would overall reduce vehicle emissions, would not contribute to any new air quality violations, and is part of the transportation conformity requirements, the action alternatives would not contribute to cumulative impacts to air quality.

**What is a mobility hub?**

A mobility hub is a location where users can transfer from their personal vehicle to a bus.

**What is the gravel pit?**

The gravel pit is an existing aggregate (gravel) mine located on the east side of Wasatch Boulevard between 6200 South and Fort Union Boulevard.

- **Noise.** As described Chapter 11, *Noise*, the action alternatives would generally increase noise levels on average by 2 A-weighted decibels (dBA) throughout the noise impact analysis area. People generally cannot detect a 1-to-2-dBA increase in noise levels; therefore, the slight increase in noise levels would be inconsequential to the overall perception of noise by residents and the recreation users adjacent to the action alternatives. This impact would not contribute to cumulative issues important to the project decision or pertain to issues of local, regional, or national importance.
- **Floodplains.** As described in Chapter 14, *Floodplains*, the action alternatives would fill less than 3 acres of floodplains. Culverts and bridges in regulatory floodplains would be designed to accommodate a 100-year flood (one with a 1% chance of occurring in a given year) in accordance with Federal Emergency Management Agency (FEMA) and local floodplain ordinance criteria. These design standards, together with the proper placement of structures and walls, would reduce the risk

that the S.R. 210 improvements would exacerbate flooding conditions. The proposed detention systems along portions of the action alternatives would reduce the stress on the stormwater system compared to the existing conditions, since areas along Wasatch Boulevard currently have no detention facility and stormwater currently discharges directly to adjacent water bodies. Overall, the less than 3 acres of floodplain impact would be inconsequential to the overall function of the floodplain and stormwater systems. It would not contribute to cumulative issues important to the project decision or pertain to issues of local, regional, or national importance.

In making these determinations, UDOT considered the projects and activities listed in Table 21.2-1, *Present and Reasonably Foreseeable Future Actions*, on page 21-11 as well as the past and present conditions of the resources near the action alternatives. Because UDOT determined that none of the resources listed above would experience substantial direct or indirect impacts that would contribute to cumulative issues important to the project decision or that would pertain to issues of local, regional, or national importance, no further cumulative impacts analysis was performed for the resources listed above.

#### 21.2.3.2 Resources Requiring Further Cumulative Impact Analysis

Based on the scoping process and the potential for direct and indirect impacts from the S.R. 210 Project, UDOT identified four important cumulative impacts issues that might be pertinent to the decision. These four issues are the focus of the cumulative impacts analysis in this EIS:

- Recreation
- Water resources
- Ecosystem resources
- Visual resources

### 21.2.4 Geographic Scope for the Analysis

The geographic scope of the cumulative impacts analysis was determined by establishing the area of project impacts and determining the geographic areas occupied by the affected resource. The specific geographic scope of analysis for each resource is listed below and shown in Figure 21.2-1 through Figure 21.2-4):

- **Recreation.** The recreation geographic scope of the analysis is the recreation resources in Little Cottonwood Canyon (designated trails, climbing resources, ski resorts, trailheads, backcountry skiing, and other recreation activities).
- **Water Resources.** The water resources geographic scope of the analysis is upper Little Cottonwood Creek from the Metropolitan Water District of Salt Lake and Sandy's water treatment plant to the creek's headwaters.
- **Ecosystem Resources.** The ecosystem resources geographic scope of the analysis is Little Cottonwood Canyon but includes a discussion of the greater central Wasatch Mountains because past changes in the central Wasatch Mountains influence Little Cottonwood Canyon.
- **Visual Resources.** The visual resources geographic scope of the analysis is the visual resources along Wasatch Boulevard in Cottonwood Heights and in Little Cottonwood Canyon.

Figure 21.2-1. Recreation Geographic Scope of Analysis

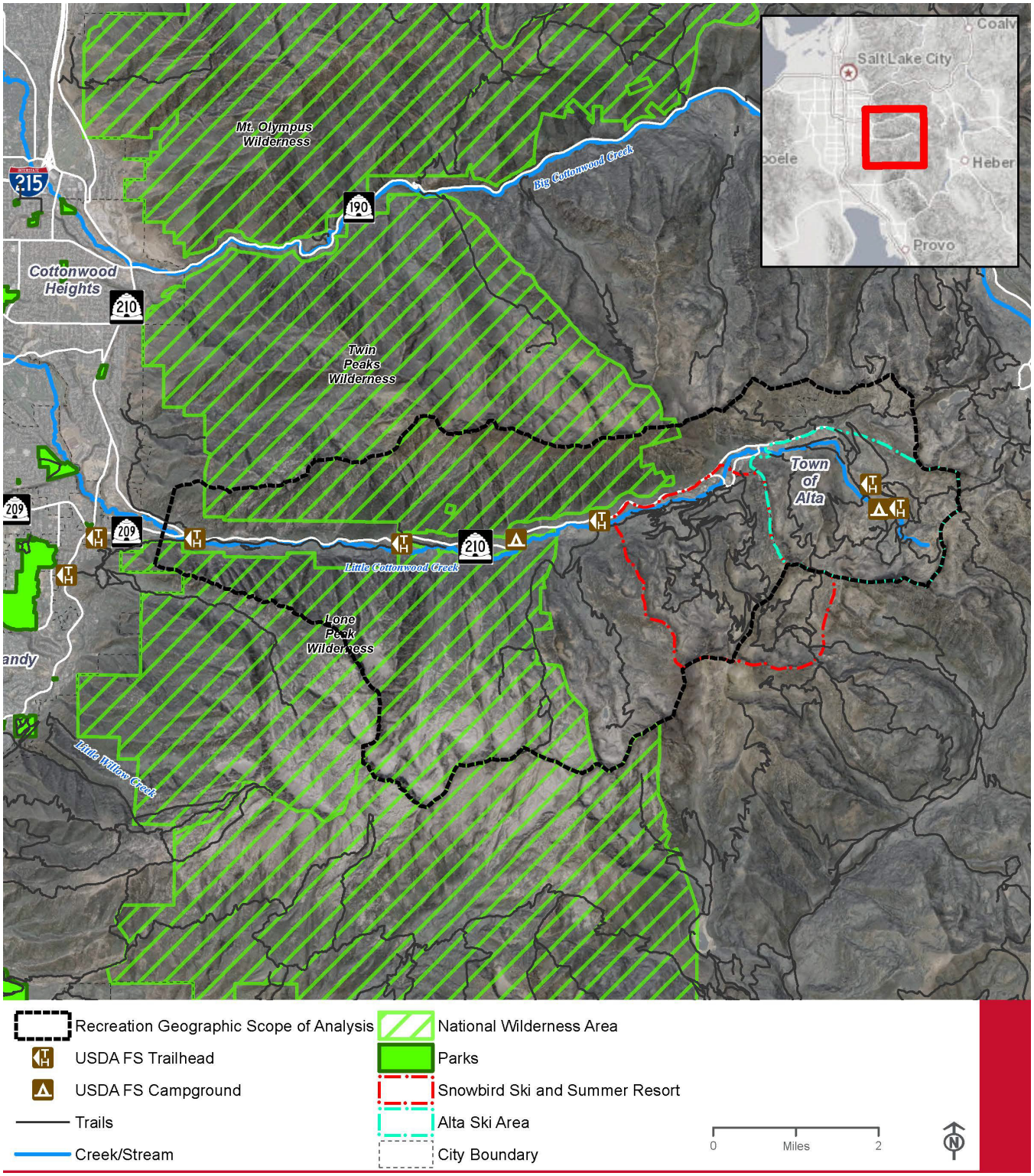


Figure 21.2-2. Water Resources Geographic Scope of Analysis

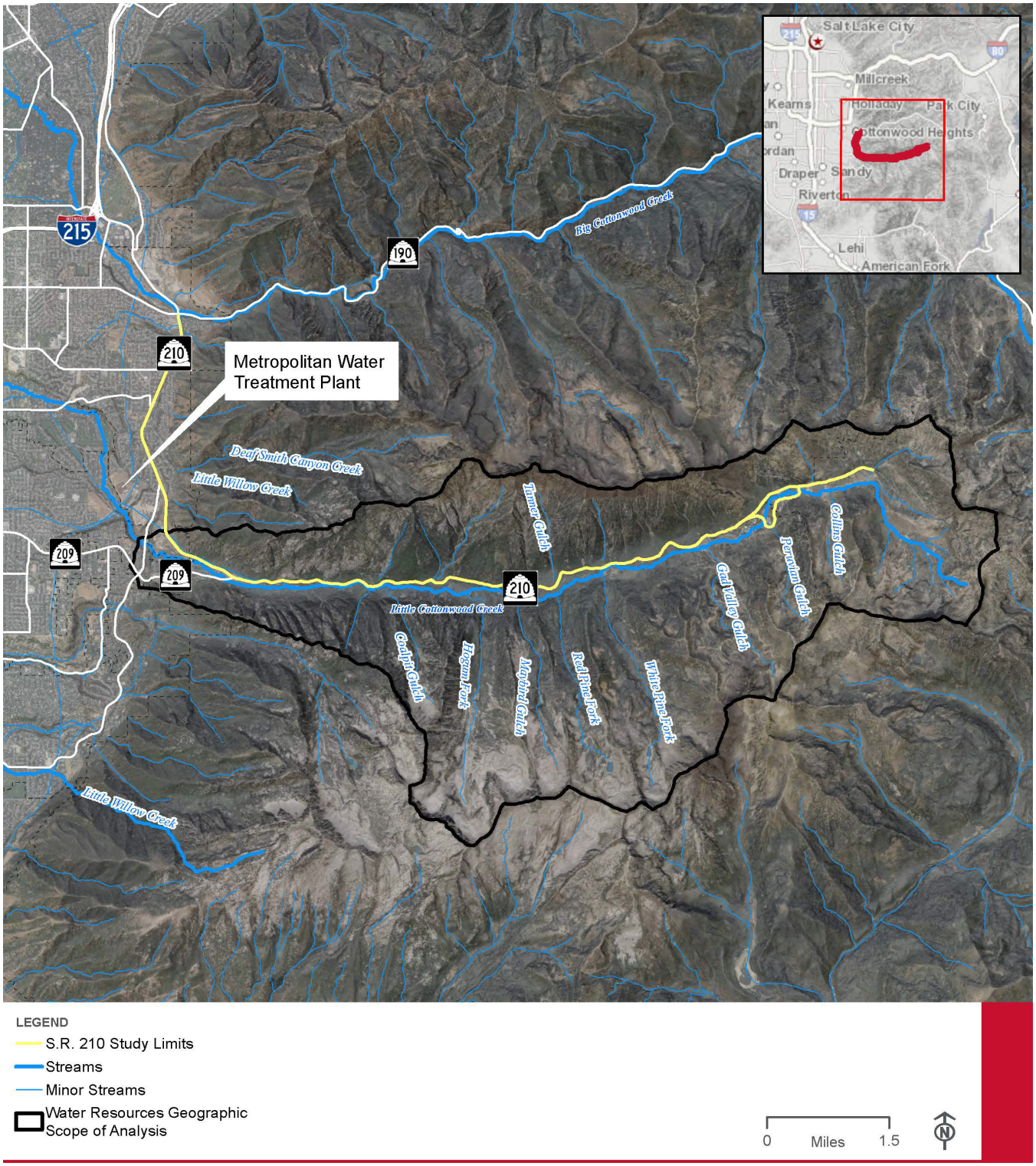


Figure 21.2-3. Ecosystem Resources Geographic Scope of Analysis

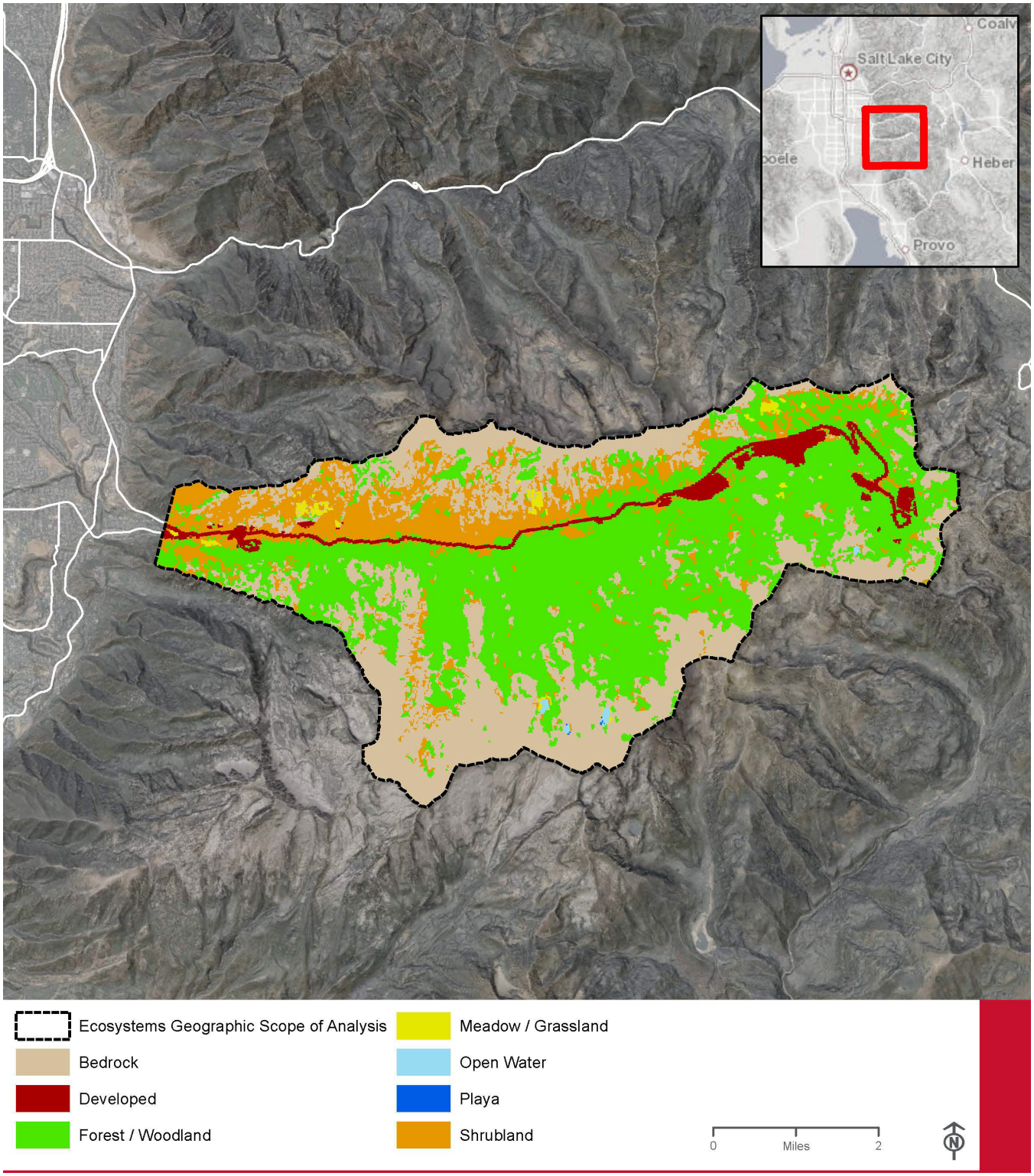
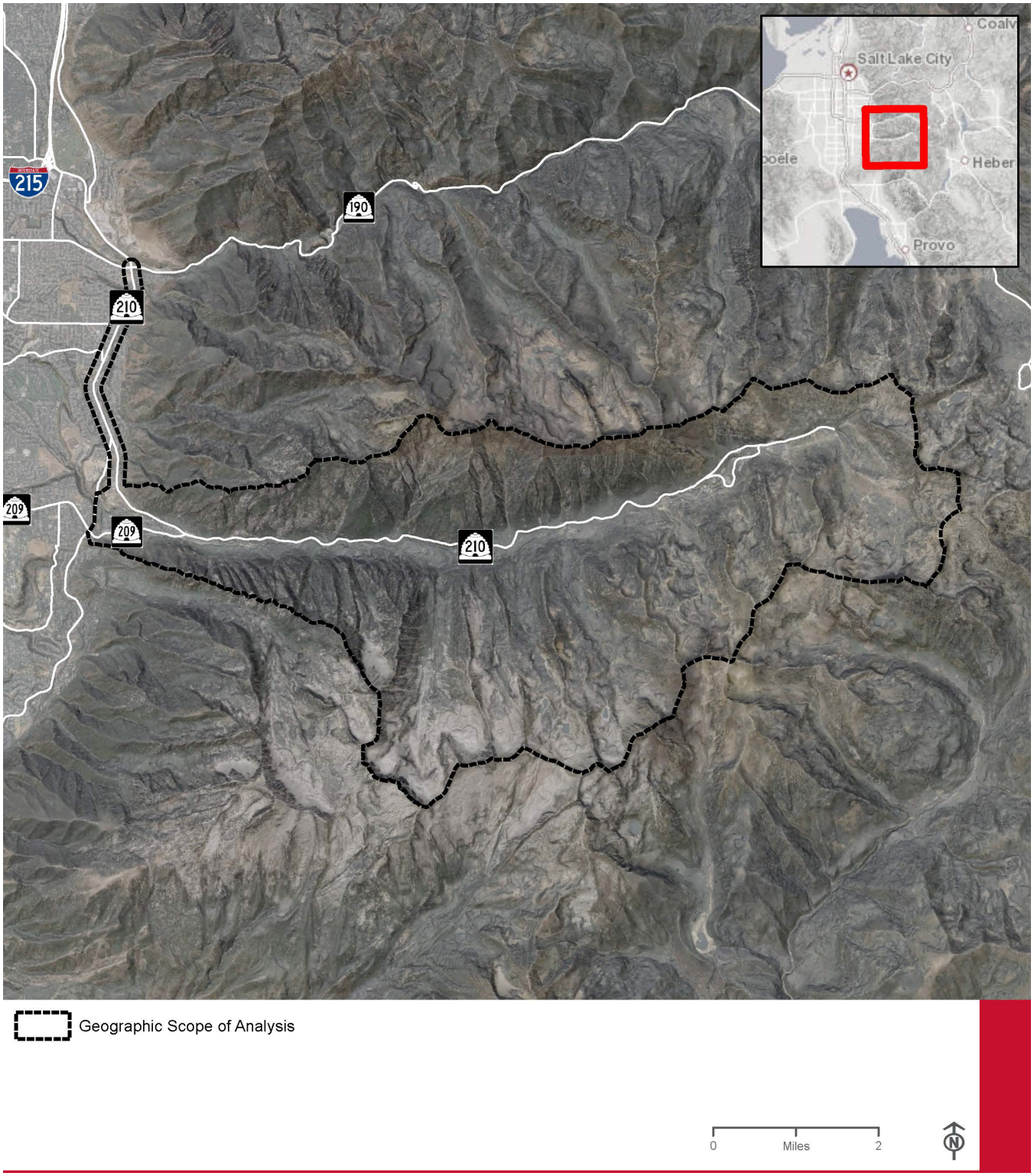


Figure 21.2-4. Visual Resources Geographic Scope of Analysis



### 21.2.5 Timeframe for the Analysis

The timeframe for the cumulative impacts analysis includes past and future periods. The period for the past impacts analysis varies by resource depending on the timeframe in which past actions contributed to effects and the availability of historical data. The period for the future impacts analysis extends from the present day to the reasonably foreseeable year of 2050.

The period for the past analysis was determined by the information available for each resource. For some resources, data are available for only the past 20 years, while for other resources data are available back to early Euro-American settlement of the Wasatch Front. The specific past-year timeframe for each resource is listed below:

- Recreation – 2000 to 2050
- Water resources – 1990s to 2050
- Ecosystem resources – Early 1900s to 2050
- Visual resources – 1970s to 2050

### 21.2.6 Past, Present, and Reasonably Foreseeable Future Actions

This section provides an overview of the past actions and the present and reasonably foreseeable future actions that have contributed or could contribute to cumulative impacts. Many of the baseline conditions relevant to cumulative impacts are described in detail in the relevant chapters of this EIS.

#### 21.2.6.1 Past Actions

S.R. 210 is in Salt Lake County. The county has experienced major urban expansion, resulting in large residential, commercial, and industrial centers along with associated infrastructure such as freeways and surface streets. The 1850 U.S. census found that Salt Lake County had a population of about 6,200 people. The county's population had increased dramatically to about 1.1 million people by 2017, and this steady increase has led to continuing urban expansion.

As a result of this population growth, the area adjacent to S.R. 210 along Wasatch Boulevard is mostly developed with residential land use. There is little remaining land for development. The land in Little Cottonwood Canyon is a mix of natural and wilderness areas on lands managed by the U.S. Department of Agriculture (USDA) Forest Service, private property development, the town of Alta, and ski resorts on both public and private lands. These uses have changed some of the natural and scenic areas in the canyon to more-developed uses.

Although Little Cottonwood Canyon retains much of its natural value, continued heavy recreation use, mining, and development at the ski resorts and in the town of Alta has diminished many of the canyon's natural resources. In turn, the recreation, mining, and urban development in the canyon have degraded the water quality in the canyon's watershed. The substantial recreation opportunities in Little Cottonwood Canyon and its proximity to a large metropolitan area generate about 1.2 million vehicle trips into the canyon per year, which carry about 2.1 million visitors. Visitation into the canyon is equally distributed between winter and summer uses, with winter use more focused on peak ski weekends and holidays, and summer use occurring throughout the season (Mountain Accord 2015).

### 21.2.6.2 Present and Reasonably Foreseeable Future Actions

UDOT took several steps to determine the present and future actions to consider in the cumulative impacts analysis. The first step involved coordinating with the Wasatch Front Regional Council (WFRC), the area's metropolitan planning organization, to help identify other roadway projects in the vicinity of S.R. 210 that could result in cumulative impacts when combined with the S.R. 210 Project. This step included reviewing environmental documents that were recently completed or are in progress and reviewing WFRC's 2019–2050 *Wasatch Front Regional Transportation Plan* (RTP) (WFRC 2019). The second step was to identify new or planned reconstruction of residential, commercial, and recreation infrastructure and ski resort developments that might be built along S.R. 210 and in Little Cottonwood Canyon. The USDA Forest Service was consulted regarding proposed future projects. UDOT also viewed the Uinta-Wasatch Cache National Forest project website.

Table 21.2-1 lists the present and reasonably foreseeable future actions that were considered in the cumulative impacts analysis. Some of the projects listed in Table 21.2-1 might be outside the geographic scope evaluated for each resource but are included since these actions could influence the cumulative impacts analysis.

Table 21.2-1. Present and Reasonably Foreseeable Future Actions [a]

| Project or Activity | Description | Impacts | Project Status |
|---|---|---|---|
| 6200 South | Widen from 5 to 7 lanes from 3000 East to Wasatch Boulevard. | • **Air quality** – Project is in a conforming implementation plan.<br>• **Water quality** – Minimal; UDOT will follow stormwater BMPs.<br>• **Floodplains** – Project would be designed to minimize stormwater flows per UDOT and Salt Lake City requirements. If floodplains would be affected, UDOT would obtain the appropriate floodplain permit from Salt Lake County or FEMA. | Planning |
| 3000 East | Widen from 3 to 5 lanes from 6200 South to 7000 South. | • **Air quality** – Project is in a conforming implementation plan.<br>• **Water quality** – Minimal; project improvements would not be adjacent to any water bodies. UDOT will follow stormwater BMPs.<br>• **Floodplains** – Project would be designed to minimize stormwater flows per UDOT requirements. If floodplains would be affected, UDOT would obtain the appropriate floodplain permit from Salt Lake County or FEMA. | Planning |
| Gravel Pit Development | Cottonwood Heights City is planning to allow commercial and residential development of the gravel pit aggregate mine after operations cease. | • **Air quality** – Could improve air quality by removing the gravel pit operation's contribution to particulate matter in the Salt Lake Valley. Vehicle traffic associated with the new development would increase vehicle emissions.<br>• **Water quality** – Could improve water quality by having a stormwater system in place for a planned development instead of the current mining operation.<br>• **Traffic** – Project would increase traffic on Wasatch Boulevard. | Planning |
| Fort Union Boulevard | Widen from 3/5 lanes to 5/7 lanes. | • **Air quality** – Project is in a conforming implementation plan.<br>• **Water quality** – Minimal; UDOT will follow stormwater BMPs.<br>• **Floodplains** – Project would be designed to minimize stormwater flows per UDOT and Salt Lake City requirements. If floodplains would be affected, UDOT would obtain the appropriate floodplain permit from Salt Lake County or FEMA. | Planning |
| Grit Mill and Climbing Master Plan Project (USDA Forest Service 2014) | • Construct new trailhead parking lot including interpretative site for climbing access for about 35 vehicles.<br>• Construct new trail segment of 1.4 miles.<br>• Maintain existing core trail routes.<br>• Stabilize routes and belay platforms. | • **Air quality** – No impact.<br>• **Cultural resources** – One adverse effect on a historic property.<br>• **Water quality** – Minimal; with use of BMPs, project improvements would generate no substantial water quality impacts on stream segments in or downstream of the project area.<br>• **Threatened and endangered species** – None.<br>• **Visual** – Project would improve scenic integrity.<br>• **Wetlands** – None. | Construction complete (2021) |

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Table 21.2-1. Present and Reasonably Foreseeable Future Actions [a]

| Project or Activity | Description | Impacts | Project Status |
|---|---|---|---|
| Alta Ski Lifts Master Development Plan Improvements Projects (USDA Forest Service 2018) | • Expand parking.<br>• Implement avalanche control.<br>• Replace lifts.<br>• Add a new lift.<br>• Improve ski runs.<br>• Expand and improve buildings. | • **Air quality** – No impact.<br>• **Cultural resources** – No adverse effects.<br>• **Water quality** – Minimal; with use of BMPs, project improvements would generate no substantial water quality impacts on stream segments in or downstream of the project area.<br>• **Wildlife** – Slight detrimental impact due to habitat loss.<br>• **Vegetation** – Minor impacts. Potential for introducing invasive species.<br>• **Threatened and endangered species** – None.<br>• **Visual** – Consistent with the "resort natural" setting theme.<br>• **Wetlands** – Project would convert 0.23 acre of wetlands and 5.34 acres of Riparian Habitat Conservation Areas to recreation use.<br>• **Recreation** – More-efficient management of skier density.<br>• **Safety** – No increased risk to backcountry skiers in Wolverine Cirque. | Environmental Assessment complete. |
| Patsey Marley Hill Subdivision, Alta, Utah (USDA Forest Service 2020) | • 25-acre development off Albion Base Road<br>• 10 single-family homes<br>• 20-space parking structure<br>• Widening of Albion Basin Road | • **Air quality** – Project would increase the amount of air pollutant emissions.<br>• **Water quality** – Project would convert open space to residential use and, if this conversion is not mitigated, increase the amount of stormwater runoff.<br>• **Wildlife** – Slight detrimental impact due to habitat loss.<br>• **Vegetation** – Natural vegetation loss. Potential for introducing invasive species.<br>• **Threatened and endangered species** – None.<br>• **Visual** – Would detract from natural setting along Albion Basin Road.<br>• **Wetlands** – Unknown.<br>• **Recreation** – Could reduce winter backcountry skiing access. | Planning |
| Giverny Housing Development (9216 Wasatch Boulevard) | • New 162-unit housing development | • **Air quality** – Project would increase the amount of air pollutant emissions.<br>• **Water quality** – Project would convert open space to residential use and, if this conversion is not mitigated, increase the amount of stormwater runoff.<br>• **Traffic** – Project would increase traffic on Wasatch Boulevard. | In process |

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Table 21.2-1. Present and Reasonably Foreseeable Future Actions [a]

| Project or Activity | Description | Impacts | Project Status |
|---|---|---|---|
| S.R. 190 Tolling and Improved Bus Service | • Expand parking at the gravel pit.<br>• Provide enhanced bus service to ski resorts in Big Cottonwood Canyon.<br>• Toll S.R. 190. | • **Air quality** – Project is in a conforming implementation plan.<br>• **Water quality** – Minimal; UDOT will follow stormwater BMPs during construction and operation.<br>• **Floodplains** – No impacts.<br>• **Wildlife** – No impacts.<br>• **Vegetation** – Minor impacts. Potential for introducing invasive species.<br>• **Threatened and endangered species** – None.<br>• **Wetlands** – No impact.<br>• **Recreation** – No impact. | Planning |
| La Caille Development | • 37.5-acre development<br>• 75-room hotel<br>• Existing and new dining facilities<br>• Renovation of existing buildings<br>• New residential units | • **Air quality** – Project would increase the amount of air pollutant emissions.<br>• **Water quality** – Project would convert open space to commercial and residential use and, if this conversion is not mitigated, increase the amount of stormwater runoff.<br>• **Floodplains** – Development would be built next to the Little Cottonwood Creek floodplain.<br>• **Traffic** – Project would increase traffic on Wasatch Boulevard and North Little Cottonwood Road.<br>• **Wildlife** – Loss of urban wildlife habitat.<br>• **Vegetation** – Natural vegetation loss. Potential for introducing invasive species.<br>• **Threatened and endangered species** – None.<br>• **Wetlands** – Unknown.<br>• **Visual** – Minor. Continuation of surrounding residential developments. | Planning |
| Cottonwood Canyons Developed Site Reconstruction Phase 3 | • Reconstruction of restrooms, water/waste water systems, bridges, parking, trailheads, and signage in both Big and Little Cottonwood Canyons. | • Projects are in the planning stage. No environmental impact information is available. The purposes of the projects are to reduce deferred maintenance and provide better overall management. The projects will be managed by the USDA Forest Service. Few environmental impacts are anticipated given the nature of the projects. | Planning |

BMPs = best management practices, FEMA = Federal Emergency Management Agency, UDOT = Utah Department of Transportation

[a] In general, the ski resorts consistently discuss potential summer recreation operations with the USDA Forest Service. Once those operations are defined, any new proposals would be analyzed by the USDA Forest Service as they are received. The projects in this table were current as of 2020. Some projects might have progressed since then, but that would not change the results of the analysis.

# 21.3 Cumulative Impacts Analysis by Resource

As discussed in Section 21.2, *Methodology for Determining Cumulative Impacts*, UDOT used CEQ guidance (CEQ 1997) to evaluate cumulative impacts. This section provides the foundation for determining the important issues to be evaluated as well as the past, present, and reasonably foreseeable future projects to be considered in the analysis. Detailed information about the affected environment and the direct impacts of the S.R. 210 Project is provided in the following chapters:

- Chapter 4, *Community and Property Impacts* (recreation resources only)
- Chapter 12, *Water Resources*
- Chapter 13, *Ecosystem Resources*
- Chapter 17, *Visual Resources*

## 21.3.1 Cumulative Impacts to Recreation

This section evaluates the potential cumulative impacts to recreation resources in Little Cottonwood Canyon from the action alternatives. The geographic scope of the analysis is the recreation resources in Little Cottonwood Canyon (designated trails, climbing resources, ski resorts, trailheads, backcountry skiing, and other recreation activities), and the timeframe for the analysis is 2000 to 2050. 2000 was selected as the start of the analysis period because reliable data are available regarding the number of yearly visitors in Little Cottonwood Canyon.

**What are the geographic scope and timeframe of the analysis of cumulative impacts to recreation?**

The geographic scope of the analysis is the recreation resources in Little Cottonwood Canyon, and the timeframe for the analysis is 2000 to 2050.

### 21.3.1.1 Past Conditions of Recreation

Many people choose to live in the Salt Lake City metropolitan area because of the easily accessible and abundant outdoor, year-round recreation opportunities (Utah State University 2015). Little Cottonwood Canyon also draws tourists from outside the region because of its easy access from Salt Lake City International Airport, which is less than 30 miles away.

S.R. 210 is the only road access into Little Cottonwood Canyon. It is a State Scenic Byway that is recognized for its views of dramatic mountain peaks and steep canyon walls. Wilderness Areas are located on both sides of the steep canyon. The canyon also has a small number of residents. Recreation activities in Little Cottonwood Canyon include rock climbing, cycling, camping, picnicking, fly fishing, bow hunting, hiking, running, skiing, ice climbing, and snowshoeing. The canyon is home to two ski and summer resorts, Alta and Snowbird.

The substantial recreation opportunities in Little Cottonwood Canyon and its proximity to a large metropolitan area generate about 1.2 million vehicle trips into the canyon per year, which carry about 2.1 million visitors. Visitation into the canyon is equally distributed between winter and summer uses, with winter use more focused on peak ski weekends and holidays, and summer use occurring throughout the season (Mountain Accord 2015).

Given that the populations of Salt Lake and Utah Counties are expected to grow by 36% and 108%, respectively, through 2050, the number of travelers into Little Cottonwood Canyon will also increase. Because of the vast number of recreation opportunities in the central Wasatch Range, in addition to other

recreation assets throughout the state, the Outdoor Industry Association estimates that the Utah travel, tourism, and recreation industry generated about $12.3 billion in annual consumer spending, 110,000 jobs, $3.9 billion in wages and salaries, and $737 million in state and local tax revenue in 2017 (OIA 2017).

### 21.3.1.2 Future Trends for Recreation

There are many variables to consider when predicting the number of visitors to Little Cottonwood Canyon in future years, variables such as the availability of parking, trends in recreation use, and how visitors react to crowded recreation activities (that is, whether they adapt to increased crowds or shift to a less crowded location or a different activity). However, it is likely that the yearly visitation will be greater than the 2.1 million visitors per year estimated for 2013 (Lamborn and Burr 2016). In using a formula developed to estimate yearly visitation for 2013, UDOT estimates that the number of visitors to Little Cottonwood Canyon could increase to about 3.4 million by 2050 (Fehr & Peers 2018).

### 21.3.1.3 Cumulative Recreation Impacts from the Enhanced Bus Service Alternative

The Enhanced Bus Service Alternative would operate during the winter only; there would be no summer operations. Because the Enhanced Bus Service Alternative, including the trailhead parking alternatives, would not increase summer recreation use, it would not contribute to summertime cumulative impacts to recreation.

As described in Section 20.4.2.2, *S.R. 210 – North Little Cottonwood Road to Alta*, in Chapter 20, *Indirect Effects*, for winter use, the indirect effects analysis assumes an increased number of visitors based on increasing bus service and assuming that the buses operate to meet the projected traffic volume in the 30th-highest hour, which is expected to occur on about 49 days per year (holiday periods and weekends). With the Enhanced Bus Service Alternative, an additional 2,283 skiers could be divided between the Snowbird and Alta ski resorts on a busy ski day, or about 1,141 skiers per resort on the 49 days.

**What is the 30th-highest hour?**

The 30th-highest hour is the hour with the 30th-highest projected hourly traffic volumes during the year.

The increase in users caused by the Enhanced Bus Service Alternative could detract from skiers' recreation experience. Note that the analysis assumes that the enhanced bus service would operate at 100% capacity from 7 AM to 12 PM. This is unlikely, so the total number of skiers would likely be less. In addition, some backcountry skiers might take the enhanced bus service to the resorts, which could also increase backcountry use.

The ski resorts would be responsible for managing the increased visitation to the resorts. The National Ski Area Permit Act of 1986, as amended by the Ski Area Recreational Opportunity Enhancement Act of 2011 (16 United States Code Section 497b), directs the U.S. Secretary of Agriculture to permit acreage sufficient and appropriate to accommodate a permittee's needs for ski operations and appropriate ancillary facilities, as determined by the Secretary, and does not explicitly direct the Secretary to set visitor capacity limits for the permitted acreage. Managing visitors' experience and safety is the responsibility of each individual ski area. This management is reflected in a ski area's master development plan, which is required by the standard Forest Service Ski Area Term Special Use Permit, and its operating plan, which lists the ski area's responsibilities for protecting public health, safety, and the environment and for ensuring delivery of high-

quality services. Additionally, the ski resort permits require the resorts to provide appropriate infrastructure to accommodate skiers.

Recreation users' perception of the additional skiers at each resort would vary. Most ski resort users expect some level of crowds and lift wait times. Not all recreationists perceive the environment in the same way; what is a quality ski experience to one person might be entirely undesirable to another. It is not possible to predict each user's recreation experience, but increased use of recreation areas and longer lift lines would likely lower the quality of the recreation experience for most users. The impacts to backcountry use, during which some users might expect some solitude while skiing, would be greater.

Overall, the cumulative impacts from the Enhanced Bus Service Alternative on the recreation experience at the ski resorts and for backcountry skiers along with other past, present, and reasonably foreseeable projects would consist of minor, but continued, incremental reduction in the recreation experience for winter users in upper Little Cottonwood Canyon.

#### 21.3.1.4 Cumulative Recreation Impacts from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The cumulative impacts to winter recreation use from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative except for the alternative's potential for increase summertime cyclist use of the peak-period shoulder lane. As stated in Chapter 20, *Indirect Effects*, UDOT does not expect the Enhanced Bus Service in Peak-period Shoulder Lane Alternative to substantially increase cyclist use of S.R. 210 because of the addition of the peak-period shoulder lanes. Cyclists would ride in a paved shoulder lane and would have the opportunity to use restrooms at trailheads and the ski resorts. Therefore, UDOT does not expect the Enhanced Bus Service in Peak-period Shoulder Lane Alternative to substantially contribute to summertime cumulative impacts to recreation.

Some commenters stated that, with the reduction in roadside climbing boulders and reduced roadside pullouts, climbers and other recreationists might choose to use other nearby canyons (Big Cottonwood Canyon, Mill Creek Canyon, and Parley's Canyon). About 41 boulders of the approximately 477 boulders on either side of S.R. 210 in Little Cottonwood Canyon would be removed to construct the peak-period shoulder lanes. The loss of 9% of the boulders would be along the road in the lower canyon, and these boulders are frequently used because of the convenient access. The loss of these boulders would be an incremental impact. The loss of 41 boulders might cause rock climbers to overcrowd some of the remaining popular boulders that have easy access.

If some climbers decided to use other locations, it would not be possible to predict the number of recreationists who might no longer visit Little Cottonwood Canyon because of the peak-period shoulder lanes and associated impacts. However, it is possible that users might go to other areas along the Wasatch Front, thereby increasing use of those areas and causing additional degradation of the areas from the additional use and causing cumulative impacts to the natural environment and the overall user recreation experience in other locations. If there is a decrease in recreation use in Little Cottonwood Canyon, the reduction could benefit the watershed conditions and the recreation experience of canyon users since there would be fewer people.

#### 21.3.1.5 Cumulative Recreation Impacts from Gondola Alternative A (Starting at Canyon Entrance)

The cumulative impacts to winter recreation use with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative. However, Gondola Alternative A would operate during the summer with stops at the Snowbird and Alta ski resorts.

Both the Snowbird and Alta ski resorts are popular summertime destinations with each resort adding new summer amenities to attract recreation users. As described in Section 20.4.1.2.2, *Summer Visitation*, in Chapter 20, *Indirect Effects*, the summer operation of the gondola could increase summer visitation to the ski resorts by about 198 people. Even with the increase in summer users, the ski resorts would still operate well below their wintertime use.

The additional summer users could increase crowds at both resorts including at restaurants, shops, and other resort attractions. The additional gondola users might also decide to hike on trails at the resorts. UDOT does not anticipate that all 198 additional users would go to one resort, but rather that the additional users would be divided between Alta and Snowbird, with Snowbird receiving the majority because it would be the first gondola stop and has more summer amenities. During flowering season, some users might visit Albion Basin to view the wildflowers. Not all additional users would go hiking; some would stay within the developed resort area. Assuming that the 198 users would be spread throughout the day, trail use would not increase in a substantial way that would detract from users' outdoor recreation experience at the resorts.

Some recreation users might find that the gondola infrastructure detracts from their recreation experience in Little Cottonwood Canyon and use other nearby canyons thereby increasing use of those canyons or recreation areas. It is not possible to predict the number of recreationists who might no longer visit Little Cottonwood Canyon because of the gondola infrastructure. However, it is possible that users might go to other areas along the Wasatch Front, thereby increasing use of those areas and causing additional degradation of the areas from the additional use and causing cumulative impacts to the natural environment and overall user recreation experience in other locations. With Gondola Alternative A, there would be a loss of five climbing boulders. The loss of the boulders would not substantially diminish climbing resources.

Overall, the impacts from summertime use of Gondola Alternative A to the recreation experience at the ski resorts and adjacent areas would be very small compared to the impacts of other past, present, and reasonably foreseeable projects, and would not contribute substantially to the cumulative impacts to the recreation experience for summertime users in upper Little Cottonwood Canyon.

#### 21.3.1.6 Cumulative Recreation Impacts from Gondola Alternative B (Starting at La Caille)

The cumulative impacts to winter and summer recreation use with Gondola Alternative B would be the same as with Gondola Alternative A.

### 21.3.1.7 Cumulative Recreation Impacts from the Cog Rail Alternative (Starting at La Caille)

The cumulative impacts to winter and summer recreation use with the Cog Rail Alternative would be the same as with Gondola Alternative A except for the impacts to climbing boulders.

Some commenters stated that, with the reduction in roadside climbing boulders and reduced roadside pullouts, climbers and other recreationists might choose to use other nearby canyons (Big Cottonwood Canyon, Mill Creek Canyon, and Parley's Canyon). About 116 boulders of the approximately 477 boulders on either side of S.R. 210 in Little Cottonwood Canyon would be removed to construct the cog rail infrastructure. The loss of 116 boulders might cause rock climbers to overcrowd the remaining popular boulders that have easy access.

If some climbers decided to use other locations, it would not be possible to predict the number of recreationists who might no longer visit Little Cottonwood Canyon because of the Cog Rail Alternative. However, given the high number of boulders removed with the Cog Rail Alternative, it is likely that users might go to other areas along the Wasatch Front, thereby increasing use of those areas and causing additional degradation of the areas from the additional use and causing cumulative impacts to the natural environment and overall user recreation experience in other locations. If there is a decrease in recreation use in Little Cottonwood Canyon, the reduction could benefit the watershed conditions and the recreation experience of canyon users since there would be fewer people.

### 21.3.1.8 Mitigation Measures for Cumulative Impacts to Recreation

As population along the Wasatch Front increases, this increase in population could cause additional pressure from recreation on the Little Cottonwood Creek watershed. To minimize these impacts, the USDA Forest Service, through its management and special-use permitting on National Forest System lands, will continue to implement recreation management to reduce the impacts of visitation on the watershed, specifically in regard to the watershed desired future condition stated in the *Revised Forest Plan: Wasatch-Cache National Forest* (USDA Forest Service 2003).

The USDA Forest Service's decisions responding to increasing recreation demands consider desired water quality and riparian conditions and the limited wildlife habitat in the watershed. The USDA Forest Service provides for a wide range of recreation uses including access and sanitation facilities that strive to prevent or fully mitigate impacts to watershed conditions. Major trailheads and restrooms are provided and maintained in cooperation with partners such as the Salt Lake City Department of Public Utilities. The USDA Forest Service has goals, identified in the *Forest Plan*, to maintain and/or restore watersheds and educate the public by increasing awareness of resources and user ethics in cooperation and partnership with other agencies.

## 21.3.2 Cumulative Impacts to Water Resources

This section describes the cumulative impacts to water quality in Little Cottonwood Canyon from the action alternatives. The geographic scope of the analysis is upper Little Cottonwood Creek from the Metropolitan Water District of Salt Lake and Sandy's (Metropolitan Water) water treatment plant to its headwaters.

**What are the geographic scope and timeframe of the analysis of cumulative impacts to water resources?**

The geographic scope of the analysis is upper Little Cottonwood Creek from the Metropolitan Water treatment plant to its headwaters, and the timeframe for the analysis is from the 1990s to 2050.

The timeframe for the analysis is from the 1990s to 2050. The 1990s were selected as the early date for the analysis based on the availability of data generated by an intensive monitoring program by the Utah Division of Water Quality (UDWQ). The baseline year selected for the analysis is 1998 based on the water quality data used in a quantitative model which was used to estimate in-stream water quality concentrations from the action alternatives as well as the projects listed in Table 21.2-1 above, *Present and Reasonably Foreseeable Future Actions*, for considerations in this cumulative impacts section.

### 21.3.2.1 Past Conditions of Water Resources

UDWQ has included Little Cottonwood Creek on its 303(d) list of impaired water bodies because the creek does not meet standards for metals (cadmium, copper, and zinc) and pH. A total maximum daily load (TMDL) analysis was prepared for zinc in 2002. The TMDL analysis identified historic mining operations and, specifically, discharges from the Howland Tunnel and Wasatch Tunnel as the major sources of zinc loading that caused the zinc impairment. Transportation facilities (roads or parking areas) were not identified in the TMDL analysis as sources of zinc contamination.

**What is a 303(d) list?**

When a lake, river, or stream fails to meet the water quality standards for its beneficial uses, Section 303(d) of the Clean Water Act requires the State to place the water body on a list of "impaired" waters, known as a 303(d) list, and prepare an analysis called a total maximum daily load (TMDL).

According to Metropolitan Water's drinking water source protection plan for Little Cottonwood Creek, mines have been cleared of abandoned equipment, materials, and waste; mine openings have been closed; and the remaining mine tunnel discharges are sufficiently controlled. Given the other additional remedial efforts in the watershed, mines are no longer considered a serious contamination source (Metropolitan Water 2013).

TMDL analyses for cadmium, copper, and pH have not yet been prepared and are ranked as low priorities for development. Therefore, the source of these contaminants, and factors affecting pH levels, are not known. UDOT did not analyze past conditions for these constituents as part of this EIS analysis. However, UDOT used a quantitative baseline water quality model, which incorporates over 20 years of water quality monitoring data and which captures past activities in the watershed, to estimate the cumulative impacts and determine whether the action alternatives would contribute these contaminants at levels that could exceed numeric water quality standards.

**What is a TMDL analysis?**

A TMDL analysis determines the sources and allowable load of a given pollutant for that water body and allocates that load among different pollutant sources so that the appropriate actions can be taken and controls implemented to maintain water quality standards.

Pathogenic pollution from human and animal waste is another common contaminant identified by watershed stewards for monitoring and management. Several management practices have been put in place to reduce the potential for pathogenic pollution including restrooms at trailheads and a prohibition on most dogs in Little Cottonwood Canyon. Transportation facilities by themselves would not add pathogenic pollution. For more information about increased recreation use from the action alternatives, see Section 21.3.1, *Cumulative Impacts to Recreation*.

**What are pathogens?**

As used in this chapter, a pathogen is a bacterium or virus that can cause disease.

### 21.3.2.2 Future Trends for Water Resources

The addition of impervious areas in the watershed is often used as a proxy for the risks to water quality, because increases in impervious areas can lead to increased runoff and pollutant loadings. The future developments listed in Table 21.2-1 above, *Present and Reasonably Foreseeable Future Actions*, will add about 45 acres of impervious area based on UDOT's review of the development documents. The increase in impervious surfaces could further degrade water quality in the Little Cottonwood Creek watershed.

### 21.3.2.3 Action Alternative Cumulative Impact Water Quality Model

UDOT used a water quality model developed by the U.S. Geological Survey (USGS) to assess the potential cumulative impacts of the action alternatives combined with past developments and proposed reasonably foreseeable future projects. The USGS Model is described in Section 12.4.1, *Methodology*, in Chapter 12, *Water Resources*. UDOT first established a baseline condition for comparing future projects, as shown in Table 21.3-1. UDOT made the following assumptions regarding inputs to the cumulative impacts model:

- **Runoff concentrations:** Runoff concentrations from all impervious areas were assumed equal to the pollutant concentrations in highway runoff.
- **Discharges:** No existing impervious areas were "disconnected" from the creek. UDOT assumed that 100% of runoff was discharged to the creek just above the Metropolitan Water treatment plant.
- **BMPs:** No BMPs were assumed.

UDOT calculated that there are about 181 acres of existing impervious area in the upper Little Cottonwood Creek watershed. The existing S.R. 210 has about 39 acres of pavement, and there are another 142 acres of additional impervious areas consisting mainly of other roads, parking lots, and driveways. UDOT assumed that runoff from these impervious areas had pollutant concentrations equal to highway stormwater runoff and that 100% of stormwater runoff was mixed with Little Cottonwood Creek just above the Metropolitan Water treatment plant. UDOT then ran the USGS Model to capture the additional impervious areas (and their pollutant loads) from the action alternatives and other projects to determine the risks that numeric water quality standards would be exceeded.

Table 21.3-1. Comparison of New Impervious Areas from the Action Alternatives

In acres

| Category | Existing Conditions | Enhanced Bus Service Alternative | Enhanced Bus Service in Peak-period Shoulder Lane Alternative | Gondola Alternative A (Starting at Canyon Entrance) | Gondola Alternative B (Starting at La Caille) | Cog Rail Alternative |
|---|---|---|---|---|---|---|
| Existing impervious area | 142 | 142 | 142 | 142 | 142 | 142 |
| S.R. 210 existing impervious area | 39 | 39 | 39 | 39 | 39 | 39 |
| Additional impervious area with action alternatives | 0 | 2 | 24 | 4 | 10 | 39 |
| Future projects impervious area[a] | 0 | 45 | 45 | 45 | 45 | 45 |
| **Total impervious area** | **181** | **228** | **250** | **230** | **236** | **265** |

[a] New impervious areas: Grit Mill – 0.8 acre (construction completed in 2021); Alta Ski Lifts Master Development Plan Improvement Projects – 3.3 acres; Patsey Marley Hill Subdivision – 3.4 acres; Giverny Development – 26 acres; and La Caille Development – 12 acres.

### 21.3.2.4 Cumulative Water Resource Impacts from the Enhanced Bus Service Alternative

The Enhanced Bus Service Alternative would add about 2 acres of impervious area for the proposed trailhead improvements. UDOT would add stormwater BMPs pursuant to its *Stormwater Quality Design Manual*.

The USGS Model results presented in Section 12.4.3, *Enhanced Bus Service Alternative*, in Chapter 12, *Water Resources*, show that the Enhanced Bus Service Alternative would not degrade Little Cottonwood Creek's water quality compared to the No-Action Alternative. For more information, see Table 12.4-2, *USGS Model Results for the No-Action and Enhanced Bus Service Alternatives*, in Chapter 12.

**What are contaminants of concern (COCs)?**

COCs are pollutants that are typically found in highway stormwater runoff. For more information, see Section 12.4.1.1, *Surface Water Quality*, in Chapter 12, *Water Resources*.

Therefore, the cumulative effects of the Enhanced Bus Service Alternative, when combined with other past and reasonably foreseeable actions, would also not substantially contribute to the degradation of water quality or contribute to water quality impairments for the 17 contaminants of concern (COCs) that were evaluated.

### 21.3.2.5 Cumulative Water Resource Impacts from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would add about 24 acres of impervious area in the Little Cottonwood Creek watershed. Considering only the increased impervious area of this alternative, the results of the USGS Model showed only *de minimis* increases over the No-Action Alternative. Therefore, this alternative would not contribute COC concentrations at levels that would impair Little Cottonwood Creek's beneficial uses or impair Metropolitan Water's ability to deliver safe drinking water. The USGS Model results are presented in Section 12.4.4, *Enhanced Bus Service in Peak-period Shoulder Lane Alternative*, in Chapter 12, *Water Resources*.

**What is a *de minimis* impact?**

As used in this chapter, a *de minimis* impact is a minor impact that does not pose a significant risk to water quality.

Table 21.3-2, *Cumulative Water Quality Model Results*, on page 21-28 presents the USGS Model results for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative (24 acres of additional pavement) combined with existing impervious areas and the impervious areas from future projects (45 acres). Table 21.3-2 also presents the model results for the existing conditions (181 acres of impervious area, which includes the existing S.R. 210) for comparison.

**What are beneficial uses?**

Lakes, rivers, and other water bodies have uses to people and other forms of life called *beneficial uses*. Three beneficial-use designations (1C, 2B, and 3A) apply to Little Cottonwood Creek.

As discussed in Chapter 12, *Water Resources*, 17 COCs were evaluated. Due to their 303(d) listing, the main COCs are metals (cadmium, copper, and zinc) and pH. The remainder of this section presents the USGS Model results for the cumulative impacts with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative. Also discussed below are the model results for phosphorus because the modeled in-stream concentrations would fall within the numeric standard of phosphorus for the range of storm events reported.

#### *21.3.2.5.1 Cadmium*

The USGS Model results for the existing conditions estimated that in-stream cadmium concentrations would range from 0.34 micrograms per liter (µg/L) for the majority of storms (low end or 80% of storm events) to about 0.60 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative with the runoff from future projects would not change the modeled range of cadmium concentrations (modeled range is 0.33 to 0.60 µg/L) over the existing conditions. The in-stream cadmium concentrations should also not exceed the most stringent numeric standard, which is 1.8 µg/L for beneficial-use classification 3A, for the majority of storm events.

**What is beneficial-use classification 3A?**

A water classified as 3A is protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.

#### *21.3.2.5.2 Copper*

The USGS Model results for the existing conditions estimated that in-stream copper concentrations would range from 4.3 µg/L for the majority of storms (low end or 80% of storm events) to about 10.2 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative with the runoff from future projects would slightly increase the modeled range of copper concentrations (modeled range is 4.47 to 10.99 µg/L) in Little Cottonwood Creek. This represents an increase of about 0.7 µg/L at the high end of the range. The in-stream copper concentrations should not exceed the most stringent numeric standard, which is 13 µg/L for beneficial-use classification 3A, for the majority of storm events.

#### *21.3.2.5.3 Zinc*

The USGS Model results for the existing conditions estimated that in-stream zinc concentrations would range from 32.2 µg/L for the majority of storms (low end or 80% of storm events) to about 66.5 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative with the runoff from future projects would slightly increase the modeled range of zinc concentrations (modeled range is 33.0 to 71.6 µg/L). This represents a maximum increase of about 5.1 µg/L at the high end of the range. The in-stream zinc concentrations would not exceed the most stringent numeric standard, which is 120 µg/L for beneficial-use classification 3A, for the majority of storm events.

#### *21.3.2.5.4 pH*

The USGS Model results show *de minimis* decreases in the levels of pH in Little Cottonwood Creek between the existing conditions (7.08–7.88) and the Enhanced Bus Service in Peak-period Shoulder Lane Alternative combined with future projects (7.03–7.86). The reported pH levels are the modeled statistical range that can be expected over a large number of storm events. The model range is within the numeric standard (6.5–9.0) for drinking water sources (beneficial use 1C).

**What is beneficial-use classification 1C?**

A water classified as 1C is protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.

#### *21.3.2.5.5 Phosphorus*

The USGS Model results for the existing conditions estimated that in-stream phosphorus concentrations would range from 0.015 milligrams per liter (mg/L) for the majority of storms (low end or 80% of storm events) to about 0.105 mg/L for the more infrequent storm events (high end or 20% of storm events). Adding runoff from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative with runoff from future projects would slightly increase the modeled range of phosphorus concentrations (modeled range is 0.016 to 0.138 mg/L) in Little Cottonwood Creek. This represents an increase of about 0.033 mg/L at the high end of the range.

Both the modeled existing conditions and the modeled cumulative impacts for the Enhanced Bus Service in Peak-period Shoulder Lane Alternative with future projects exceed the upper numeric standard threshold at the high end of the modeled range. With the steep gradient of the steam, the short duration of storm events (8 hours on average), and the relatively few storm events that could result, statistically (about 20% of storms,

10 storms per year, or 3% of total annual stream flow time), higher phosphorus loading (nutrient enrichment) should not cause an ecological response that impairs in-stream water quality.

However, as described in Chapter 12, *Water Resources*, additional investigations would be required to determine whether existing phosphorus loadings are excessive and are impairing or threatening Little Cottonwood Creek's designated beneficial use or how much additional phosphorus loading might be allowed before an ecological response is likely to occur. A TMDL analysis would also be needed if UDWQ's ongoing monitoring identifies a possible phosphorus impairment in the creek.

#### *21.3.2.5.6 Conclusion*

The amount of impervious surface related to the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would increase in conjunction with other past, current, and reasonably foreseeable projects. However, stormwater runoff from this increase would not impair Little Cottonwood Creek's water quality, and the beneficial uses of the water would be maintained.

Note that the USGS Model results for the cumulative impacts analysis did not include BMPs for any of the new impervious surfaces. The use of BMPs, which are required[1] to treat stormwater runoff before it is discharged to receiving waters, would help protect water quality. Overall, UDOT does not expect the Enhanced Bus Service in Peak-period Shoulder Lane Alternative to substantially contribute to cumulative water quality impacts in the Little Cottonwood Creek watershed.

### 21.3.2.6 Cumulative Water Resource Impacts from Gondola Alternative A (Starting at Canyon Entrance)

Gondola Alternative A would add about 3 acres of new impervious area for the proposed trailhead improvements in Little Cottonwood Canyon, reconfiguring the existing park-and-ride lot at the intersection of S.R. 210 and S.R. 209, and building the gondola base station at the entrance to the canyon. UDOT would add stormwater BMPs pursuant to its *Stormwater Quality Design Manual*. There would be no substantial increase in paved impervious surfaces (parking areas) associated with the gondola towers, the angle station, or the destination stations in Little Cottonwood Canyon.

The USGS Model results presented in Section 12.4.5, *Gondola Alternative A (Starting at Canyon Entrance)*, in Chapter 12, *Water Resources*, show that Gondola Alternative A would not degrade Little Cottonwood Creek's water quality compared to the No-Action Alternative. For more information, see Table 12.4-3, *USGS Model Results for the No-Action and Gondola Alternatives*, in Chapter 12. Therefore, the cumulative effects of Gondola Alternative A, when combined with other past and reasonably foreseeable actions, would also not substantially contribute to the degradation of water quality or contribute to water quality impairments for the 17 COCs that were evaluated.

[1] Alta Ordinance 9-4-6, the *Cottonwood Heights Stormwater Management Plan*, and UDOT's *Stormwater Quality Design Manual* all address the required use of stormwater BMPs and would apply to the action alternatives and the identified future developments.

### 21.3.2.7 Cumulative Water Resource Impacts from Gondola Alternative B (Starting at La Caille)

Gondola Alternative B would add about 17 acres of new impervious area for the proposed trailhead improvements in Little Cottonwood Canyon and for the parking structure and ancillary roads at the gondola base station at La Caille including the improvements to North Little Cottonwood Road near the base station for this alternative. UDOT would add stormwater BMPs pursuant to its *Stormwater Quality Design Manual*.

The USGS Model results presented in Section 12.4.6, *Gondola Alternative B (Starting at La Caille)*, in Chapter 12, *Water Resources*, show that Gondola Alternative B would not degrade Little Cottonwood Creek's water quality compared to the No-Action Alternative. For more information, see Table 12.4-3, *USGS Model Results for the No-Action and Gondola Alternatives*, in Chapter 12. Therefore, the cumulative effects of Gondola Alternative B, when combined with other past and reasonably foreseeable actions, would also not substantially contribute to the degradation of water quality or contribute to water quality impairments for the 17 COCs that were evaluated.

### 21.3.2.8 Cumulative Water Resource Impacts from the Cog Rail Alternative (Starting at La Caille)

The Cog Rail Alternative would add about 39 acres of impervious area in the upper Little Cottonwood Creek watershed. About 13 acres of impervious area would be associated with the roadway improvements and the parking structure at the cog rail base station at La Caille. The cog rail track section would be constructed mostly on ballasted fill, but a few short sections of track would be embedded in the roadway to reduce the footprint around the trailhead parking lots. Track ballast is a porous material, but some runoff is still expected for higher-intensity storm events since stormwater would infiltrate the ballast but would encounter a presumably rock subgrade. UDOT assumed that 70% of stormwater would run off from the ballasted track segments and that 100% of the embedded track would generate runoff. A total impervious area equivalent for the cog rail line is about 23 acres. There would also be about 4 acres of impervious area for an operations and maintenance facility.

Table 21.3-2, *Cumulative Water Quality Model Results*, on page 21-28 presents the USGS Model results for the Cog Rail Alternative (39 acres of additional impervious area) combined with existing impervious areas and the impervious areas from future projects (45 acres). Table 21.3-2 also presents the model results for the existing conditions (181 acres of impervious area, which includes the existing S.R. 210) for comparison.

As discussed in Chapter 12, *Water Resources*, 17 COCs were evaluated. Due to their 303(d) listing, the main COCs are metals (cadmium, copper, and zinc) and pH. The remainder of this section presents the USGS Model results for the cumulative impacts with the Cog Rail Alternative. Also discussed below are the model results for phosphorus because the modeled in-stream concentrations would fall within the numeric standard of phosphorus for the range of storm events reported.

#### *21.3.2.8.1 Cadmium*

The USGS Model results for the existing conditions estimated that in-stream cadmium concentrations would range from 0.34 µg/L for the majority of storms (low end or 80% of storm events) to about 0.60 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Cog Rail Alternative with the runoff from future projects would not change the modeled range of cadmium concentrations (modeled range is 0.33 to 0.60 µg/L) over the existing conditions. The in-stream cadmium concentrations should not exceed the most stringent numeric standard, which is 1.8 µg/L for beneficial-use classification 3A, for the majority of storm events.

#### *21.3.2.8.2 Copper*

The USGS Model results for the existing conditions estimated that in-stream copper concentrations would range from 4.3 µg/L for the majority of storms (low end or 80% of storm events) to about 10.2 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Cog Rail Alternative with the runoff from future projects would slightly increase the modeled range of copper concentrations (modeled range is 4.49 to 11.2 µg/L) in Little Cottonwood Creek. This represents an increase of about 1 µg/L at the high end of the range. The in-stream copper concentrations should not exceed the most stringent numeric standard, which is 13 µg/L for beneficial-use classification 3A, for the majority of storm events.

#### *21.3.2.8.3 Zinc*

The USGS Model results for the existing conditions estimated that in-stream zinc concentrations would range from 32.2 µg/L for the majority of storms (low end or 80% of storm events) to about 66.5 µg/L for the more infrequent storm events (high end or 20% of storm events). Adding the runoff from the Cog Rail Alternative with the runoff from future projects would slightly increase the modeled range of zinc concentrations (modeled range is 33.1 to 72.5 µg/L). This represents a maximum increase of about 6 µg/L at the high end of the range. The in-stream zinc concentrations would not exceed the most stringent numeric standards, which is 120 µg/L for beneficial-use classification 3A, for the majority of storm events.

#### *21.3.2.8.4 pH*

The USGS Model results show *de minimis* decreases in the levels of pH in Little Cottonwood Creek between the existing conditions (7.08–7.88) and the Cog Rail Alternative combined with future projects (6.99–7.84). The reported pH levels are the modeled statistical range that can be expected over a large number of storm events. The model range is within the numeric standard (6.5–9.0) for drinking water sources (beneficial use 1C).

#### *21.3.2.8.5 Phosphorus*

The USGS Model for the existing conditions estimated that in-stream phosphorus concentrations would range from 0.015 mg/L for the majority of storms (low end or 80% of storm events) to about 0.105 mg/L for the more infrequent storm events (high end or 20% of storm events). Adding runoff from the Cog Rail Alternative with runoff from future projects would slightly increase the modeled range of phosphorus concentrations (modeled range is 0.017 to 0.138 mg/L) in Little Cottonwood Creek. This represents an increase of about 0.033 mg/L at the high end of the modeled range.

Both the modeled existing conditions and the modeled cumulative impacts for the Cog Rail Alternative with future projects exceed the upper numeric standard threshold at the high end of the modeled range. With the steep gradient of the steam, the short duration of storm events (8 hours on average), and the relatively few storm events that could result, statistically (about 20% of storms, 10 storms per year, or 3% of total annual stream flow time), higher phosphorus loading (nutrient enrichment) should not cause an ecological response that impairs in-stream water quality.

However, as described in Chapter 12, *Water Resources*, additional investigations would be required to determine whether existing phosphorus loadings are excessive and are impairing or threatening Little Cottonwood Creek's designated beneficial uses or how much additional phosphorus loading might be allowed before an ecological response is likely to occur. A TMDL analysis would also be needed if UDWQ's ongoing monitoring identifies a possible phosphorus impairment in the creek.

#### *21.3.2.8.6 Conclusion*

The amount of impervious surface associated with the Cog Rail Alternative would increase in conjunction with other past, current, and reasonably foreseeable projects. However, stormwater runoff from this increase would not impair Little Cottonwood Creek's water quality, and the beneficial uses of the water would be maintained.

Note that the USGS Model results for the cumulative impacts analysis did not include BMPs for any of the new impervious surfaces. The use of BMPs, which are required to treat stormwater runoff before it is discharged to receiving waters, would help protect water quality. Overall, UDOT does not expect the Cog Rail Alternative to substantially contribute to cumulative water quality impacts in the Little Cottonwood Creek watershed.

Table 21.3-2. Cumulative Water Quality Model Results

| Constituent of Concern | Unit | Modeled Downstream Concentration Range Low End (80% of Storms) – High End (20% of Storms) | | | Numeric Standards | | |
|---|---|---|---|---|---|---|---|
| | | Existing Conditions (runoff from all impervious areas of watershed) | Existing Conditions + Future Projects + Enhanced Bus Service in Peak-period Shoulder Lane Alternative | Existing Conditions + Future Projects + Cog Rail Alternative | Primary or Secondary MCL | Beneficial Use 1C | Beneficial Use 3A |
| Alkalinity | mg/L | 38.0–55.2 | 36.5–53.8 | 36.3–53.6 | — | — | — |
| Cadmium | µg/L | 0.34–0.60 | 0.33–0.60 | 0.33–0.60 | 5 | 10 | 1.8 |
| Calcium | mg/L | 18.3–26.6 | 17.0–26.2 | 16.8–26.1 | — | — | — |
| Chloride | mg/L | 12.6–65.1 | 12.4–69.5 | 12.4–70.0 | 250 | — | — |
| Chromium | µg/L | 1.62–3.73 | 1.68–4.10 | 1.69–4.18 | 100 | 50 | 16 |
| Copper | µg/L | 4.33–10.20 | 4.47–10.99 | 4.49–11.19 | 1,000 | — | 13 |
| Hardness | mg/L | 59.8–96.8 | 57.4–95.4 | 56.6–95.1 | — | — | — |
| Lead | µg/L | 0.85–5.52 | 0.94–6.67 | 0.96–6.86 | 15 | 15 | 65 |
| Magnesium | mg/L | 3.73–6.14 | 3.57–6.05 | 3.53–6.03 | — | — | — |
| Nitrogen | mg/L | 0.19–0.37 | 0.19–0.38 | 0.19–0.38 | 10 | 10 | 0.4–0.8 |
| pH | NA | 7.08–7.88 | 7.03–7.86 | 6.99–7.84 | 6.5–8.5 | 6.5–9.0 | 6.5–9.0 |
| Phosphorus | mg/L | 0.015–0.105 | 0.016–0.138 | 0.017–0.138 | — | — | 0.035–0.08 |
| Sulfate | mg/L | 11.4–28.1 | 11.0–27.4 | 10.9–27.2 | 1,000 | — | — |
| TDS | mg/L | 102.6–205.1 | 100.7–212.4 | 100.6–213.1 | 500 | — | — |
| TSS | mg/L | 4.0–38.7 | 4.6–48.1 | 4.67–50.3 | — | — | — |
| Water temperature | °C | 4.3–9.9 | 4.6–10.3 | 4.60–10.3 | — | — | 20° max, 2° change |
| Zinc | µg/L | 32.2–66.5 | 33.0–71.6 | 33.1–72.5 | 5,000 | — | 120 |

°C = degrees Celsius, mg/L = milligrams per liter, µg/L = micrograms per liter, MCL = maximum contaminant level, NA = not applicable, TDS = total dissolved solids, TSS = total suspended solids

#### 21.3.2.9 Mitigation Measures for Cumulative Impacts to Water Resources

All action alternatives and future developments are subject to stormwater quality management plans and ordinances. Alta Ordinance 9-4-6, which would apply to the Patsey Marley Hill Subdivision and the *Alta Lifts Master Plan*, requires erosion control, revegetation, and drainage best practices to address stormwater quality. The *Cottonwood Heights Stormwater Management Plan* is implemented to limit the discharge of pollutants from the Cottonwood Heights storm drain system through the use of minimum control measures and BMPs. UDOT assumes that the *Cottonwood Heights Stormwater Management Plan* would be applied to the Giverny and La Caille developments. UDOT would manage stormwater from its facilities using its *Stormwater Quality Design Manual*. When these stormwater management plans are implemented, stormwater quality would be improved, and the resulting in-stream concentrations of pollutants in Little Cottonwood Creek would be less than those reported in Table 21.3-2 above.

### 21.3.3 Cumulative Impacts to Ecosystem Resources

This section evaluates the potential cumulative impacts to ecosystem resources from the action alternatives. None of the action alternatives would impact threatened or endangered species. More information about the ecosystem resources and the direct and indirect impacts from the action alternatives is provided in Chapter 13, *Ecosystem Resources*. The geographic scope of the analysis is Little Cottonwood Canyon but includes a discussion of the greater central Wasatch Mountains since past changes in the central Wasatch Mountains influence Little Cottonwood Canyon. The timeframe for the analysis is the early 1900s to 2050.

**What are the geographic scope and timeframe of the analysis of cumulative impacts to ecosystem resources?**

The geographic scope of the analysis is Little Cottonwood Canyon but includes a discussion of the central Wasatch Mountains, and the timeframe for the analysis is the early 1900s to 2050.

#### 21.3.3.1 Past Conditions of Ecosystem Resources

Little Cottonwood Canyon encompasses about 17,080 acres consisting mostly of forest/woodland, shrubland, meadow/grassland, and bedrock (Table 21.3-3). Little Cottonwood Canyon is part of the central Wasatch Mountains, which also include Parley's Canyon, Mill Creek Canyon, and Big Cottonwood Canyon. Recreation amenities (trailheads, trails, and climbing areas), ski resorts, housing developments, mining, and roads have all contributed to loss of the natural habitat and fragmentation of forested communities (USDA Forest Service 2013).

Table 21.3-3. Wildlife Habitat Acreage in the Little Cottonwood Creek Watershed

| Habitat Type | Acres | Percentage of Existing Habitat |
|---|---|---|
| Developed | 604 | 4% |
| Forest/woodland | 6,620 | 38% |
| Shrubland | 2,412 | 14% |
| Meadow/grassland | 1,173 | 7% |
| Bedrock | 6,245 | 36% |
| Open water | 26 | 1% |
| **Total** | **17,080** | **100%** |

Historically, much of the conifer trees in upper Little Cottonwood Canyon were cut during the middle to late 1800s and into the early 1900s. Although many second-growth trees have reached maturity, some of those trees have been removed to accommodate resort and housing developments, roads, and other constructed facilities.

The distribution of plant and wildlife species in the central Wasatch Mountains today reflects historical changes to the ecosystem. Despite these changes, the central Wasatch Mountains provide large patches of relatively connected, intact habitats that support moderately high levels of biodiversity compared to adjacent areas. These areas of intact habitats are important for maintaining regional plant and wildlife populations.

However, many native plant and wildlife populations have declined as a result of past development that caused habitat loss and fragmentation. Some plant and wildlife species are rare or declining due to the fragmentation and degradation of the terrestrial and aquatic ecosystems that provide their habitat (Mountain Accord 2014). Additionally, many non-native plant and wildlife species have been introduced and have become established in the central Wasatch Mountains.

Human activity in Little Cottonwood Canyon and in the Central Wasatch Mountains has altered and fragmented wildlife habitat. Consequently, some species of mammals, birds, amphibians, and invertebrates in the Wasatch Mountains have declined as a result of hunting, disease, and habitat loss and fragmentation. The decline in wildlife species indicates how the environment has been substantially modified compared to the conditions before Euro-American settlement.

Noxious weeds and other invasive plants have also affected the health of both terrestrial and aquatic ecosystems by outcompeting native plants, altering the vegetation structure and fire regimes, and decreasing forage quality for wildlife. Infestations are nearly always associated with human activity such as construction, roads, and trails. Efforts are underway in Little Cottonwood Canyon to contain and control existing infestations, but the infestations continue to spread.

#### 21.3.3.2 Future Trends for Ecosystem Resources

Population growth along the Wasatch Front, increased tourism, development, and climate change will continue to stress aquatic and terrestrial ecosystems in the central Wasatch Mountains and these ecosystems' ability to provide the habitat requirements for sensitive plant and wildlife species. In addition to the predicted growth trends, terrestrial and aquatic resources will continue to be affected by many other factors. Potential future effects are uncertain because of the complexity and interdependence of the components of the ecosystems in the central Wasatch Mountains. Though it is difficult to make detailed predictions regarding the health of these ecosystems in the future, increased human use of the central Wasatch Mountains will likely continue to degrade terrestrial and aquatic ecosystem resources.

#### 21.3.3.3 Cumulative Ecosystem Resource Impacts from the Enhanced Bus Service Alternative

With the Enhanced Bus Service Alternative, there would be no improvements to S.R. 210 in Little Cottonwood Canyon but bus stops would be placed at Snowbird Entry 1 and along S.R. 210 in the Town of Alta. If a trailhead parking alternative that includes improving parking or an avalanche mitigation alternative (both of which include snow sheds) is selected, some ecosystem resources would be lost.

The proposed bus stops would mostly be on developed land and would result in about 1 acre of forest/woodland habitat loss. The trailhead parking alternatives would remove about 3.25 acres of forest/woodland and shrubland habitat, and the avalanche mitigation alternatives would remove about 6 acres of forest/woodland and shrubland habitat. The trailhead parking alternatives that improve parking would remove about 0.6 acre of Riparian Habitat Conservation Areas (RHCAs), and the avalanche

mitigation alternatives would remove about 0.23 acre of RHCAs. All of this habitat would be lost along the existing S.R. 210 or at existing trailheads that have already experienced some human disturbance. Overall, the loss of forest/woodland, shrubland, and RHCAs would be less than 1% of the total existing habitat and RHCAs in the ecosystem resources impact analysis area.

The trailhead parking alternatives that would improve parking at trailheads would not further impede wildlife movement, but the snow sheds would slightly increase the barrier effect of an area that is likely already avoided by most wildlife because of the steep slopes and existing roadway.

About 1,015 individual broadleaf beardtongue (*Penstemon platyphyllus*) plants (a USDA Forest Service Watch List Species) would be removed by the Snow Sheds with Berms Alternative. Most of these individual plants are concentrated in one population that has colonized a previously disturbed open site. However, species-specific field surveys identified additional occurrences of broadleaf beardtongue on open, rocky sites throughout the top half of the canyon. In addition, a search of the Intermountain Regional Herbarium Network found a list of 187 broadleaf beardtongue occurrences throughout the Wasatch Front in Davis, Salt Lake, and Utah Counties as well as Box Elder and Duchesne Counties. Also, the collections manager for the herbarium at Brigham Young University's Monte L. Bean Life Science Museum confirmed that this species grows throughout the Wasatch Front.

Given this evidence, and since broadleaf beardtongue is not listed by the State of Utah as a Species of Greatest Conservation Need and is not listed in the Utah Rare Plant Guide published by the Utah Native Plant Society, these impacts are not expected to cause species-level impacts, nor are they likely to cause a loss of species viability. It is not known whether other projects that could occur in the cumulative impact analysis area for ecosystem resources would impact this plant species. If additional plants are impacted, it could result in a further decline of this species in Little Cottonwood Canyon.

Although the Enhanced Bus Service Alternative would not substantially contribute to the cumulative loss of ecosystem resources, the loss of habitat in combination of with past, present, and reasonably foreseeable future projects (Alta Ski Lifts Master Development Plan Improvement Projects, Patsey Marley Hill Subdivision, and other changes to ski resort operations) would incrementally contribute to cumulative impacts. Overall, the cumulative impacts from the Enhanced Bus Service Alternative along with other past, present, and reasonably foreseeable projects would consist of minor, but continued, fragmentation and loss of ecosystem resources in Little Cottonwood Canyon and the central Wasatch Mountains.

With the Enhanced Bus Service Alternative, the bus service would not operate during the summer, so the alternative would not increase summer recreation opportunities. During the winter, the alternative could increase use at the ski resorts or in the backcountry by about 13%. UDOT expects that the ski resorts could manage the increase in use and thus minimize impacts to ecosystem resources. The increase in backcountry use could cause greater disturbance of wildlife and, combined with other increases in recreation use of Little Cottonwood Canyon, could incrementally add to the stress on wildlife. If it occurs, the increased backcountry ski use in upper Little Cottonwood Canyon caused by the Enhanced Bus Service Alternative would have minor, but continued, cumulative impacts to ecosystem resources in Little Cottonwood Canyon and the central Wasatch Mountains.

#### 21.3.3.4 Cumulative Ecosystem Resource Impacts from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative

With the Enhanced Bus Service in Peak-period Shoulder Lane Alternative, S.R. 210 would be widened to include bus shoulder lanes in Little Cottonwood Canyon and include canyon bus stops, which would remove ecosystem resources. Also, if a trailhead parking alternative that includes improving parking or an avalanche mitigation alternative (both of which include snow sheds) is selected, some additional ecosystem resources would be lost.

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would remove about 34 acres of forest/woodland and shrubland habitat, about 0.29 acre of meadow/grassland habitat, and about 1.44 acres of RHCAs. The trailhead parking alternatives would remove about 3.25 acres of forest/woodland and shrubland habitat, and the avalanche mitigation alternatives would remove about 6 acres of forest/woodland and shrubland habitat. The trailhead parking alternatives that improve parking would remove about 0.6 acre of RHCAs, and the avalanche mitigation alternatives would remove about 0.23 acre. All of this habitat would be lost along the existing S.R. 210 or at existing trailheads that have already experienced some human disturbance. Overall, the loss of forest/woodland, shrubland, meadow/grassland, and RHCAs would be less than 1% of the total existing habitat and RHCAs in the ecosystem resources impact analysis area.

The peak-period shoulder lanes would widen S.R. 210 and further fragment habitat and impede wildlife movement. The snow sheds would also slightly increase the barrier effect in an area that is likely already avoided by most wildlife because of the steep slopes and existing roadway. The trailhead parking alternatives that would improve parking would not further impede wildlife movement or fragment habitat.

Although the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would not substantially contribute to the cumulative loss of ecosystem resources, the loss of resources would be incrementally greater than with the Enhanced Bus Service Alternative. The loss of habitat and RHCAs in combination with past, present, and reasonably foreseeable future projects (Alta Ski Lifts Master Development Plan Improvement Projects, Patsey Marley Hill Subdivision, and other changes to ski resort operations) would incrementally contribute to cumulative impacts.

The potential cumulative impacts to broadleaf beardtongue from the Snow Sheds with Berms Alternative with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

Overall, the cumulative impacts from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative along with other past, present, and reasonably foreseeable projects would consist of continued fragmentation of ecosystem resources in Little Cottonwood Canyon and the central Wasatch Mountains.

The cumulative impacts from increased winter visitation on ecosystem resources would be the same as with the Enhanced Bus Service Alternative.

#### 21.3.3.5 Cumulative Ecosystem Resource Impacts from Gondola Alternative A (Starting at Canyon Entrance)

With Gondola Alternative A, there would be no improvements to S.R. 210 in Little Cottonwood Canyon, but placing gondola towers and stations in the canyon would remove ecosystem resources. Also, if a trailhead parking alternative that includes improving parking or an avalanche mitigation alternative (both of which include snow sheds) is selected, additional ecosystem resources would be lost.

Gondola Alternative A would remove about 4.5 acres of forest/woodland and shrubland habitat. The trailhead parking alternatives would remove about 3.25 acres of forest/woodland and shrubland habitat, and the avalanche mitigation alternatives would remove about 6 acres of forest/woodland and shrubland habitat. The trailhead parking alternatives that improve parking would remove about 0.6 acre of RHCAs, and the avalanche mitigation alternatives would remove about 0.23 acre of RHCAs. Most of this habitat would be lost along the existing S.R. 210 or at existing trailheads that have already experienced some human disturbance. Overall, the loss of forest/woodland, shrubland, meadow/grassland, and RHCAs would be less than 1% of the total existing habitat and RHCAs in the ecosystem resources impact analysis area.

The gondola towers and stations would not substantially fragment habitat or restrict wildlife movement because they would have a small footprint and would be located mostly in disturbed areas along S.R. 210 or at the ski resorts. The snow sheds would slightly increase the barrier effect in an area that is likely already avoided by most wildlife because of the steep slopes and existing roadway. The trailhead parking alternatives that would improve parking would not further impede wildlife movement or fragment habitat.

Gondola Alternative A would not substantially contribute to the cumulative loss of ecosystem resources. The loss of resources would be incrementally greater than with the Enhanced Bus Service Alternative but less than with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative. The loss of habitat and RHCAs in combination with past, present, and reasonably foreseeable future projects (Alta Ski Lifts Master Development Plan Improvement Projects, Patsey Marley Hill Subdivision, and other changes to ski resort operations) would incrementally contribute to cumulative impacts. Overall, the cumulative impacts from Gondola Alternative A along with other past, present, and reasonably foreseeable projects would consist of minor, but continued, fragmentation of ecosystem resources in Little Cottonwood Canyon and the central Wasatch Mountains.

The potential cumulative impacts to broadleaf beardtongue from the Snow Sheds with Berm Alternative with Gondola Alternative A would be the same as with the Enhanced Bus Service Alternative.

The cumulative impacts to ecosystem resources from increased visitation during the winter would be the same as with the Enhanced Bus Service Alternative. However, Gondola Alternative A would provide summer service to the ski resorts. As described in Section 20.4.1.2.2, *Summer Visitation*, in Chapter 20, *Indirect Effects*, the summer operation of the gondola could increase summer visitation to the ski resorts by about 198 people.

The additional summer users could increase crowds at both resorts including at restaurants, shops, and other resort attractions. The additional users might also decide to hike on trails at the resorts. UDOT does not anticipate that all 198 additional users would go to one resort, but rather that the additional users would be divided between Alta and Snowbird, with Snowbird receiving the majority because it would be the first gondola stop and has more summer amenities. Also, not all additional users would go hiking; some would stay within the developed resort area. It is difficult to predict how many of the additional gondola users would go hiking; however, an increase in trail use could increase soil erosion, loss of vegetation, and the spread of invasive species and potentially disturb wildlife. UDOT expects that the 198 additional users would represent about a 1.4% increase in daily summer visitation on a normal busy weekend (for more information, see Chapter 20, *Indirect Effects*).

Continued population growth along the Wasatch Front is also anticipated to increase the number of people visiting the central Wasatch Mountains for recreation purposes. Overall visitation in Little Cottonwood Canyon could increase from 2.1 million to 3.4 million over an entire year by 2050. Aquatic ecosystems (for

example, lakes, waterfalls, and streams) and adjacent terrestrial ecosystems are popular recreation destinations for hikers and other visitors to the mountains. High levels of use, especially when not appropriately managed, can damage and reduce the functionality of aquatic ecosystems. Increased visitation will strain the limited existing staff, budget, and other agency resources for law enforcement and visitor management. If visitation exceeds the ability of agencies to manage recreation users, the function of these ecosystems could further decline in the future. Although Gondola Alternative A would contribute less than a 2% increase in yearly visitation, it would contribute minor, but continued, cumulative impacts to ecosystem resources in Little Cottonwood Canyon and the central Wasatch Mountains from recreation users.

#### 21.3.3.6 Cumulative Ecosystem Resource Impacts from Gondola Alternative B (Starting at La Caille)

The cumulative impacts to ecosystem resources from Gondola Alternative B in Little Cottonwood Canyon would be the same as from Gondola Alternative A.

#### 21.3.3.7 Cumulative Ecosystem Resource Impacts from the Cog Rail Alternative (Starting at La Caille)

With the Cog Rail Alternative, S.R. 210 in Little Cottonwood Canyon would not be improved, but a cog rail alignment and stations would be placed along S.R. 210 in the canyon, and these elements would remove ecosystem resources. Also, if a trailhead parking alternative that includes improving parking or an avalanche mitigation alternative (both of which include snow sheds) is selected, additional ecosystem resources would be lost.

The Cog Rail Alternative would remove about 66 acres of forest/woodland and shrubland habitat, about 3 acre of meadow/grassland habitat, and about 0.48 acre of RHCAs. The trailhead parking alternatives would remove about 1 acre of shrubland habitat, and the avalanche mitigation alternatives would remove about 15 acres of forest/woodland and shrubland habitat. The trailhead parking alternatives that improve parking would remove about 0.6 acre of RHCAs, and the avalanche mitigation alternatives would remove about 0.36 acre of RHCAs. All of this habitat would be lost along the existing S.R. 210 or at existing trailheads that have already experienced some human disturbance. Overall, the loss of forest/woodland, shrubland, and meadow/grassland habitat and RHCAs would be less than 1% of the total existing habitat and RHCAs in the ecosystem resources impact analysis area.

The cog rail alignment and stations would not substantially fragment habitat, but the cog rail alignment would include a concrete barrier that would be a barrier to some wildlife movement. The snow sheds would also slightly increase the barrier effect in an area that is likely already avoided by most wildlife because of the steep slopes and existing roadway. The trailhead parking alternatives that would improve parking would not further impede wildlife movement or fragment habitat.

The potential cumulative impacts to broadleaf beardtongue from the Snow Sheds with Berm Alternative with the Cog Rail Alternative would be the same as with the Enhanced Bus Service Alternative.

The Cog Rail Alternative would have the highest incremental cumulative impact to ecosystem resources of the action alternatives. This conclusion is based on the Cog Rail Alternative removing the most vegetation, having greatest potential to disrupt wildlife movement, and having greatest potential to disturb wildlife. The loss of habitat and RHCAs in combination with past, present, and reasonably foreseeable future projects

(Alta Ski Lifts Master Development Plan Improvement Projects, Patsey Marley Hill Subdivision, and other changes to ski resort operations) would incrementally contribute to cumulative impacts. Overall, the cumulative impacts from the Cog Rail Alternative along with other past, present, and reasonably foreseeable projects would consist of continued fragmentation and loss of ecosystem resources in Little Cottonwood Canyon and in the central Wasatch Mountains.

The cumulative impacts from increased winter and summer visitation would be the same as with Gondola Alternative A.

#### 21.3.3.8 Mitigation Measures for Cumulative Impacts to Ecosystem Resources

Mitigation measures for ecosystem resources are identified in Chapter 13, *Ecosystem Resources*.

### 21.3.4 Cumulative Impacts to Visual Resources

This section evaluates the potential cumulative impacts to visual resources along Wasatch Boulevard in Cottonwood Heights and in Little Cottonwood Canyon from the action alternatives. The geographic scope of the analysis is the visual resources along Wasatch Boulevard in Cottonwood Heights and in Little Cottonwood Canyon, and the timeframe for the analysis is the 1970s to 2050.

**What are the geographic scope and timeframe of the analysis of cumulative impacts to visual resources?**

The geographic scope of the analysis is the visual resources along Wasatch Boulevard in Cottonwood Heights and in Little Cottonwood Canyon, and the timeframe for the analysis is the 1970s to 2050.

#### 21.3.4.1 Past Conditions of Visual Resources

The visual character of the Salt Lake Valley has continued to transform from a mostly natural sagebrush plain to a metropolitan area with expanses of residential, commercial, and industrial development. The communities of Cottonwood Heights and Sandy experienced major population growth from the 1980s to the present, resulting in increasing development at the bases of Big and Little Cottonwood Canyons. The Wasatch Range, which defines the eastern edge of the Salt Lake Valley, has experienced much less development in part due to its steep terrain as well as large areas being designated as wilderness under two wilderness acts in 1978 and 1984.

As described in Section 21.3.1, *Cumulative Impacts to Recreation*, S.R. 210 is a scenic byway that provides access to numerous recreation opportunities in Little Cottonwood Canyon. Development in the canyon is mostly associated with recreation amenities (campgrounds, trailheads, and so on), including the Snowbird and Alta ski resorts in the upper canyon. There is also some isolated residential development associated with the Wasatch Resort in the lower portion of the canyon. Most of the canyon does not have the mechanized recreation associated with the ski lifts and other equipment at the ski resorts, and the canyon's character is defined by natural mountain settings accessed from trailheads located along the scenic byway.

#### 21.3.4.2 Future Trends for Visual Resources

Increasing population growth in the Salt Lake Valley will likely lead to more and denser development to facilitate planned growth. With the valley becoming more developed, access to natural settings will become more important for residents as opportunities become more limited. The Wasatch Range, including Little Cottonwood Canyon, will likely experience increased visitation that, without increased capacity in the

transportation system, could limit access to high-quality natural settings. In addition, future changes at the ski resorts and some planned future developments could further detract from the visual resources in Little Cottonwood Canyon.

### 21.3.4.3 Cumulative Visual Impacts from the Enhanced Bus Service Alternative

The Enhanced Bus Service Alternative, when combined with past and present projects and reasonably foreseeable future actions, would modify the landscape character of Little Cottonwood Canyon to become incrementally more developed. Because the alternative would not include any topographic changes along the road except for the mid-canyon snow sheds, trailhead improvements, and two proposed bus stops, the Enhanced Bus Service Alternative would have limited additive cumulative effects.

With the avalanche mitigation alternatives, the local viewshed adjacent to the mid-canyon snow sheds would be modified, and the snow sheds would be visually dominant as viewed from key observation point (KOP) locations (see Chapter 17, *Visual Resources*). The trailhead improvements associated with the trailhead parking alternatives would be visually subordinate in the landscape except for the improvements at the Lisa Falls Trailhead, which would be more visually prominent in the landscape. The Grit Mill and Climbing Master Plan Project and the trailhead improvements associated with the trailhead parking alternatives would have an overall beneficial impact to visual resources by increasing access to high-quality natural settings. The two bus stops would be located in areas with current resort or urban development and would not change the visual landscape.

Most of the reasonably foreseeable future actions that would contribute to cumulative impacts to visual resources would be located at the top of Little Cottonwood Canyon (Alta Ski Lifts Master Development Plan Improvement Projects and Patsey Marley Hill Subdivision) and the entrance to the canyon (La Caille Development) where there are existing residential and commercial developments. Because the Enhanced Bus Service Alternative and reasonably foreseeable future actions are spread out across the canyon, the area viewed as modified in the canyon would become expanded as the mid-canyon snow sheds introduce large built structures into an area defined by its natural and intact landscape character.

These impacts would also continue to influence the management objectives of the Little Cottonwood Canyon State Scenic Byway; however, based on the scale of these projects, the management of the byway to protect scenic vistas and intrinsic scenic qualities would be diminished but not limited. Overall, the visual change to more developed from the Enhanced Bus Service Alternative along with other past, present, and reasonably foreseeable future actions would represent a moderate change to Little Cottonwood Canyon's natural-appearing visual setting. The Enhanced Bus Service Alternative would have the lowest cumulative impacts to the natural visual resources in Little Cottonwood Canyon.

The proposed improvements to Wasatch Boulevard would be visually subordinate and similar to other infrastructure in the area. No reasonably foreseeable future actions affecting visual resources were identified in this area; however, based on additional development to support increasing population in the Salt Lake Valley, the rural-like character of the benchlands is likely to become increasingly modified through expanding development. The Wasatch Boulevard alternatives would cause a minor cumulative change to the overall urban nature of Cottonwood Heights.

The two mobility hubs (at the gravel pit and at 9400 South and Highland Drive) would be in areas with the same industrial/commercial developed character as surrounding existing development and would cause limited changes to visual resources. Similar to the discussion regarding improvements to Wasatch

Boulevard, no reasonably foreseeable future actions affecting visual resources were identified in these areas; however, with the growing population, additional development is likely to occur adjacent to the proposed mobility hubs.

#### 21.3.4.4 Cumulative Visual Impacts from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative

The cumulative impacts from the improvements to Wasatch Boulevard and the mobility hubs with the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would be the same as with the Enhanced Bus Service Alternative.

The Enhanced Bus Service in Peak-period Shoulder Lane Alternative, when combined with past and present projects and reasonably foreseeable future actions, would modify the landscape character of Little Cottonwood Canyon to a greater extent than would the Enhanced Bus Service Alternative. Because the Enhanced Bus Service in Peak-period Shoulder Lane Alternative would include topographic changes along the roadway, in addition to the mid-canyon snow sheds and trailhead improvements, this alternative would have increased additive cumulative effects.

With the avalanche mitigation alternatives, the local viewshed adjacent to the mid-canyon snow sheds and road improvements, as viewed from the Bridge Trailhead, would change, and the show sheds and roadway improvements would range from being visually prominent to dominating the landscape character. The trailhead improvements associated with the trailhead parking alternatives would be visually subordinate in the landscape except for the improvements at the Lisa Falls Trailhead, which would be more visually prominent in the landscape. The Grit Mill and Climbing Master Plan Project and the trailhead improvements associated with the trailhead parking alternatives would have an overall beneficial impact to visual resources by increasing access to high-quality natural settings.

Most of the reasonably foreseeable future actions that would contribute to cumulative impacts to visual resources would be located at the top of Little Cottonwood Canyon (Alta Ski Lifts Master Development Plan Improvement Projects and Patsey Marley Hill Subdivision) and the entrance to the canyon (La Caille Development) where there are existing residential and commercial developments. Because the Enhanced Bus Service in Peak-period Shoulder Lane Alternative and reasonably foreseeable future actions are spread out across the canyon, the area viewed as modified in the canyon would become expanded as the mid-canyon snow sheds and road improvements introduce large built structures into an area defined by its natural and intact landscape character. These impacts would also continue to influence the management objectives of the Little Cottonwood Canyon State Scenic Byway; however, based on the scale of these projects, the management of the byway to protect scenic vistas and intrinsic scenic qualities would be diminished but not limited.

Overall, the visual change to more developed from the Enhanced Bus Service in Peak-period Shoulder Lane Alternative along with other past, present, and reasonably foreseeable future actions would represent a moderate to high change to Little Cottonwood Canyon's natural-appearing visual setting. The Enhanced Bus Service in Peak-period Shoulder Lane Alternative would contribute slightly more to cumulative impacts to the natural visual resources in Little Cottonwood Canyon than the Enhanced Bus Service Alternative but less cumulative impacts than the gondola and cog rail alternatives.

### 21.3.4.5 Cumulative Visual Impacts from Gondola Alternative A (Starting at Canyon Entrance)

The cumulative impacts from the improvements to Wasatch Boulevard and the mobility hubs would be the same as those with the Enhanced Bus Service Alternative.

The Grit Mill and Climbing Master Plan Project and the trailhead improvements associated with the trailhead parking alternatives would have an overall beneficial impact to visual resources by increasing access to high-quality natural settings.

Gondola Alternative A, when combined with past and present projects and reasonably foreseeable future actions, would modify the landscape character of Little Cottonwood Canyon to become increasingly dominated by ski resort–type infrastructure. At the entrance to the canyon, the alternative would introduce a new gondola base station and gondola towers in addition to planned commercial development including the La Caille Development.

In this location, the setting would become more intensely developed by transportation and commercial uses. Because these projects would be located in areas already viewed as modified, the impacts to the landscape and views from sensitive locations would be less intense than if these projects were implemented in a more intact natural setting.

**What are gondola terminal stations, base stations, angle stations, and towers?**

As used in the discussions of the gondola alternatives, the term *terminal station* refers to the first and last stations on a passenger's gondola trip. Passengers board and disembark the gondola cabins at the terminal stations.

The *base station* is the terminal station at the bottom of the canyon, and a *destination station* is a terminal station at the top of the canyon.

The gondola alternatives also include *angle stations*, which are needed to adjust the horizontal direction of the cabin; passengers remain in the cabin as it passes through an angle station.

A *tower* supports the gondola cable.

Views along the Little Cottonwood Canyon State Scenic Byway would become dominated by development because Gondola Alternative A would expand the area characterized by ski resort–type infrastructure, which is currently focused at the two ski resorts at the top of the canyon. The introduction of gondola towers, moving gondola cabins, destination stations, and other associated infrastructure, in addition to the changes associated with the Patsey Marley Hill Subdivision and Alta Ski Lifts Master Development Plan Improvement Projects, would dominate the setting in areas with a natural-appearing setting and would further develop those with a "resort natural" setting. These impacts would also continue to influence the management objectives of the Little Cottonwood Canyon State Scenic Byway. Based on the scale of these projects, the management of the byway to protect scenic vistas and intrinsic scenic qualities would be constrained and the visitor experience would be degraded.

Overall, the visual change to more developed from Gondola Alternative A along with other past, present, and reasonably foreseeable future actions would represent a high change to Little Cottonwood Canyon's natural-appearing visual setting. The gondola and cog rail alternatives [see Section 21.3.4.7, *Cumulative Visual Impacts from the Cog Rail Alternative (Starting at La Caille)*] would have the greatest contribution to cumulative impacts to the natural visual resources in Little Cottonwood Canyon.

### 21.3.4.6 Cumulative Visual Impacts from Gondola Alternative B (Starting at La Caille)

The cumulative impacts associated with Gondola Alternative B would be similar to those associated with Gondola Alternative A except that there would be no mobility or additional additive cumulative effects at the entrance to Little Cottonwood Canyon. Because of the increased development with this alternative (additional gondola towers, angle station, and parking structure) adjacent to the future La Caille Development, the setting at the entrance to the canyon would become increasingly defined by multistory transportation and commercial structures compared to its existing residential and recreation-focused character.

### 21.3.4.7 Cumulative Visual Impacts from the Cog Rail Alternative (Starting at La Caille)

The cumulative impacts from the improvements to Wasatch Boulevard would be the same as those with the Enhanced Bus Service Alternative.

The Cog Rail Alternative, when combined with past and present projects and reasonably foreseeable future actions, would modify the landscape character of Little Cottonwood Canyon to become increasingly dominated by mechanized recreation. At the entrance to the canyon, this alternative would introduce a new parking structure, a new operations and maintenance yard and building, a reconfigured park-and-ride lot at the intersection of S.R. 209 and S.R. 210, and a new cog rail alignment in the same area as the future La Caille Development.

**What are cog rail base and terminal stations?**

As used in the discussions of the Cog Rail Alternative, the term *terminal station* refers to the first and last stations on a passenger's cog rail trip. Passengers board and disembark the cog rail cars at the terminal stations.

The *base station* is the terminal station at the bottom of the canyon, and a *destination station* is a terminal station at the top of the canyon.

In this area, the setting would become a high-intensity development zone with multistory transportation and commercial structures. Portions of the Grit Mill and Climbing Master Plan Project would be affected by the Cog Rail Alternative, requiring UDOT to reconfigure the park-and-ride lot, thereby creating a larger area of disturbance. The other portions of the Grit Mill and Climbing Master Plan Project, and the improvements at the Bridge and White Pine Trailheads proposed with this alternative, would have an overall beneficial impact to visual resources by increasing access to high-quality natural settings.

Views along the Little Cottonwood Canyon State Scenic Byway and at the Cottonwood Heights open space would become dominated by transportation features, including the addition of the cog rail alignment with its cleared geometric right of way and mid- and upper-canyon snow sheds, especially when looking to the north where there would be unobstructed views of the cog rail alignment. Increased planned development at the top of the canyon, from the proposed Patsey Marley Hill Subdivision and Alta Ski Lifts Master Development Plan Improvement Projects, in addition to the cog rail and upper-canyon snow sheds, would create an expanding area characterized by mechanized recreation where currently this type of development is focused at the two ski resorts. These impacts would also continue to influence the management objectives of the Little Cottonwood Canyon State Scenic Byway. Based on the scale of these projects, the management of the byway to protect scenic vistas and intrinsic scenic qualities would be inhibited and the visitor experience would be degraded.

Overall, the visual change to more developed from the Cog Rail Alternative along with other past, present, and reasonably foreseeable future actions would represent a high change to Little Cottonwood Canyon's natural-appearing visual setting. The cog rail and gondola alternatives [see Section 21.3.3.5, *Cumulative Ecosystem Resource Impacts from Gondola Alternative A (Starting at Canyon Entrance)*, and Section 21.3.3.6, *Cumulative Ecosystem Resource Impacts from Gondola Alternative B (Starting at La Caille)*] would have the greatest contribution to cumulative impacts to the natural visual resources in Little Cottonwood Canyon.

#### 21.1.1.1 Mitigation Measures for Cumulative Impacts to Visual Resources

In addition to the project-specific mitigation measures listed in Section 17.4.8, *Mitigation Measures*, in Chapter 17, *Visual Resources*, the following are recommended mitigation measures to reduce potential adverse cumulative impacts to visual resources:

- For large-scale buildings proposed as part of the action alternatives, design elements to use natural materials and colors to harmonize with the existing residential and recreation character.
- In the upper canyon, design new facilities to blend with the existing resort setting, or natural evolving setting where appropriate, to maintain a cohesive landscape character and avoid expanding the area characterized as a resort setting. For example, the gondola alternatives and the Alta Ski Lifts Master Development Plan Improvement Projects both plan to introduce additional towers into the landscape. To reduce impacts from additional vertical intrusions into the setting, both projects could paint the towers the same natural color to establish a more cohesive landscape character.

# 21.4 References

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