

Proposed Inclusions to the Utah State Rail Plan

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Introduction

A state rail plan is a comprehensive, in-depth planning document used to shape a state's transportation policy. An up to date state rail plan is usually a prerequisite to apply for federal funding for intercity rail projects. Utah's state rail plan was last updated in 1996 and detailed the state of Utah's railroads at that time (Utah Department of Transportation, 1996). Unfortunately, little attention was given to passenger rail other than a brief mention of the possibility of a future light rail system, an overview of the 16-mile (26 km) Heber Valley Historic Railroad, a rather grim prognosis for the future of Amtrak, and the details of the Golden Spike Railroad—a proposed tourist railroad that would have connected Ogden and Brigham City with the Golden Spike National Historical Site, which was the location of the completion of the Transcontinental Railroad in 1869.

Much has changed in Utah since 1996 with regards to passenger rail. The Utah Transit Authority started light rail service in Salt Lake County in 1999 with an initial 15-mile (24 km) line, which has been expanded multiple times and will reach a system of 44 miles (71 km) by the end of 2013. In 2008, the Utah Transit Authority started commuter rail service—known as FrontRunner—with an initial 38-mile (61 km) line serving Salt Lake, Davis, and Weber Counties. FrontRunner was expanded to a total length of 88 miles (142 km) when service to Utah County began in 2012. The establishment and expansion of rail service has been followed by dramatic rises in public transit ridership in the Salt Lake City metropolitan region and with it an increase in public support for mass transit.

Additionally, the grim prognosis for Amtrak forecasted in 1996 never came to fruition. Rising fuel prices and rising fares have made passenger rail an increasingly attractive travel option, and Amtrak ridership continues to grow as people seek transportation alternatives. In fact, Amtrak's ridership grew by 55% between 1997 and 2012 (Puentes, et al, 2013). The *Utah Unified Transportation Plan, 2011-2040* makes mention of "intercity rail and interstate passenger rail" as components of "a multimodal transportation system," but no plans for including them as part of Utah's future are spelled out among the many plans enumerated by the document, despite the increasing popularity of rail travel (Utah Department of Transportation, et al, 2011).

Recently the Utah Department of Transportation began the process of revising the state rail plan. The purpose of this project is to explore three possible inclusions to the state rail plan: 1. the Rerouting of Transcontinental Freight; 2. FrontRunner version 2.0; and 3. Utah's Intrastate Passenger Rail Needs. It is hoped that sufficient justification will be provided by this project to warrant addition of these items in the plan and thereby contribute to shaping Utah's future transportation policy.

Rerouting of Transcontinental Freight

A large volume of transcontinental rail freight passes through Utah on Union Pacific's east-west route across northern Utah. This transcontinental freight did not originate in Utah nor is destined for Utah but rather is part of the flow of goods and raw materials across the United States. As shown in **Map 1**, this transcontinental route enters Utah from the east near Evanston, Wyoming, and is double-tracked to Ogden, Utah, where the route splits. After the northern portion leaves Ogden, it becomes single-tracked and travels through a relatively unpopulated area before rejoining the southern portion at Wells, Nevada. The southern portion heads south from Ogden to Salt Lake City through a highly-

populated area before turning at Salt Lake City and proceeding west and rejoining the northern portion at Wells. **Map 2** shows the current configuration of single-trackage and double-trackage.

If the northern portion were upgraded to a double-tracked route, freight traffic could be reduced along the Ogden to Salt Lake City line, which would reduce the impacts on the surrounding population and also allow for more flexibility in utilizing the Union Pacific right-of-way for future passenger rail expansion. **Map 3** shows this proposed single-trackage and double-trackage configuration. In order to justify this reconfiguration, further study of the freight volumes involved and the overall feasibility of the proposal are required.

However, there is an additional aspect of this transcontinental route that could become an opportunity for reconstruction and double-tracking of a portion of the route. As shown in **Map 4**, the northern portion of the route crosses the Great Salt Lake via a causeway. The Great Salt Lake lies at the bottom of an endorheic basin, which means that the lake has no outlet to the ocean, and the level of the lake is controlled by the balance of the volume of water flowing into it and the rate of evaporation of the lake. As with all endorheic lakes, the Great Salt Lake is highly saline.

Originally built as a wooden trestle across the shallow lake, the route was later rebuilt as an earthen causeway. The wooden trestle allowed the waters of the lake to flow freely under it, which allowed the levels of salt and other minerals in the lake to remain relatively even (Gwynn). Even though the replacement causeway was built with culverts to allow for some flow of lake water, the circulation of water in the lake was severely limited by the causeway, which caused the chemistry of the lake and even the level of the lake to vary north and south of the causeway (U.S. Geological Survey, 1999). The lake's varying chemistry even causes the color of the lake to vary from one side of the causeway to the other (Hollenhorst, 2011). This variance is especially pronounced in the northwestern arm of the lake, which lies far from the lake's main inlets consisting of the Bear River, the Weber River, and the Jordan River.

In recent years, the causeway has experienced structural problems, including a partial collapse of a culvert, which prompted Union Pacific to make emergency repairs (Fahys, 2012). The causeway's structural issues and its interference with lake flows present an opportunity to reconstruct the causeway with more bridges, which would allow for increased lake flow. If this reconstruction were to take place, then consideration should be given to reconstructing it as a double-tracked structure.

FrontRunner version 2.0

The Utah Transit Authority's FrontRunner commuter rail system connects Salt Lake City with Ogden to the north and Provo to the south. There is limited, rush-hour service on weekday mornings and evening between Ogden and Pleasant View. The route serves four counties: Salt Lake County, Utah County, Davis County, and Weber County, which together comprise the core of the Wasatch Front metropolitan region and total a population of over 2 million residents. Future plans specify future extensions to Brigham City on the northern end of the route and to Santaquin on the southern end (Utah Department of Transportation, et al, 2011). **Map 5** shows the current route of the FrontRunner line with the future extensions.

FrontRunner operates on 60-minute headways from approximately 5 am to 11 pm on weekdays with 30-minutes headways during the morning and evening rush-hours. Saturday services operates on 90-

minute headways from approximately 8 am to 11 pm. Sunday service has not yet been established. FrontRunner trains, which have a maximum operational speed of 79 mph (127 km/hr), are powered by push-pull diesel-electric locomotives, which operate on a mostly single-track system with passing sidings. The current source of motive power and the track configuration will likely become problematic in the future.

The reliance on diesel fuel and the associated pollution generated by consuming it will likely necessitate an upgrade to a catenary electric system sometime in the future. Future fluctuations in the price of oil will complicate transit operations and necessitate raising fares, which will affect the affordability of FrontRunner to its riders. Additionally, some question whether FrontRunner may contribute more to air pollution than it reduces air pollution. During rush hour, when trains are relatively full of commuters, it can be assumed that FrontRunner creates a net reduction in air pollution by taking automobiles off the roads and highways. However, when ridership is lower at off-peak travel times, the net reduction in air pollution might be questioned. No study has been performed to explore this matter in more depth. At any rate, upgrading FrontRunner to a catenary electric system would overcome the influence of oil price fluctuations and end the speculation over air pollution. Further benefits of electrification also include the ability of trains to accelerate faster and more efficiently and the ability to perform regenerative braking, where trains are able to produce electricity when braking.

Due to single-track operation, schedules must be carefully timed to allow trains headed in opposite directions to pass at sidings. This results in limited scheduling flexibility, and if one train becomes delayed, the delay can reverberate through the system and delay multiple trains. **Figure 1** compares the differences among various track configurations. **Figure 1a** shows the current single-track configuration with passing sidings at stations, while **Figure 1b** shows the standard double-track configuration. **Figure 1c** shows a double-track configuration that allows express trains to bypass stations, and **Figure 1d** shows a quad-track configuration, which allows for express and local trains to operate on separate tracks.

Additionally, in most passenger rail systems throughout the United States and the world where both commuter rail and intercity rail operate in the same corridors, the commuter trains and intercity trains share the same tracks. Consideration should also be given to future intercity rail needs when planning upgrades to the FrontRunner system including increasing the maximum operational speed to at least 110 mph (177 km/hr). **Figure 2a** shows the current layout of FrontRunner stations integrated with the Amtrak "California Zephyr" route. **Figure 2b** shows a possible future schematic of FrontRunner with the proposed extensions, additional infill stations, and a possible FrontRunner Express line along with the integration of a future intercity rail route and the current Amtrak "California Zephyr."

Utah's Intrastate Passenger Rail Needs

The Western Regional Alliance has begun to explore the possibility of a passenger rail system connecting Salt Lake City with Denver, Phoenix, Las Vegas, and Reno (Western Regional Alliance, 2012). However, prior to extensive planning of an interstate passenger rail system connecting the aforementioned metropolitan regions, attention should be paid to the Utah's intrastate rail needs in order to plan an integrated passenger rail system that meets both intra- and interstate needs. Much attention has been given to the public transportation needs of the Wasatch Front metropolitan region. However, little attention has been given to the intercity transportation needs of other significant population centers within Utah.

Map 6 shows the current railroads of Utah and its counties shaded according to population using the color scheme presented in **Table 1**. **Map 7** adds the route of the Amtrak "California Zephyr," which crosses Utah once daily in each direction on its 2,438-mile (3,924 km), 51-hour journey between Chicago and the San Francisco Bay Area. **Map 8** shows the FrontRunner route with future extensions from Brigham City to Santaquin relative to the entire state of Utah. **Table 1** lists the 29 counties of Utah ordered by their 2010 Census populations and reveals that, in addition to the four core counties of the Wasatch Front, two other counties also have populations exceeding 100,000 residents—Washington County and Cache County—both of which have experienced high growth rates in recent decades. Future rail planning should examine the entire state with Cache and Washington Counties as priorities.

Cache County is served by a freight rail mainline but lacks passenger rail. **Map 9** shows a potential scenario for a passenger rail route between Brigham City and Logan, which is Cache County's largest city. The route could utilize the existing Union Pacific right of way north from Brigham City into Cache County and then utilize an abandoned railroad right of way as a shortcut into Logan. A potential rail connection continuing north into Idaho using the existing Union Pacific right of way is also shown on the map. Further analysis should be conducted in order to determine whether Logan would best be served by an intercity rail route, by extending FrontRunner north from Brigham City, or both.

Washington County lacks rail entirely! An analysis performed by the author using data from the Bureau of Transportation Statistics revealed Washington County to be the third most populous county in the 48 contiguous states entirely lacking a railroad connection. **Map 10** shows a potential scenario for a passenger rail route between Santaquin and Saint George, which is Washington County's largest city. The route could utilize the existing Union Pacific right of way south from Santaquin to Delta. After Delta, the route could utilize an abandoned railroad right of way to Fillmore, where a new railroad right of way would need to be constructed paralleling Interstate 15 in order to continue south. Upon reaching the outskirts of the Saint George metropolitan area, the route could be configured such that it would also connect the various cities of that area. A potential rail connection continuing southwest into Nevada is also shown on the map. Due to its relatively long distance from Salt Lake City, Saint George would best be served by an intercity rail route, however, further analysis may show the potential for a local commuter rail route connecting the cities of the Saint George metropolitan area, which could be further extended to run from Cedar City through Saint George to Mesquite, Nevada.

References

- Fahys, J. (2012) *Great Salt Lake causeway sinks, prompting emergency repairs..* [online] Available at: <http://www.sltrib.com/sltrib/news/54989110-78/causeway-lake-salt-corps.html.csp> [Accessed: 3 May 2013].
- Gwynn, J. (n.d.) *A Lake Divided: A History of the Southern Pacific Railroad Causeway and Its Effect on Great Salt Lake, Utah..* [online] Available at: <http://geology.utah.gov/utahgeo/gsl/lakedivided.htm> [Accessed: 3 May 2013].
- Hollenhorst, J. (2011) *Union Pacific causeway upgrade proposal could change colors of the Great Salt Lake* / *Deseret News*. [online] Available at:

<http://www.deseretnews.com/article/705374172/Union-Pacific-causeway-upgrade-proposal-could-change-colors-of-the-Great-Salt-Lake.html> [Accessed: 3 May 2013].

Puentes, R., et al. (2013) *A New Alignment: Strengthening America's Commitment to Passenger Rail*. [e-book] Brookings Institution.
<http://www.brookings.edu/~media/research/files/reports/2013/03/01-passenger-rail-puentes-tomer/passenger-rail-puentes-tomer.pdf> [Accessed: 3 May 2013].

U.S. Geological Survey (1999) *USGS Fact Sheet 046-99: Effect of Causeway on Great Salt Lake..* [e-book]
<http://pubs.usgs.gov/fs/FS-046-99/pdf/fs-046-99.pdf> [Accessed: 3 May 2013].

Utah Department of Transportation (1996) *Utah State Rail Plan*. Fifth Edition. [report].

Utah Department of Transportation, et al. (2011) *Utah's Unified Transportation Plan: 2011 – 2040*. [e-book] <http://www.udot.utah.gov/main/uconowner.gf?n=8990514948923321> [Accessed: 3 May 2013].

Western Regional Alliance (2012) *Creating a Vision for the Region in the 21st Century Global Network – Step 1: Assessment and Analysis..* [e-book]
http://www.whsra.com/sites/all/files/Shannond/WRA-Vision_Step1_FinalReport.pdf [Accessed: 3 May 2013].

Data Sources

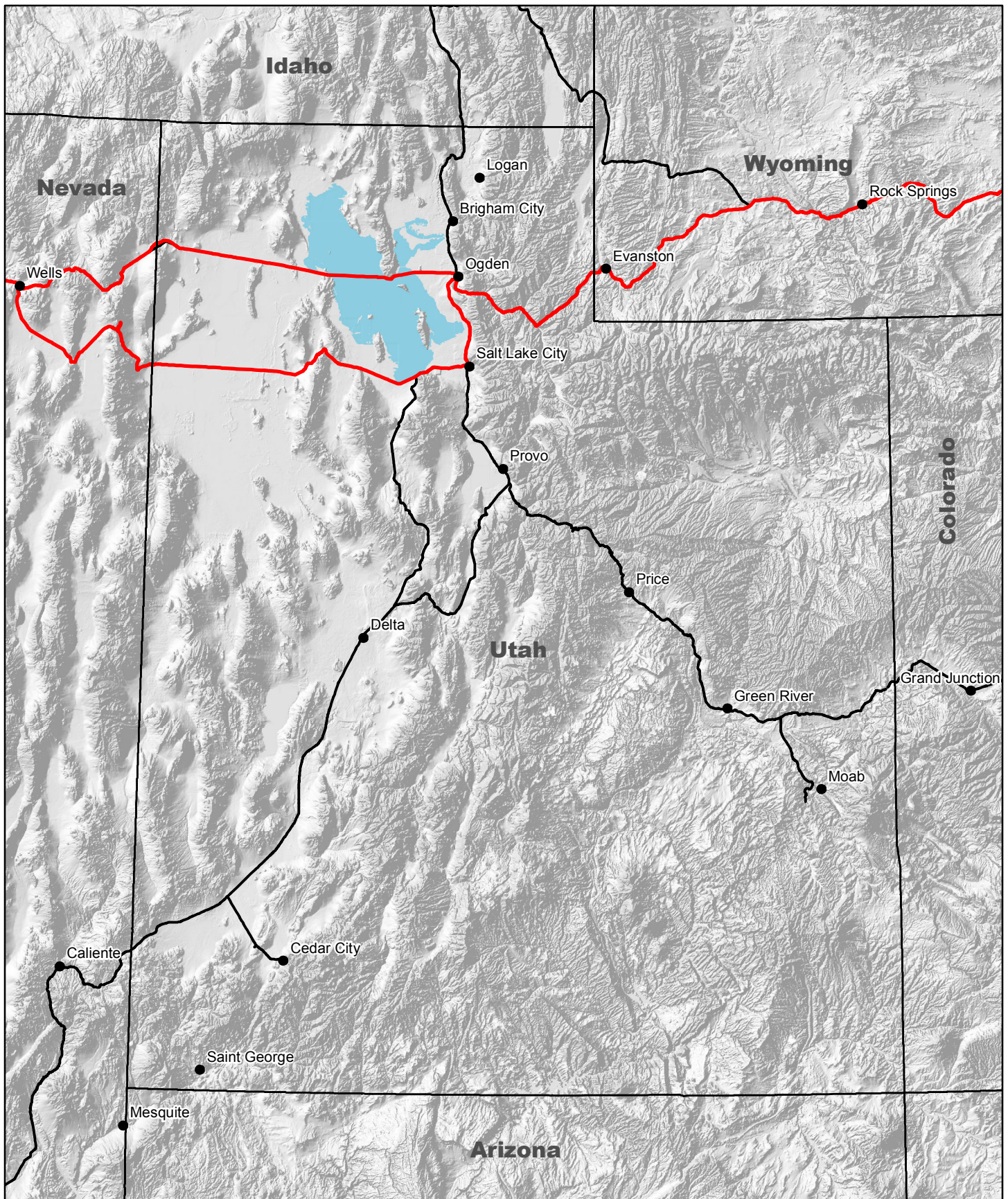
AGRC (2013). State of Utah: Automated Geographic Reference Center. <http://gis.utah.gov/data/>

Bing Maps (2013). Microsoft Corporation. <http://www.bing.com/maps/>

BTS (2012). *National Transportation Atlas Database*. U.S. Department of Transportation: Research and Innovative Technology Administration: Bureau of Transportation Statistics.
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/2012/index.html

National Atlas (2013). U.S. Department of the Interior. <http://www.nationalatlas.gov/atlasftp.html>

U.S. Census Bureau (2010). U.S. Department of Commerce. <http://www.census.gov/>



Map 1: Utah's Freight Main Lines

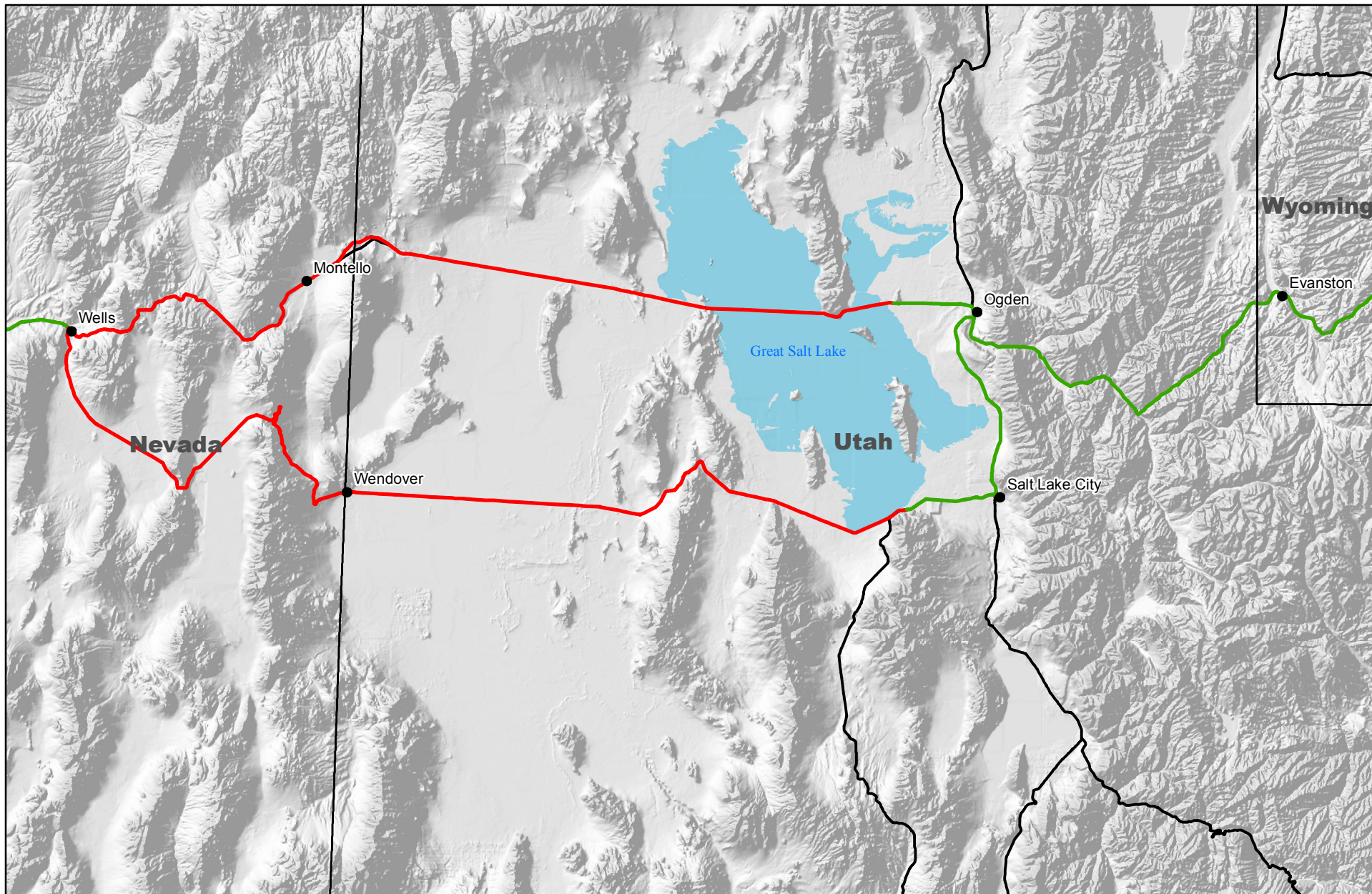
- Union Pacific Transcontinental Route
- Other Union Pacific Main Lines

0 100 Miles

Data sources: AGRC, BTS, National Atlas



1:3,000,000



Map 2: Current Trackage of Union Pacific Transcontinental Route

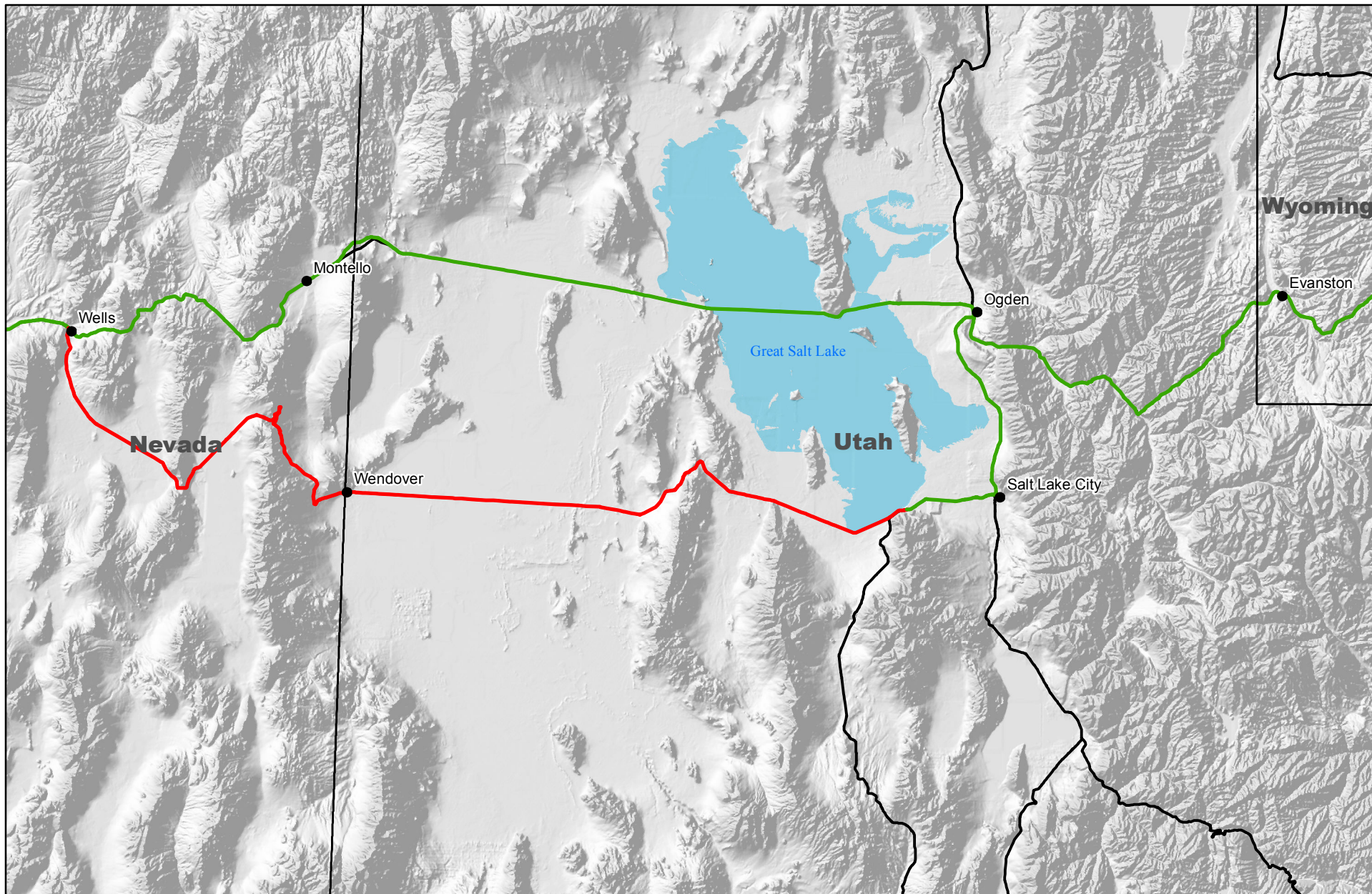
0 10 20 30 40 50 Miles

— Single Track — Double Track — Other Union Pacific Main Lines

Data sources: AGRC, BTS, National Atlas

1:1,500,000





Map 3: Proposed Trackage of Union Pacific Transcontinental Route

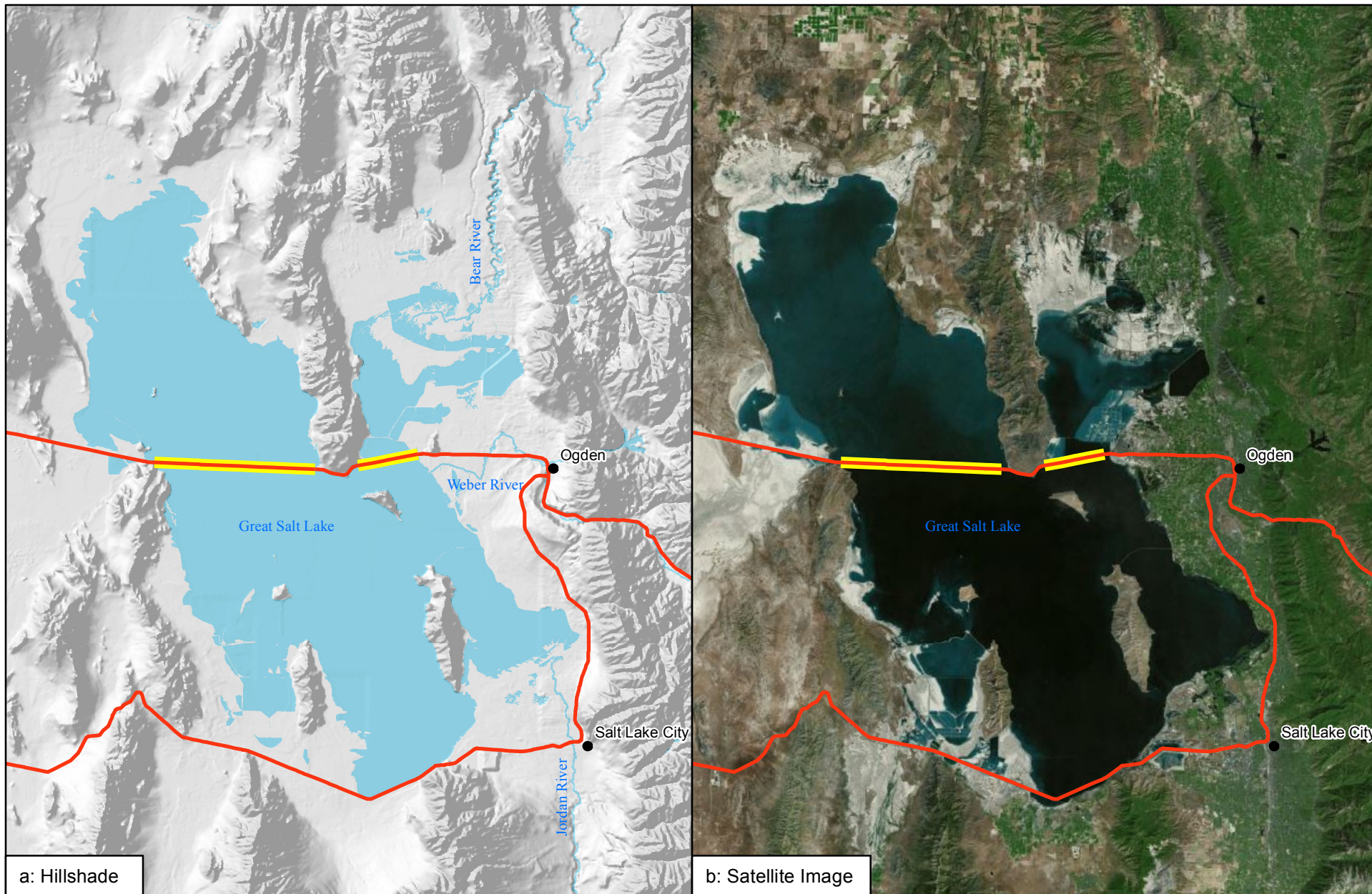
— Single Track — Double Track — Other Union Pacific Main Lines

0 10 20 30 40 50 Miles



Data sources: AGRC, BTS, National Atlas

1:1,500,000



Map 4: Great Salt Lake

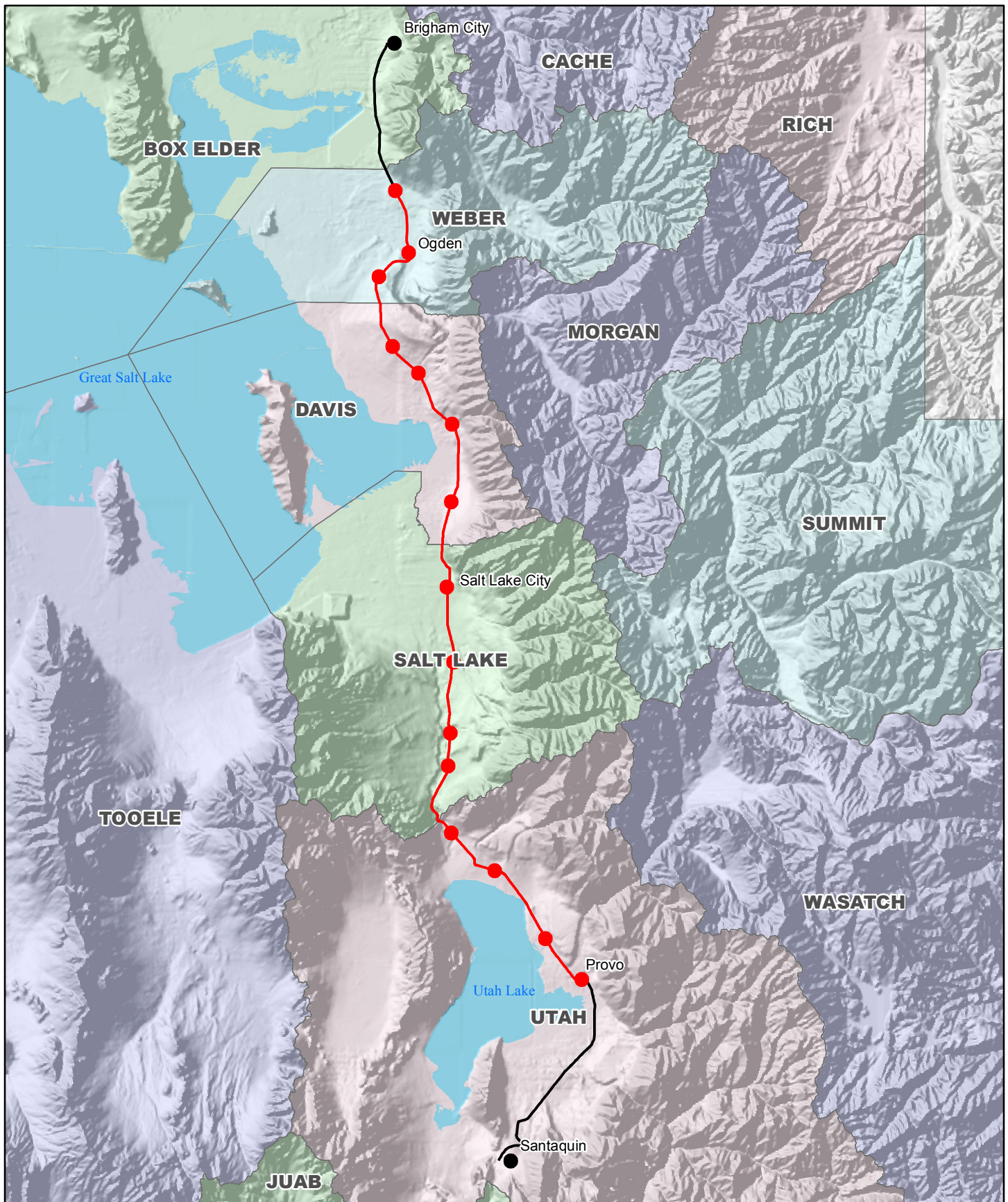
Great Salt Lake Causeway Union Pacific Transcontinental Route

0 10 20 30 40 50 Miles

Data sources: AGRC, Bing Maps, BTS, National Atlas



1:1,000,000



Map 5: FrontRunner Commuter Rail

- Current FrontRunner Lines
- Proposed FrontRunner Extensions

0 10 20 Miles



Data sources: AGRC, National Atlas 1:800,000

Figure 1: Comparison of Track Configurations

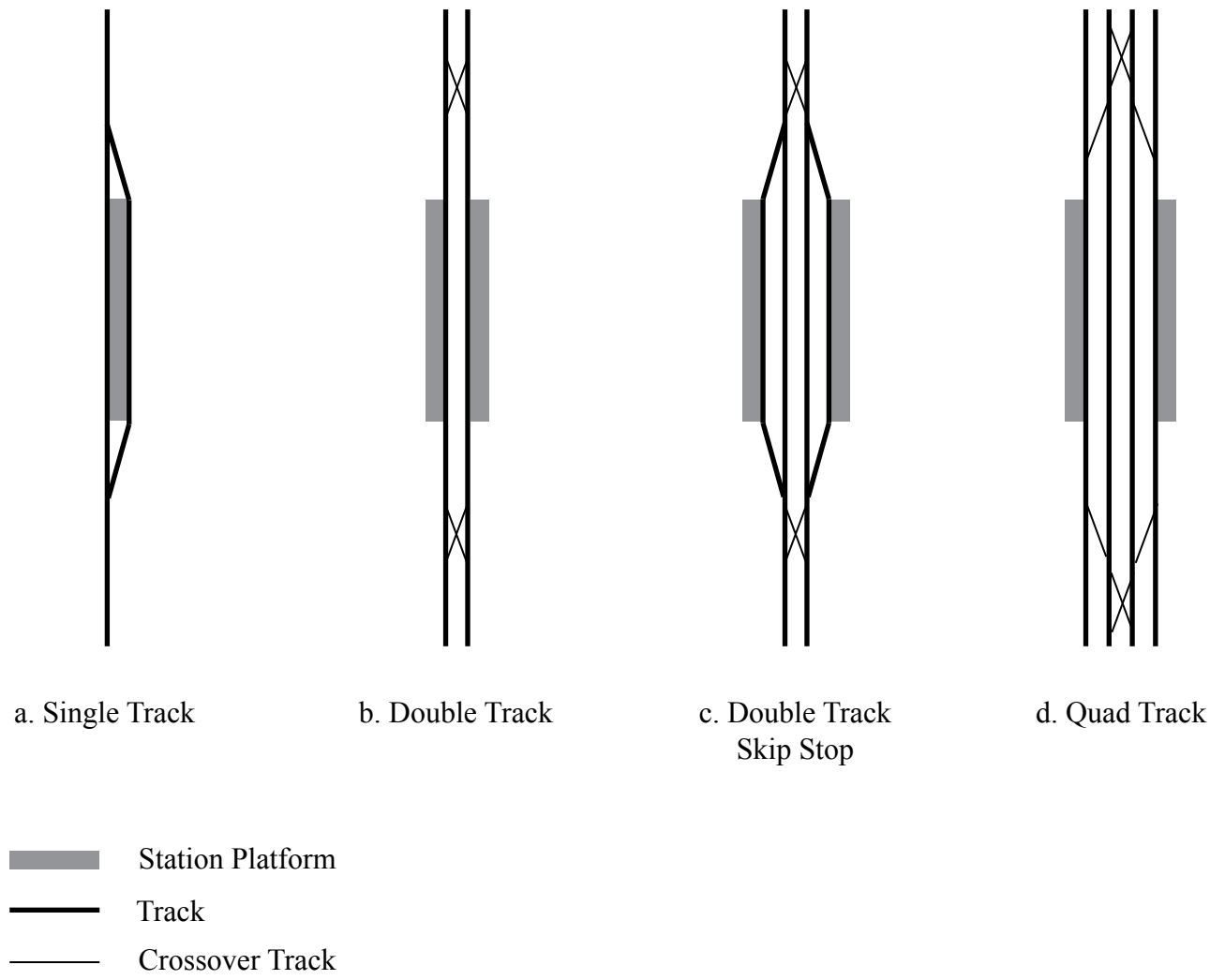


Figure 2: FrontRunner System Schematic

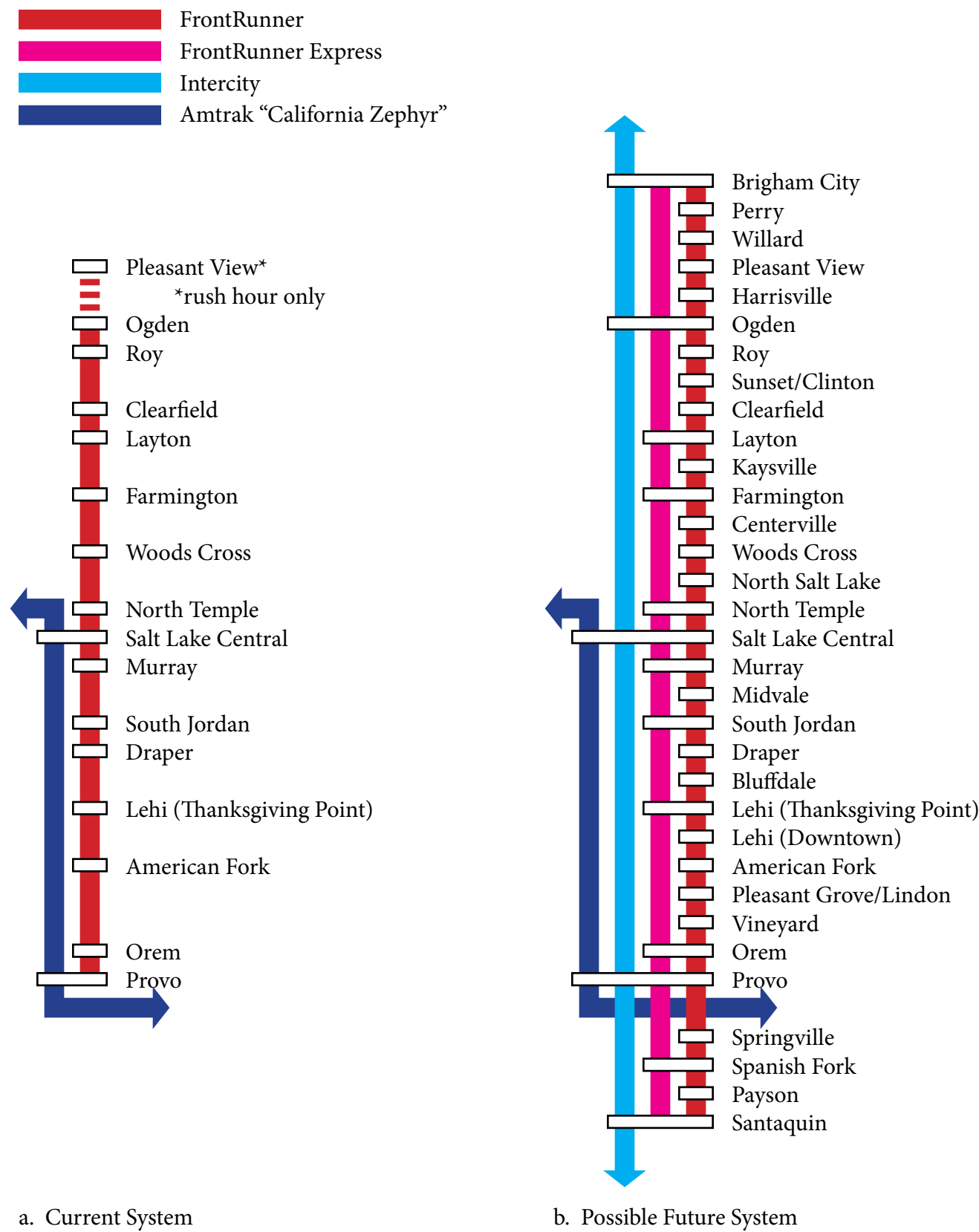
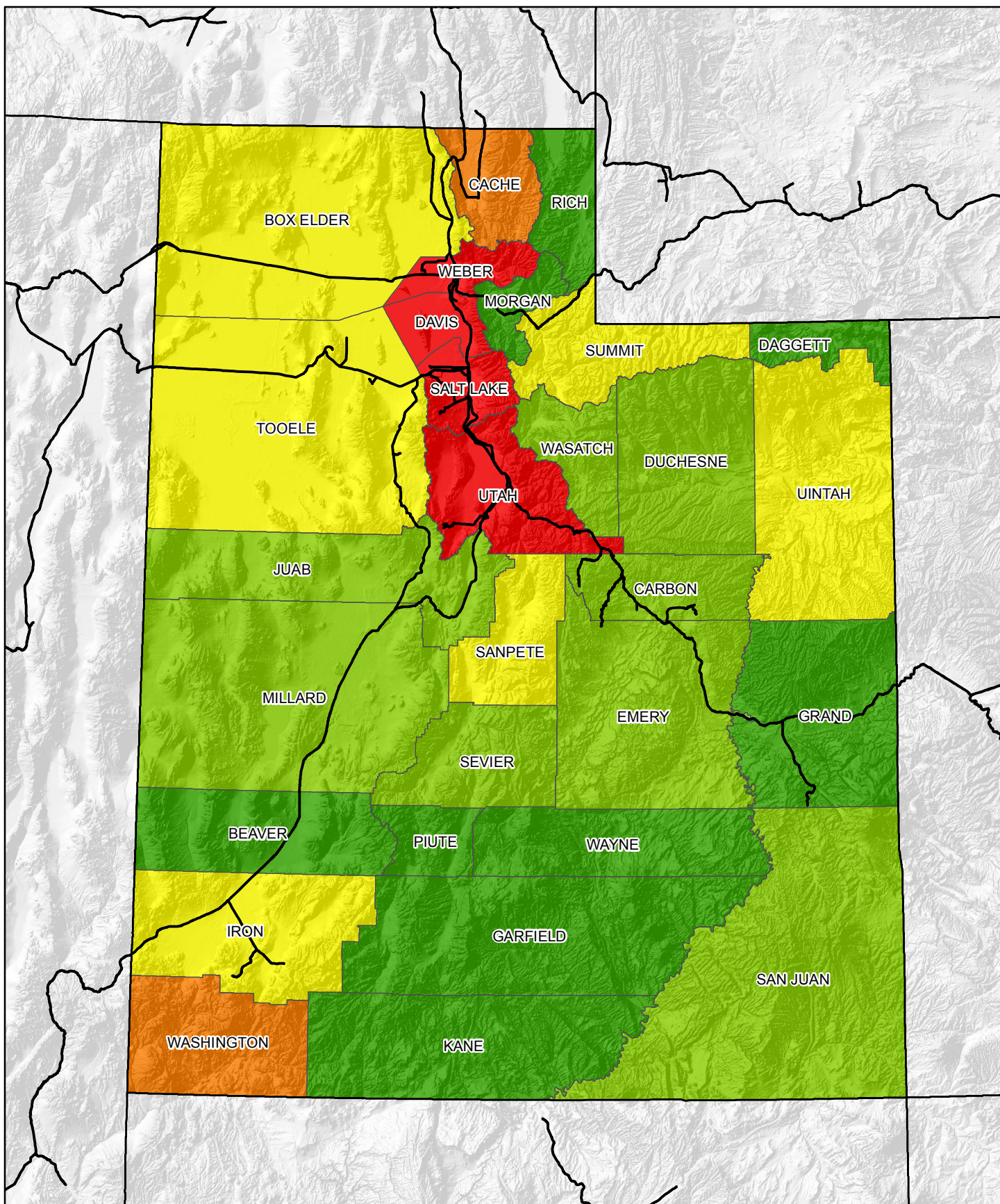


Table 1: 2010 Population of Counties in Utah

		2010
Map Color	County	Population
Red	Salt Lake County	1,029,655
	Utah County	516,564
	Davis County	306,479
	Weber County	231,236
Orange	Washington County	138,115
	Cache County	112,656
Yellow	Tooele County	58,218
	Box Elder County	49,975
	Iron County	46,163
	Summit County	36,324
	Uintah County	32,588
	Sanpete County	27,822
Light Green	Wasatch County	23,530
	Carbon County	21,403
	Sevier County	20,802
	Duchesne County	18,607
	San Juan County	14,746
	Millard County	12,503
	Emery County	10,976
	Juab County	10,246
Dark Green	Morgan County	9,469
	Grand County	9,225
	Kane County	7,125
	Beaver County	6,629
	Garfield County	5,172
	Wayne County	2,778
	Rich County	2,264
	Piute County	1,556
	Daggett County	1,059

Data source: U.S. Census Bureau



Map 6: Railroads and Counties of Utah

Refer to Table 1 for county populations and color schemes.

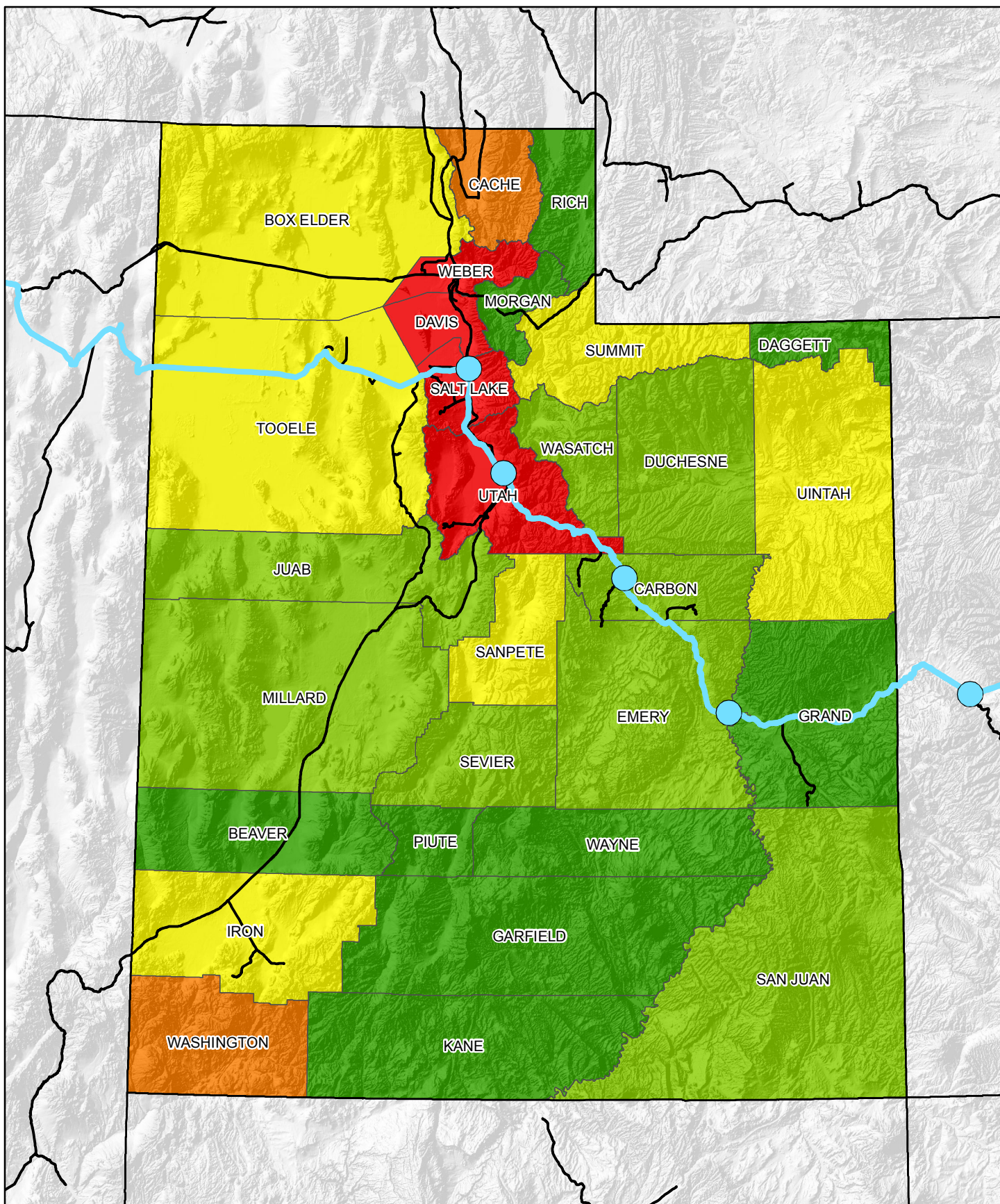
— Railroads

0 50 Miles



Data sources: AGRC, BTS, National Atlas

1:3,000,000



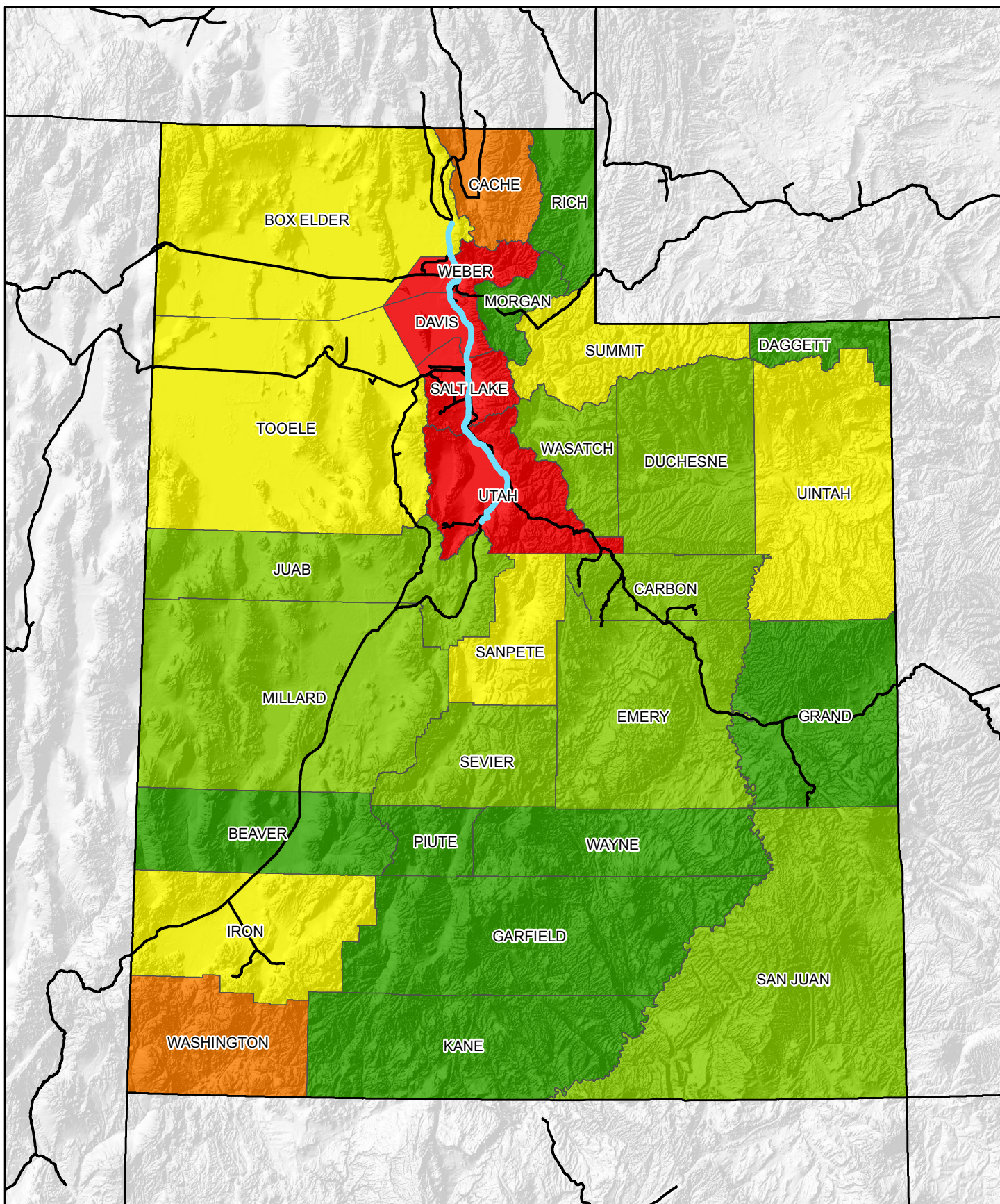
Map 7: Amtrak's "California Zephyr"

Refer to Table 1 for county populations and color schemes.

● Amtrak Stations — Amtrak — Railroads

Data sources: AGRC, BTS, National Atlas

1:3,000,000



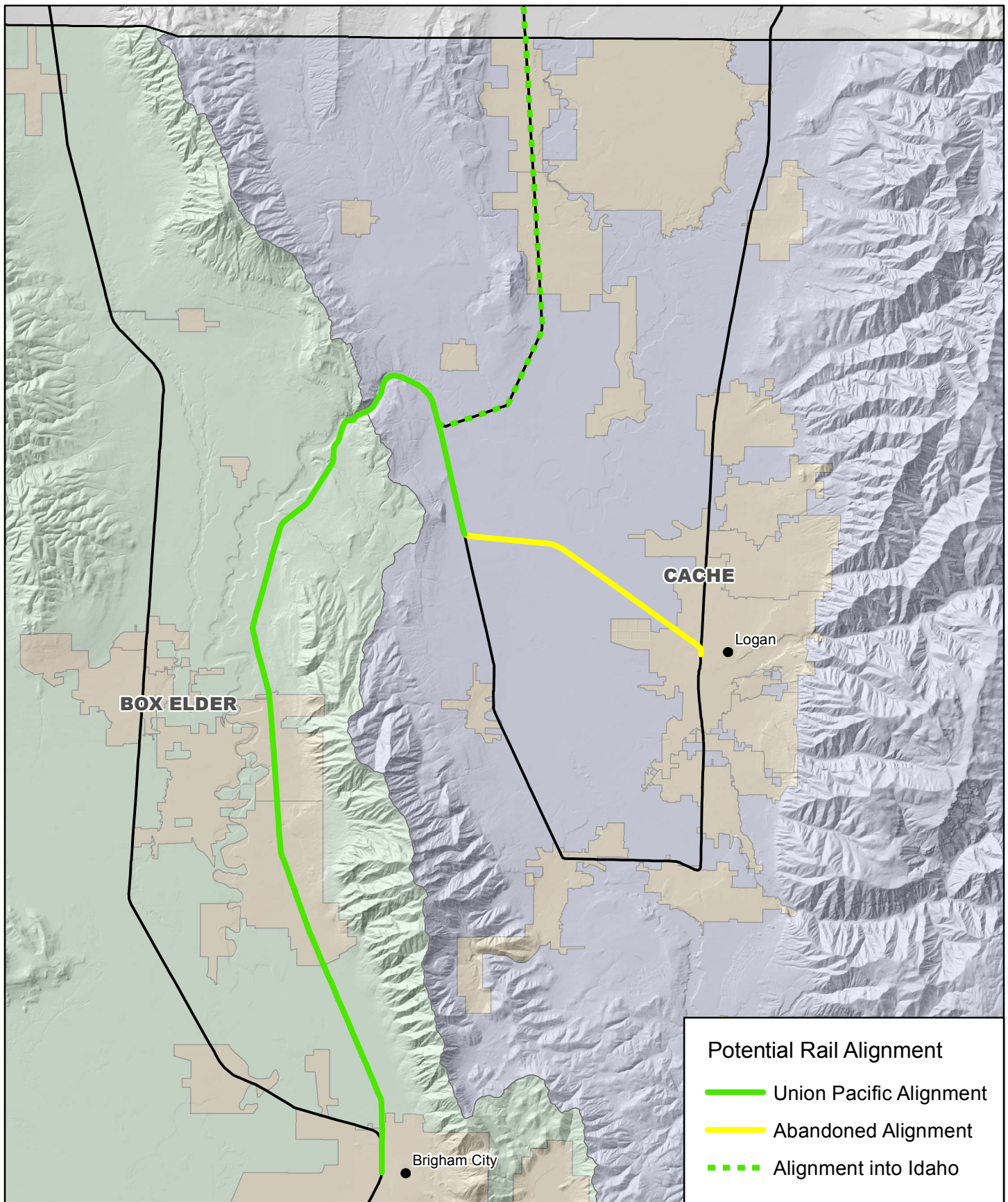
Map 8: FrontRunner Commuter Rail

Refer to Table 1 for county populations and color schemes.

0 50 Miles



FrontRunner (Current and Proposed) Railroads Data sources: AGRC, BTS, National Atlas 1:3,000,000



Map 9: Brigham City to Logan

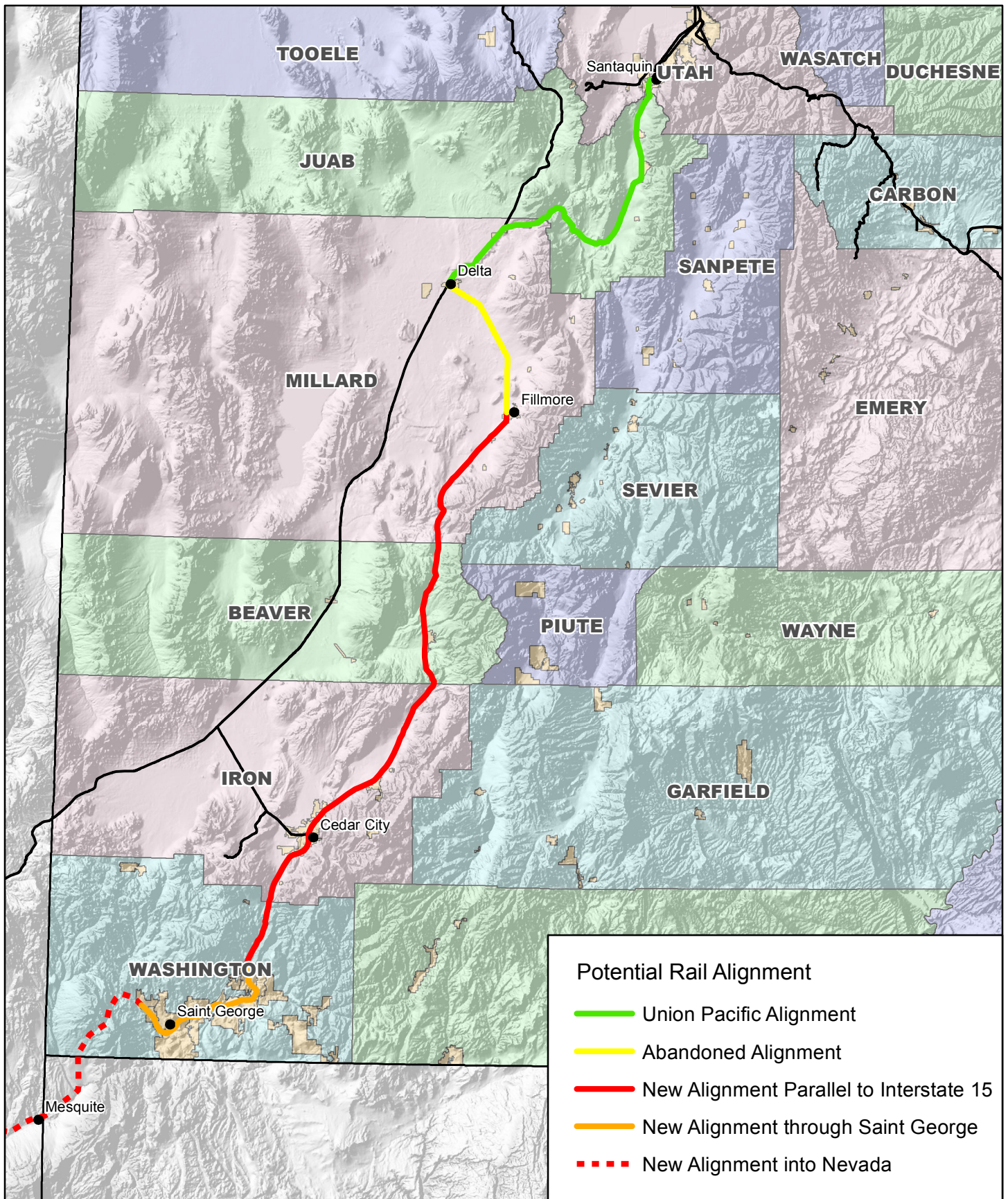
- Railroads
- Incorporated Utah Communities

0 5 Miles

Data sources: AGRC, BTS

1:250,000





Map 10: Santaquin to Saint George

— Railroads
 Incorporated Utah Communities

0 50 Miles



Data sources: AGRC, BTS, National Atlas

1:1,750,000