Ridership Feasibility Study From Oroville To Wenatchee Corridor

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***Abstract*—This study builds upon earlier gravity-model ridership forecasts to advance the feasibility analysis of restoring passenger rail service along the 131-mile Oroville-Wenatchee corridor. Using sensitivity testing, population growth scaling, and Class II track constraints, the research estimates ridership under multiple operating scenarios (2030 baseline vs. 2040 growth). It further integrates cost modeling, station catchment analysis, and scenario benchmarking with other North American corridors. Findings suggest strong demand in the Wenatchee-Chelan pair, moderate flows from Omak/Okanogan, and limited but politically valuable ridership from Oroville. Results inform operating schedules, subsidy requirements, and future research needs.**

I. Introduction

1) Problem: North Central Washington lacks frequent, reliable intercity public transport. With limited bus service, car dependency is near total. Rural communities, seasonal workers, and tourists have limited alternatives, constraining access to jobs, healthcare, and recreation.

2) Objective: To evaluate the feasibility of passenger rail along the Cascade and Columbia River Railroad (CSCD) corridor by estimating ridership, testing sensitivity to demographic and tourism factors, and aligning service planning with equity and economic goals.

II. Methodology

A. Data Inputs

- **Stations**: Wenatchee, Chelan, Brewster, Omak, Tonasket, Oroville.
- **Demographics**: ACS 2020 baseline populations; scaled with Washington OFM growth factors (2025, 2030, 2040).
- **Tourism**: Applied multipliers (1.25 for 2030, 1.30 for 2040) for Chelan flows.

B. Modeling Approaches

*1) **Foundations and Corridor Context**:*

The study began with a foundational review of existing transport services along the Wenatchee-Oroville corridor. This work highlights inefficiencies in the current system, particularly the absence of a unified transportation strategy and the heavy dependence on private automobiles. The study profiled the 131-mile corridor, emphasizing Wenatchee as the key interchange hub and Lake Chelan as a major tourism driver. This week also established the demographic and economic baseline of the corridor, pointing to the outsized role tourism plays in mobility demand and the structural disadvantage faced by non-drivers in accessing regional services.

TABLE I: Station-level population catchments within 10- and 20-mile radii, based on ACS 2020 data.

Station	10-mile population	20-mile population
Wenatchee	35,508	36,885
Chelan	4,222	6,192
Brewster	2,576	2,576
Okanogan/Omak	7,239	7,239
Tonasket	1,103	2,898
Oroville	1,795	2,898

*2) **Service Concept Development**:*

The shift towards envisioning a service concept for the corridor. Analysis of current gaps revealed limited bus frequencies, overreliance on automobiles, and restricted mobility for non-drivers, particularly the elderly and low-income populations. In response, I proposed an intercity passenger rail service concept of two to four daily round trips. Estimated travel times were around two hours, providing a modest advantage compared to 2040 by car. Potential station stops were outlined, and initial operational and financial considerations were introduced, including track rehabilitation, station upgrades, rolling stock procurement, freight coordination, and PTC compliance. I also identified key ridership markets such as commuters, students, healthcare travelers, and tourists.

*3) **Modeling and Cost Framework**:*

Focused on quantitative modeling and establishing a cost framework. I built a gravity model to estimate origin-destination (OD) flows based on ACS populations, interstation distances, and elasticity parameters. The model was calibrated to Wenatchee-Chelan flows (266 daily trips or 97,000 annually), which provided a strong anchor for the system wide OD table. I expanded this baseline with machine learning adjustments, incorporating socioeconomic factors such as income, tourism flags, and bus availability. Alongside ridership modeling, I developed a preliminary cost framework, estimating start-up capital costs between $120-200M and annual operating costs of roughly $6.5M. The farebox recovery ratio was projected at under 15% if constrained to Class 2 speeds. Importantly, I quantified tourism's effect by showing that Chelan's seasonal draw nearly doubles baseline demand.

TABLE II: Adjusted daily trips for Wenatchee origin-destination OD pairs under growth, tourism, and time multipliers.

Destination	Base	Adj. (S1)	Growth (S1)	Adj. (S2)	Growth (S2)	Tourism / Time
Chelan	266.00	365.37	1.1859	534.49	1.3572	1.25 / 0.927; 1.30 / 1.139
Entiat	150.11	151.47	1.0890	199.16	1.1650	1.00 / 0.927; 1.00 / 1.139
Brewster	53.80	56.73	1.1380	78.01	1.2733	1.00 / 0.927; 1.00 / 1.139
Pateros	19.78	19.96	1.0890	26.24	1.1650	1.00 / 0.927; 1.00 / 1.139
Omak/Okanogan	49.54	52.23	1.1380	71.84	1.2733	1.00 / 0.927; 1.00 / 1.139

*4) **Sensitivity and System-Level Extensions**:*
I extended the analysis with sensitivity testing and system-level applications. I developed demographic catchments within 10 and 20-mile radii around each station, scaled them with Washington OFM growth factors for 2025, 2030, and 2040, and integrated these projections into ridership modeling. Chelan flows were further boosted with tourism multipliers (1.25 in 2030, 1.3 in 2040). I also incorporated travel time elasticity (-0.8), which showed that a 10% slowdown in schedules reduces ridership by 7%, while a 15% speedup increases ridership by 14%. Scenario testing produced concrete outcomes: Wenatchee-Chelan trips rise from 266 daily to about 365 by 2030 (slower schedule) and 534 by 2040 (faster schedule). I extended these forecasts into service planning, testing two vs. four daily round trips, and found subsidies per passenger ranged from $73-113 in 2030 to $45-72 in 2040. At the station level, Wenatchee and Chelan consistently dominated flows, while Omak and Okanogan contributed steady demand and Oroville maintained symbolic importance as a northern anchor.

*5) **Advanced Scenario & Policy Analysis**:*

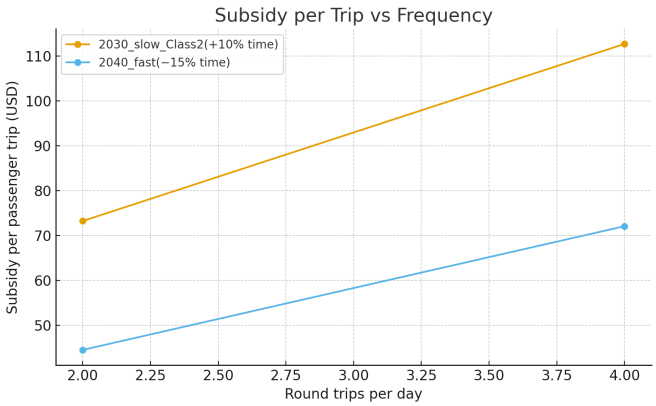

Fig. 1: Subsidy per passenger for different service frequencies under 2030 and 2040 scenarios.

The research advanced beyond pure modeling into scenario expansion, benchmarking, and policy framing. First, I benchmarked the corridor against the North Carolina Piedmont service, which demonstrated how ridership scales with phased frequency growth from one to four round trips. This reinforced the idea that the Oroville-Wenatchee corridor should adopt a staged implementation strategy. Second, I developed an equity index by weighting station catchments by low-income and car-free households. Wenatchee scored highest, followed by Chelan and Okanogan, while Oroville ranked lowest but retained symbolic value. Fare and frequency scenarios were tested at $5, $10, and $15. Where $10 emerged as revenue-maximizing. Frequency elasticity showed that doubling from two to four trips nearly doubles ridership, but further increases to six trips yield diminishing returns of 20-30%. Multimodal access improvements, particularly feeder bus integration, were modeled to add 5-10% to ridership. Market segmentation revealed commuters are highly sensitive to frequency, while tourists are more responsive to fares, with Chelan showing a +50% seasonal multiplier in summer months. Finally, I examined policy and funding implications, estimating subsidies of $45-100 per passenger and recommending CRISI grants, state contributions, and county partnerships. The emphasis shifted toward coalition building and phased rollouts that balance technical modeling with political feasibility.

III. Results and Discussion

The gravity model findings for the Oroville-Wenatchee corridor clearly showed that Wenatchee-Chelan is the anchor market, driven primarily by

Chelan's tourism economy, which attracts over two million visitors annually. Omak and Okanogan contributed steady but modest flows, while Oroville generated fewer than 10 daily trips. Despite this, Oroville remains politically important for corridor continuity and maintaining a northern connection to Amtrak's Empire Builder. The elasticity analysis underscored how strongly ridership responds to travel times, with even small speed changes having outsized impacts on demand.

The catchment and demographic scaling confirmed that Wenatchee and Chelan dominate within 10-mile radii, while at 20 miles towns such as Okanogan and Brewster gain relative importance. Population growth to 2040 modestly increases demand, but the effect of tourism multipliers in Chelan produces sharper ridership shifts, highlighting the corridor's reliance on seasonal visitor traffic. These demographic patterns reinforce the need to treat tourism-driven ridership as a core component of the feasibility study rather than a secondary effect.

Service scenarios revealed that under a 2030 Class 2 case, daily ridership is projected around 660 for two daily round trips, requiring subsidies in the range of $73-113 per trip due to constrained travel speeds. By contrast, a 2040 Class 3 upgrade scenario, with faster speeds, raises ridership to between 945 and 1,336 daily riders, reducing subsidy needs to $45-72 per trip. These results make clear that improving speed produces stronger cost-effectiveness than adding frequency alone. Equity analysis confirmed that Wenatchee and Chelan generate the highest benefits for car-limited, lower income populations, while the northern stations though weaker in ridership carry symbolic and political importance. Finally, benchmarking with peer corridors like Maine's Downeaster and North Carolina's Piedmont showed that sustained, multi-decade investment strategies are necessary. Both corridors demonstrated ridership anchored in a strong urban-tourism link, validating our approach and underscoring the corridor's alignment with state and federal equity, tourism, and decarbonization goals.

IV. Conclusion

Restoring passenger rail along the Oroville-Wenatchee corridor is feasible if framed as a phased, equity-driven, and tourism-supported policy project rather than a purely financial investment. Key next steps include developing a corridor authority (Downeaster model), negotiating agreements with CSCD/Genesee & Wyoming, pursuing state and federal grants (FRA CRISI, WSDOT Rail), launching a 2-round trip pilot with potential to scale, and building a political coalition emphasizing rural access, equity, and tourism.

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