# Managing Visitor Use at National Parks with Big Data

Rachel Collins, NPS
Ted Mansfield and Ben Swanson, RSG
Steve Lawson and Abbie Larkin, Otak

January 9, 2022

# NPS needs are evolving as park management becomes more complicated

## Park management challenges

- Visitation often concentrated during peak periods and at a small number of primary destinations within parks
- High travel volumes can impact travel routes and destinations both within park units and surrounding communities

## Existing data systems not responsive to these challenges

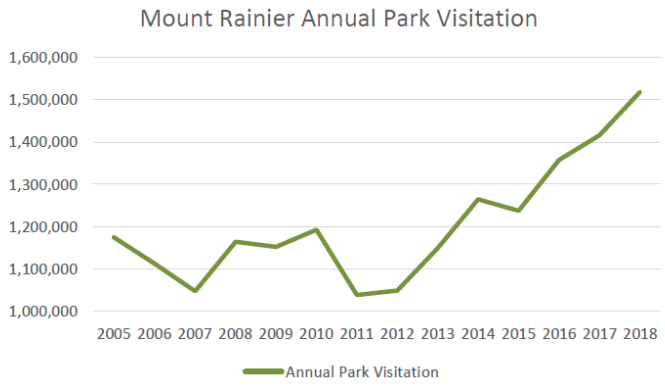
- Visitor use surveys are costly and infrequent
- Provide limited information on potential community impacts

***How can big data help NPS address these concerns?***

# Mount Rainier: a Flagship National Park


## A flagship park with flagship visitation

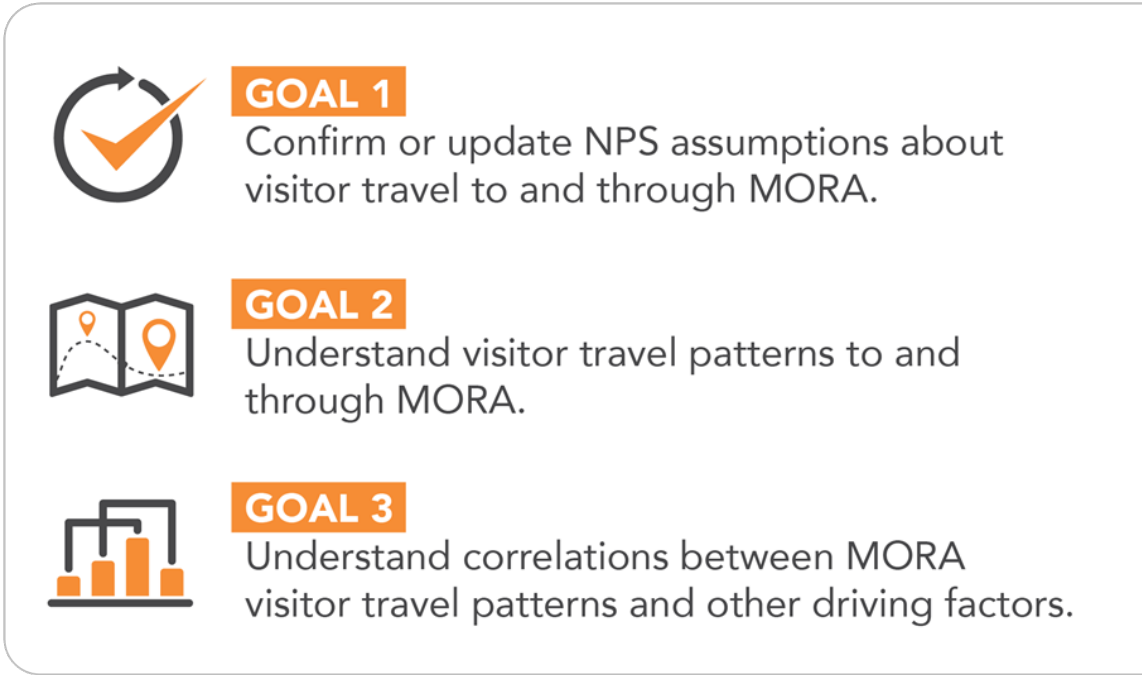
- Yearly increases in visitation since 2011
- Within driving distance of several major cities in the pacific northwest, including Seattle and Portland



# How can LBS data help NPS address park management challenges in Mount Rainier?

## RSG and Otak team processed 2019 LBS data

- Validated using a 2012 visitor use survey, other external data
- Insights used develop strategies to support NPS in developing a corridor management plan for Mount Rainier National Park
- Custom processing tailored to address specific goals:



# How can LBS data help NPS address park management challenges in Mount Rainier?

## RSG and Otak team processed 2019 LBS data

- Validated using a 2012 visitor use survey, other external data
- Insights strate NPS corrid plan fo National
- Custom processing tailored to address specific goals:

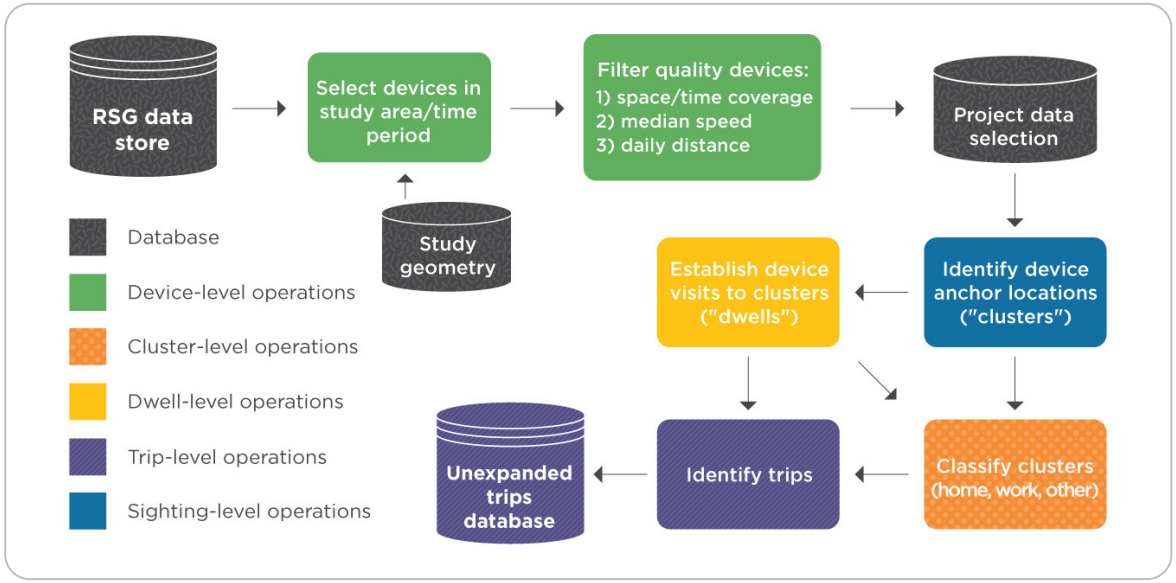
Today, we'll focus on the first two

**GOAL 1**
Confirm or update NPS assumptions about visitor travel to and through MORA.

**GOAL 2**
Understand visitor travel patterns to and through MORA.

**GOAL 3**
Understand correlations between MORA visitor travel patterns and other driving factors.

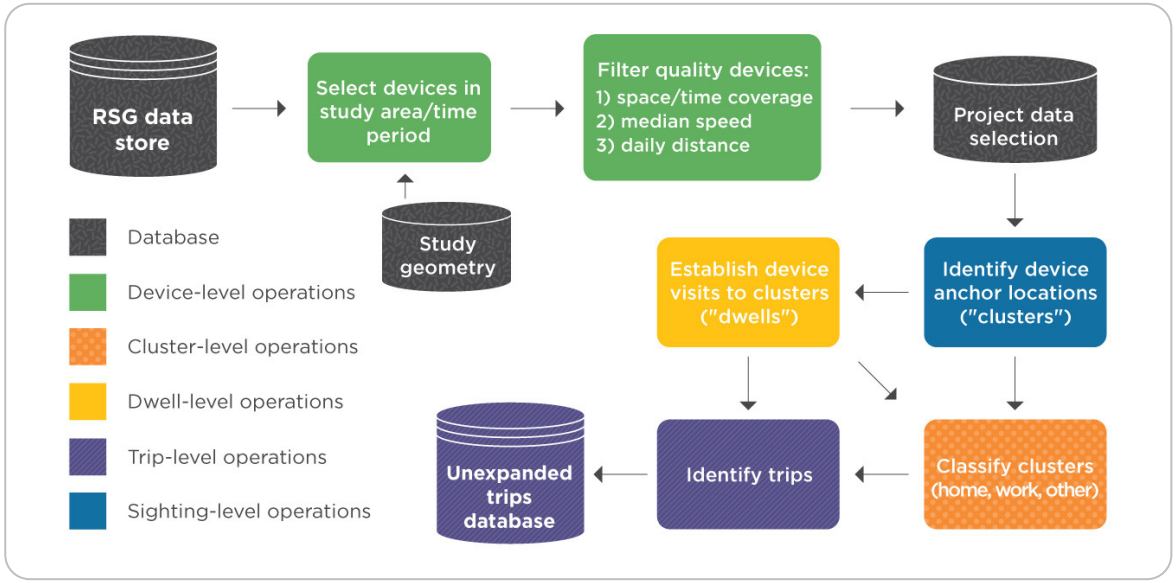
# LBS data processing at RSG




## Standard LBS data processing:

- Spatial clustering algorithm (DBSCAN) applied to identify **clusters**
- Sequential records in same cluster grouped to form **visits**
- **Trips** formed between visits, routed on OpenStreetMap roadway network
- Device home location inferred using overnighting patterns

# LBS data processing at RSG



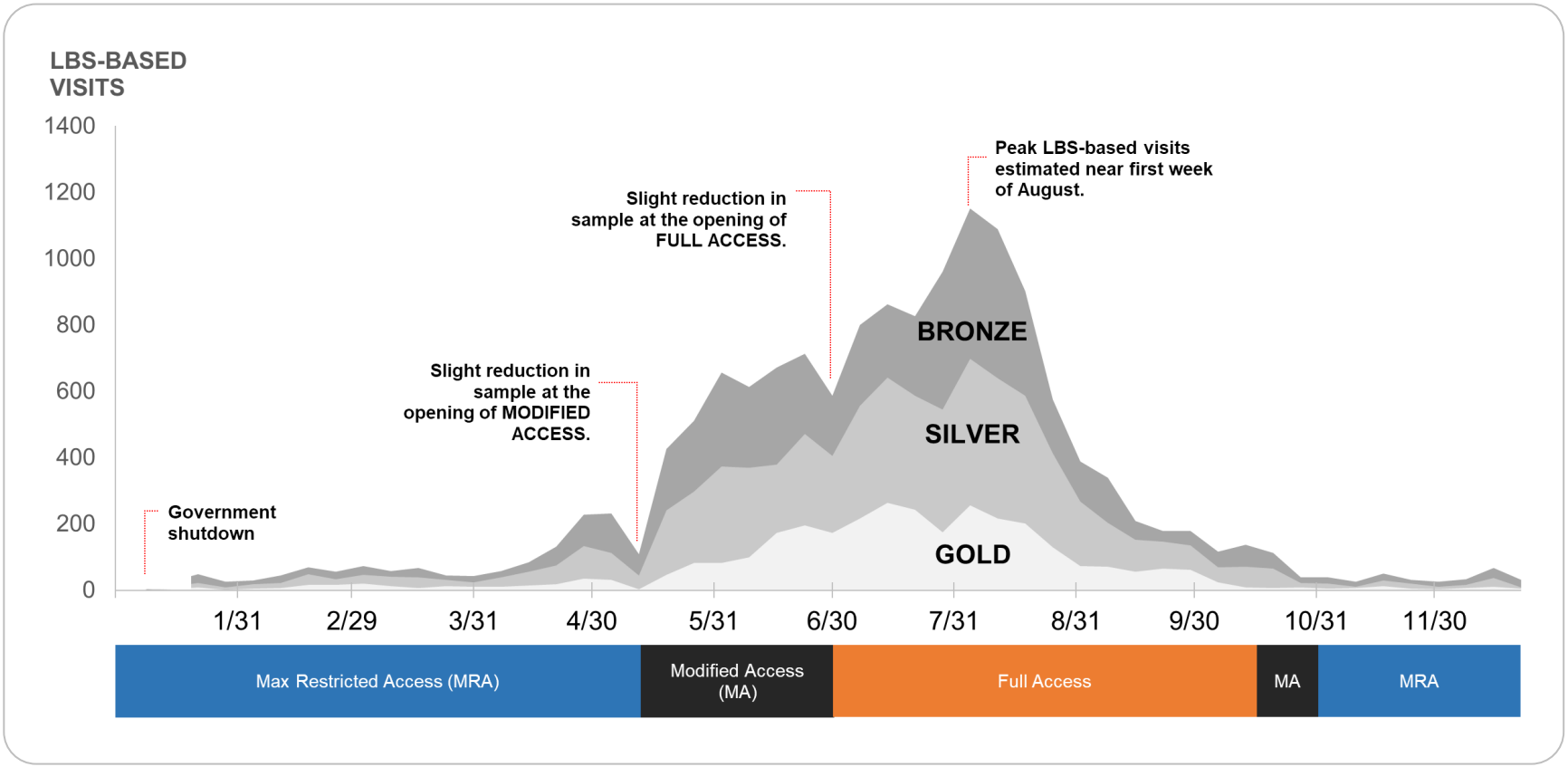

## Additional custom processing for MORA:

- **Tours** constructed by grouping trips a device makes between departing and arriving back at its inferred home location.
- Devices classified into three quality tiers: **bronze**, **silver**, and **gold**

## GOAL 1

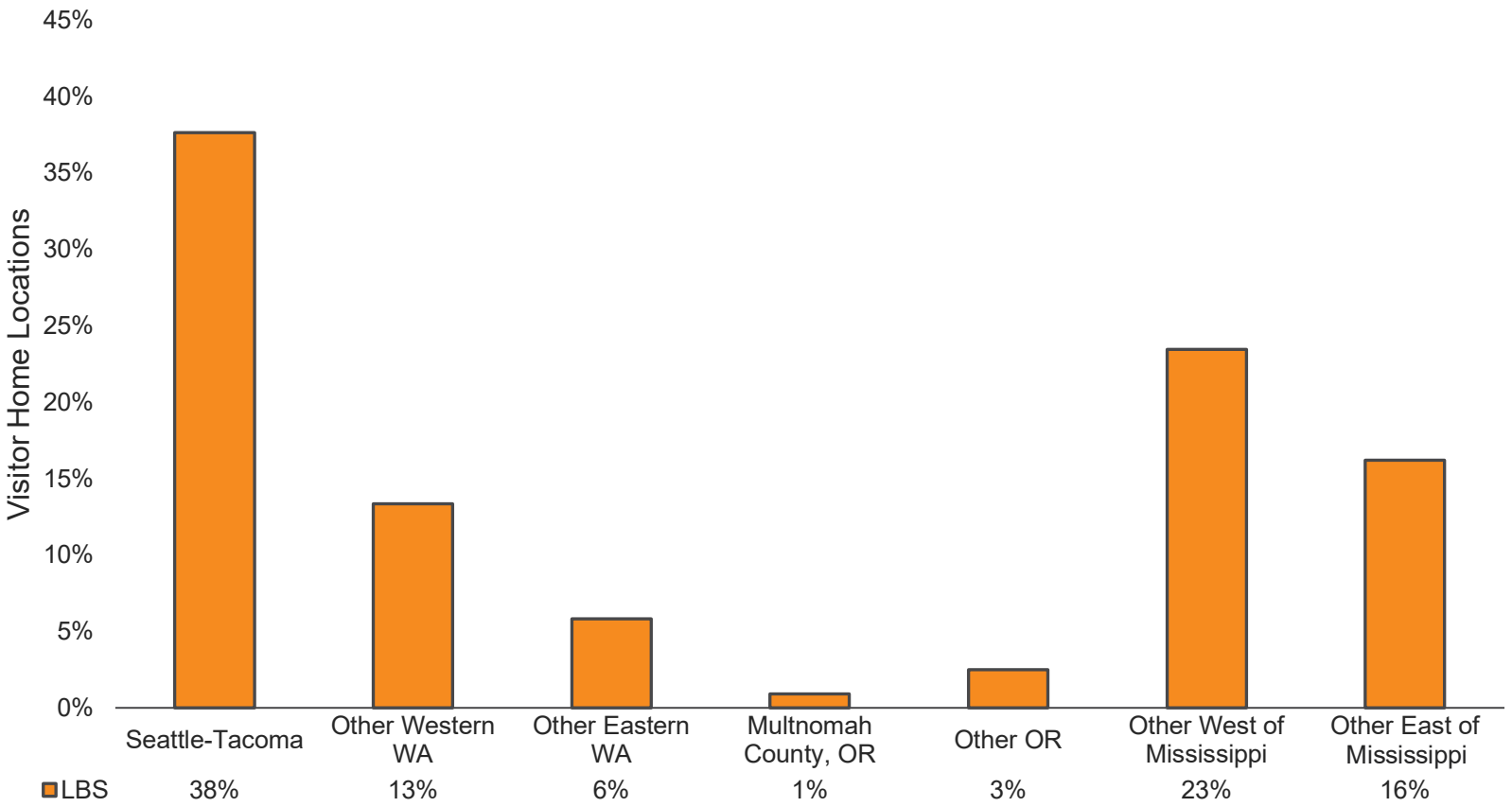
Confirm or update NPS assumptions about visitor travel to and through MORA.

# LBS data confirms seasonal visitation trends



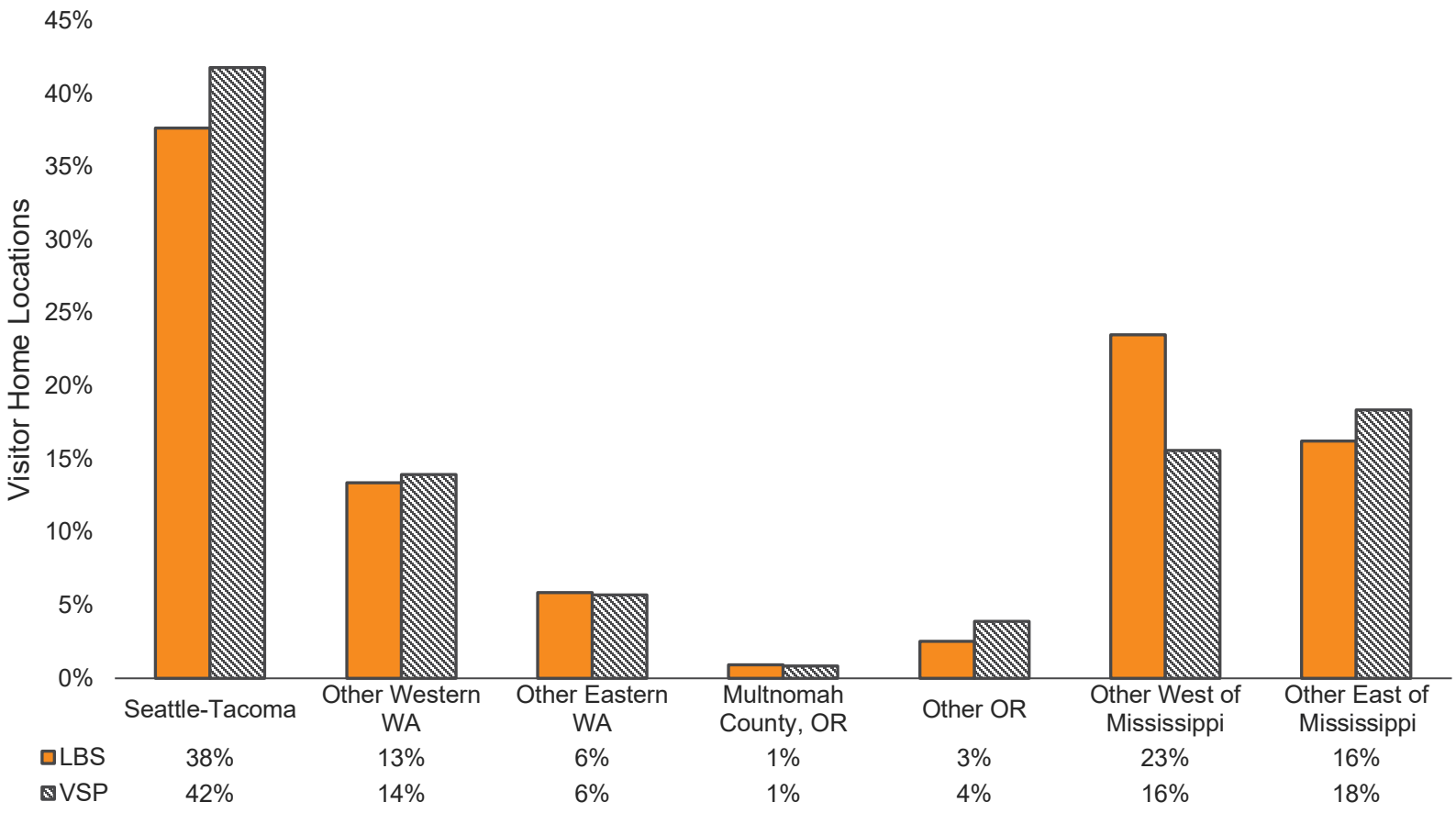

**GOAL 1**
Confirm or update NPS assumptions about visitor travel to and through MORA.

# Most visitors were from nearby, though some were from further afield




**GOAL 1**
Confirm or update NPS assumptions about visitor travel to and through MORA.

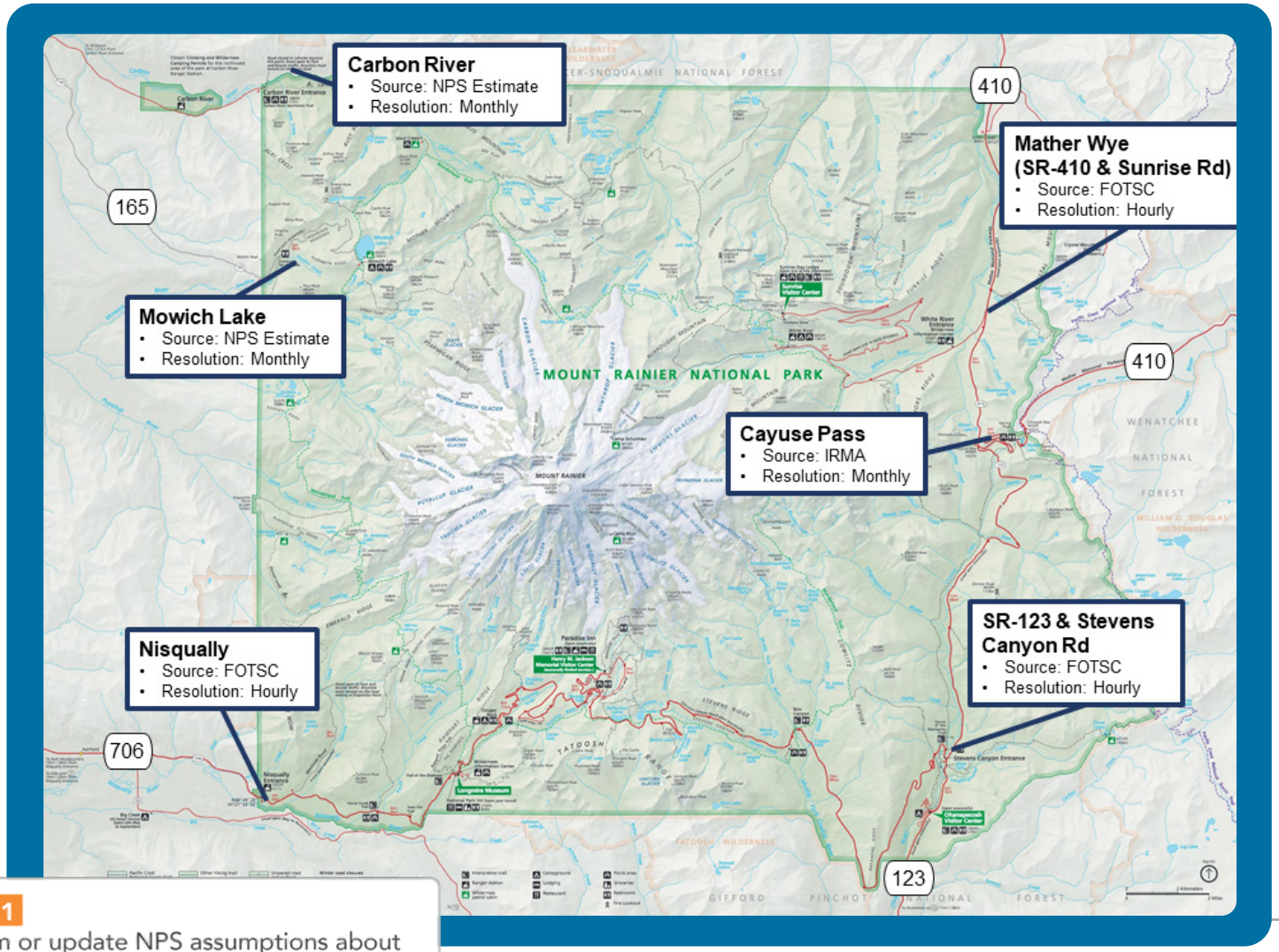
# LBS estimates of visitor home location validated by survey results




| | Seattle-Tacoma | Other Western WA | Other Eastern WA | Multnomah County, OR | Other OR | Other West of Mississippi | Other East of Mississippi |
|---|---|---|---|---|---|---|---|
| LBS | 38% | 13% | 6% | 1% | 3% | 23% | 16% |
| VSP | 42% | 14% | 6% | 1% | 4% | 16% | 18% |

**GOAL 1**
Confirm or update NPS assumptions about visitor travel to and through MORA.

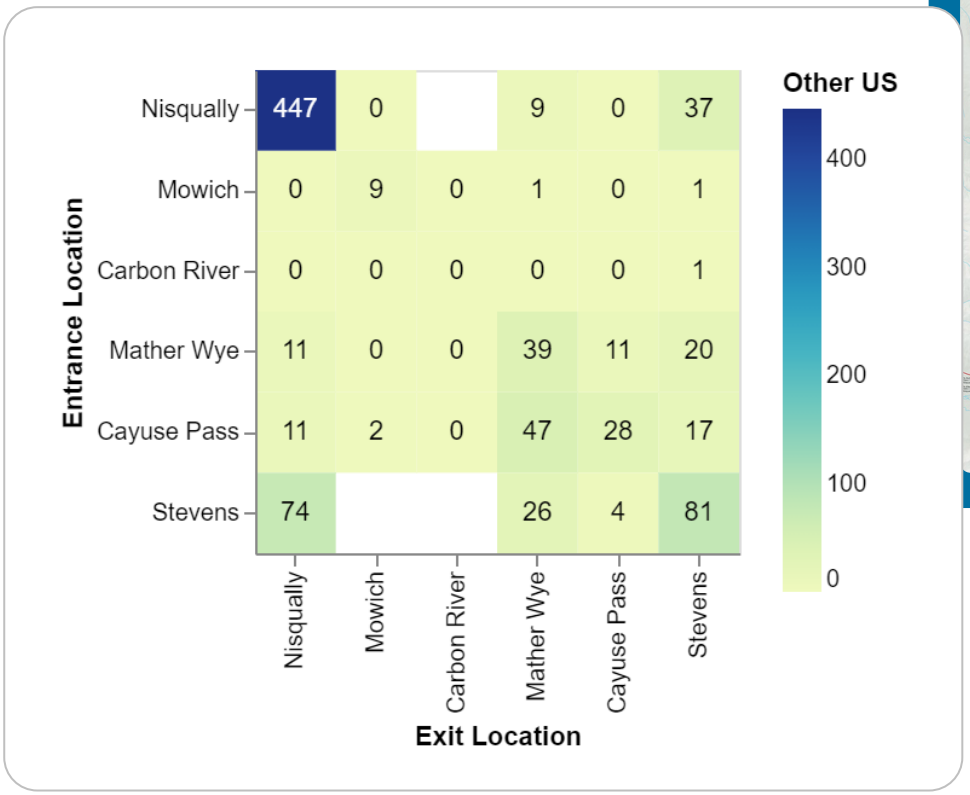
# What can LBS data tell us about park entrance and exit locations?

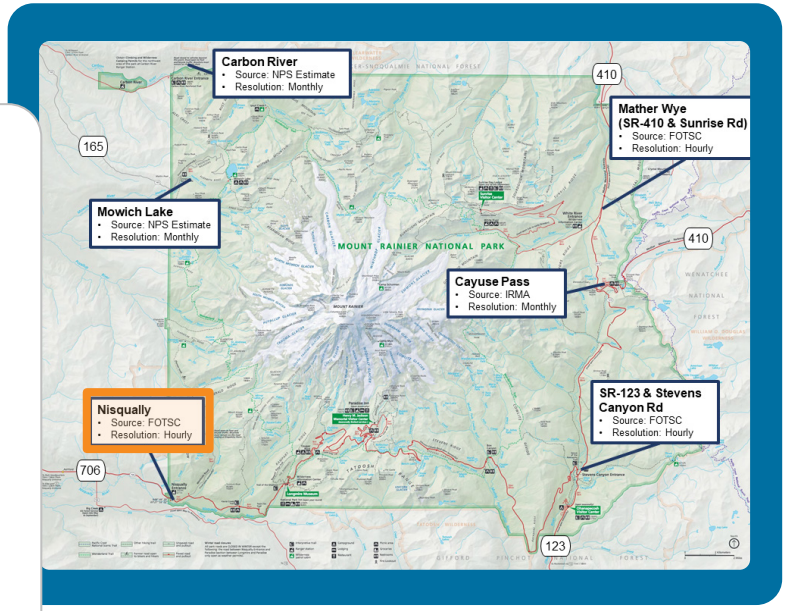



**GOAL 1**

Confirm or update NPS assumptions about visitor travel to and through MORA.

# Longer-distance visitors relied heavily on the Nisqually entrance

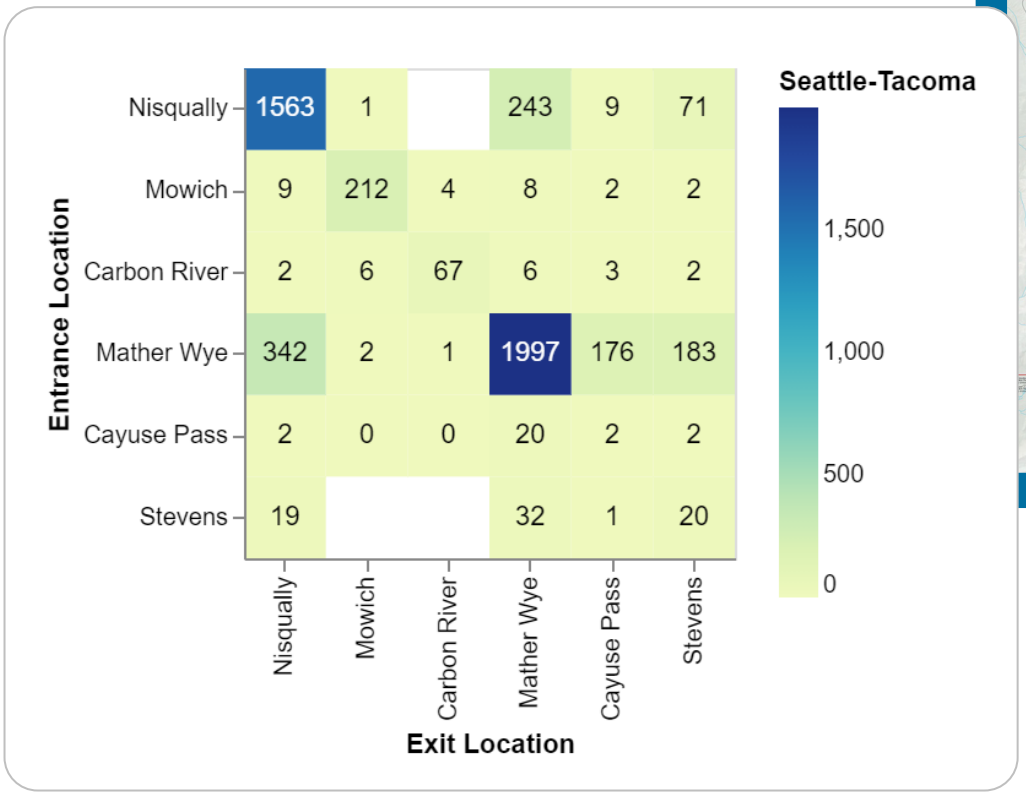


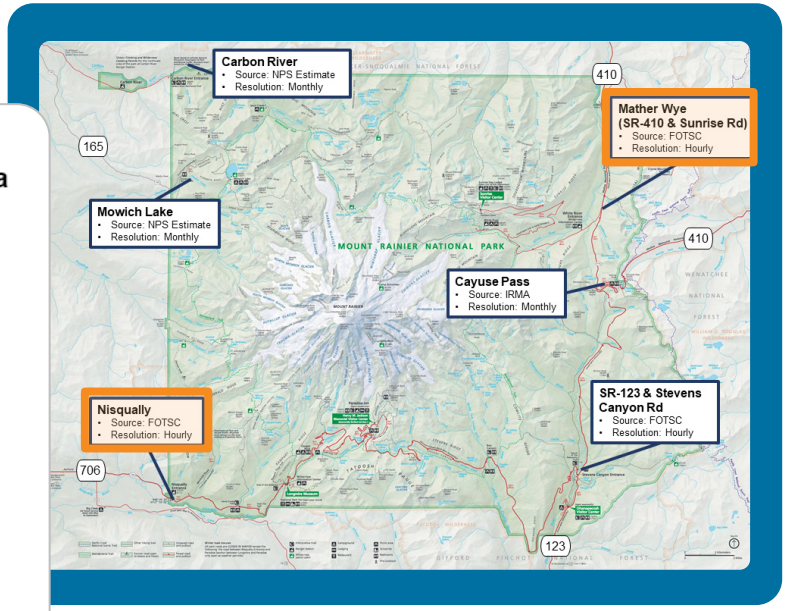




**GOAL 1**

Confirm or update NPS assumptions about visitor travel to and through MORA.

# While Seattle residents used the Mather Wye, Nisqually entrances

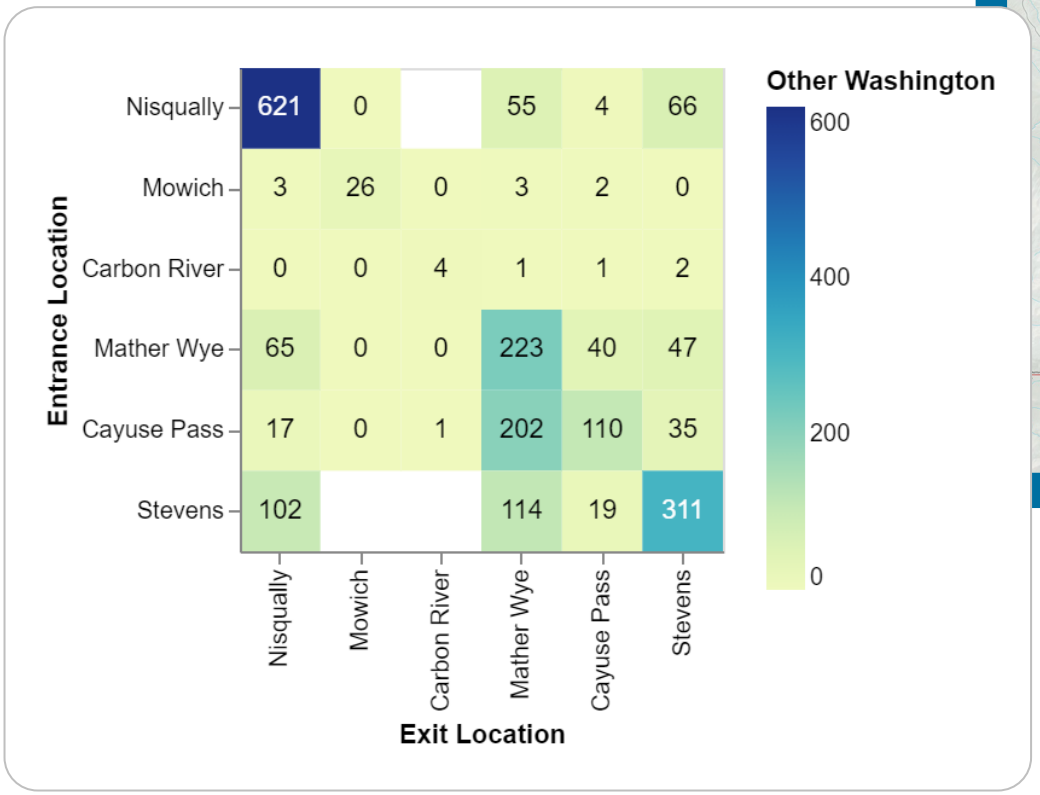


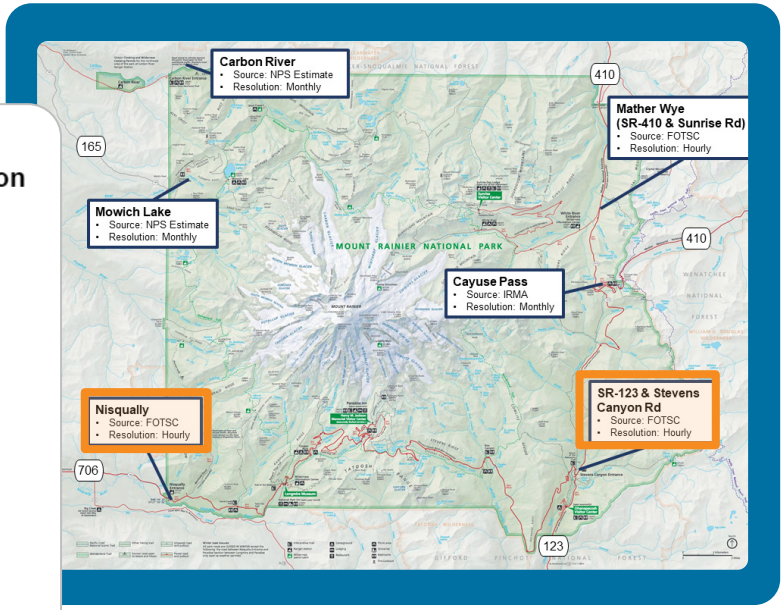




GOAL 1

Confirm or update NPS assumptions about visitor travel to and through MORA.

# Finally, other Washington residents were more likely to use the Stevens entrance

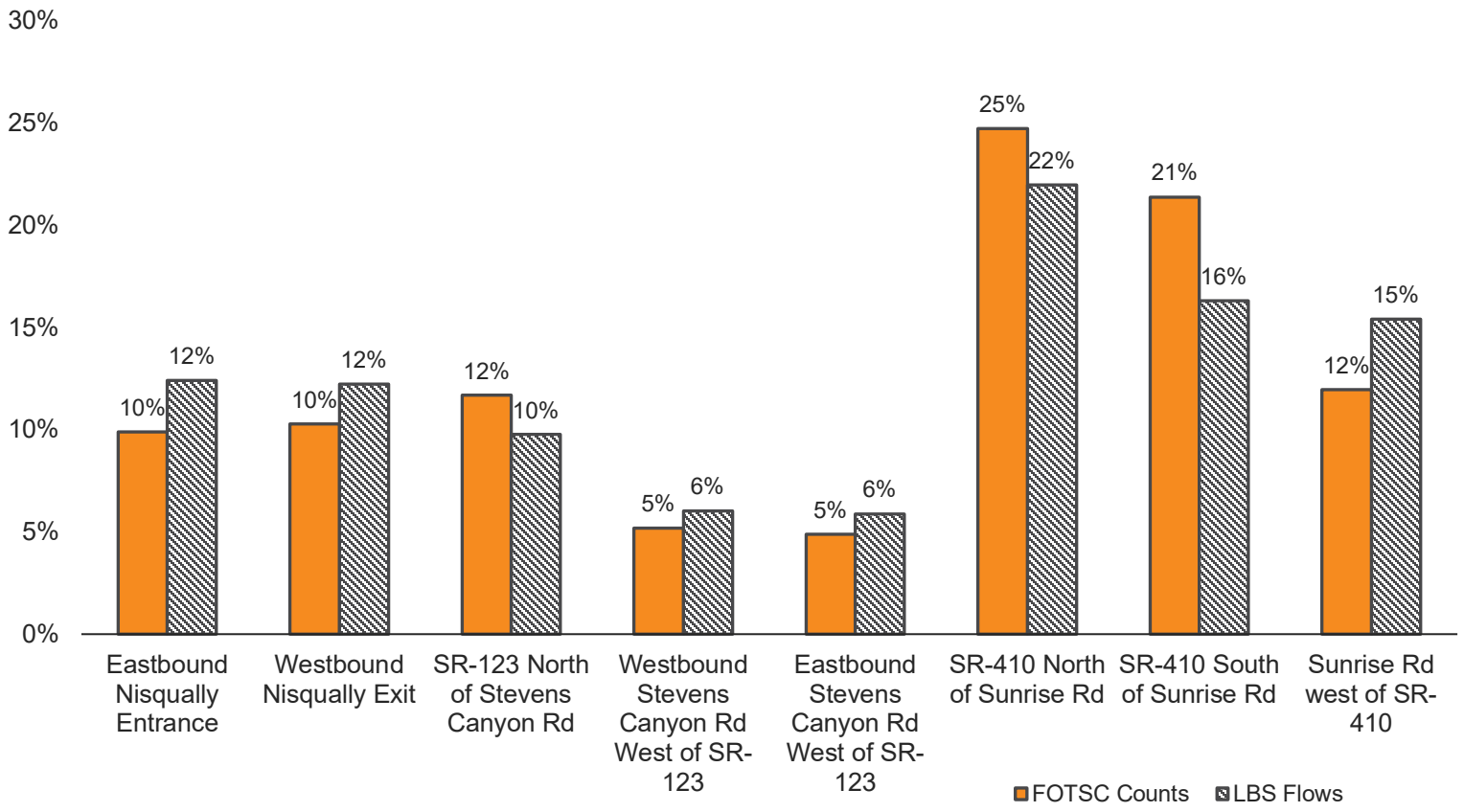



**GOAL 1**

Confirm or update NPS assumptions about visitor travel to and through MORA.

# Overall, LBS data match count data at park entrance locations fairly well

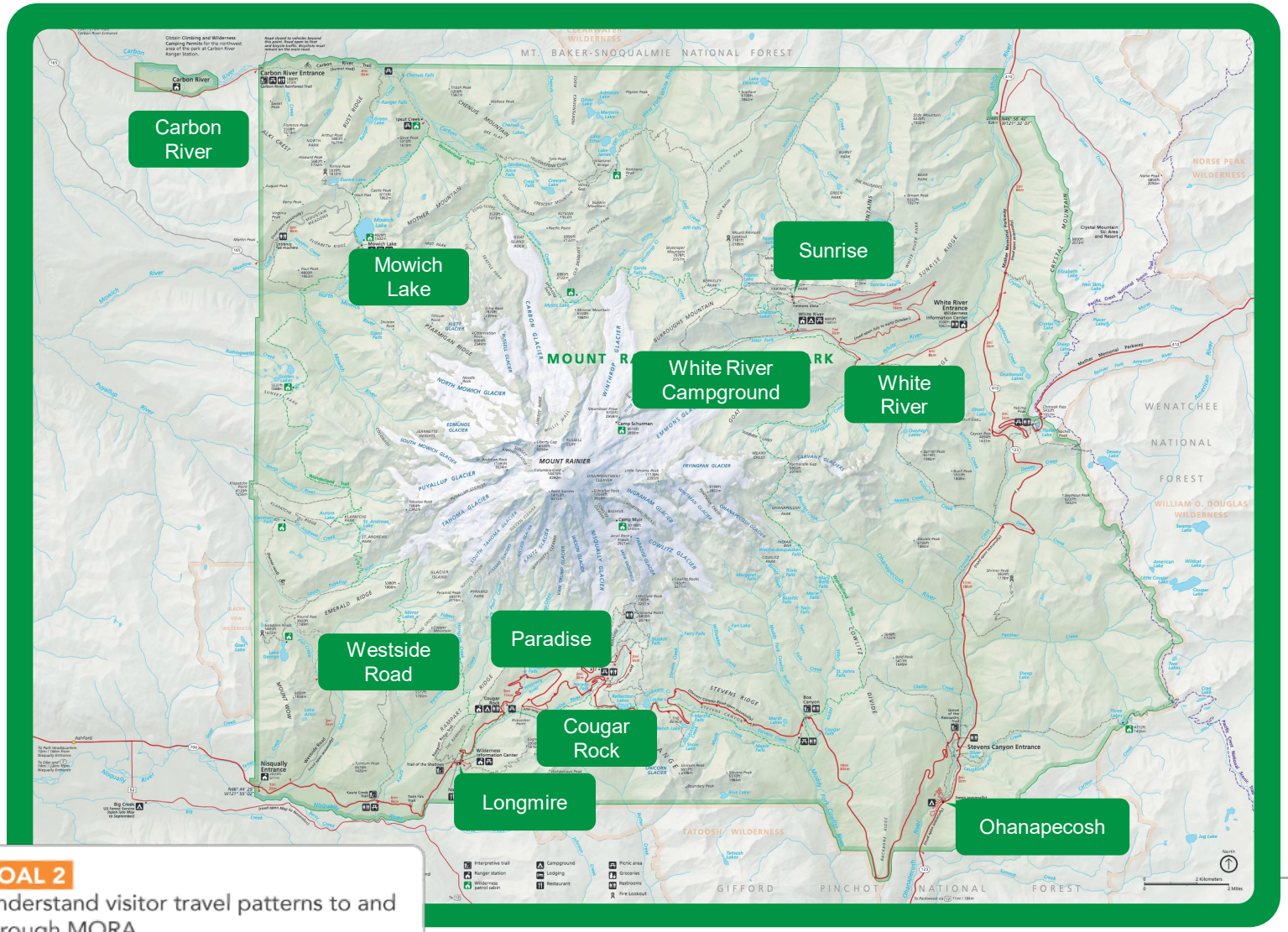



GOAL 1
Confirm or update NPS assumptions about visitor travel to and through MORA.

**GOAL 2**

Understand visitor travel patterns to and through MORA.

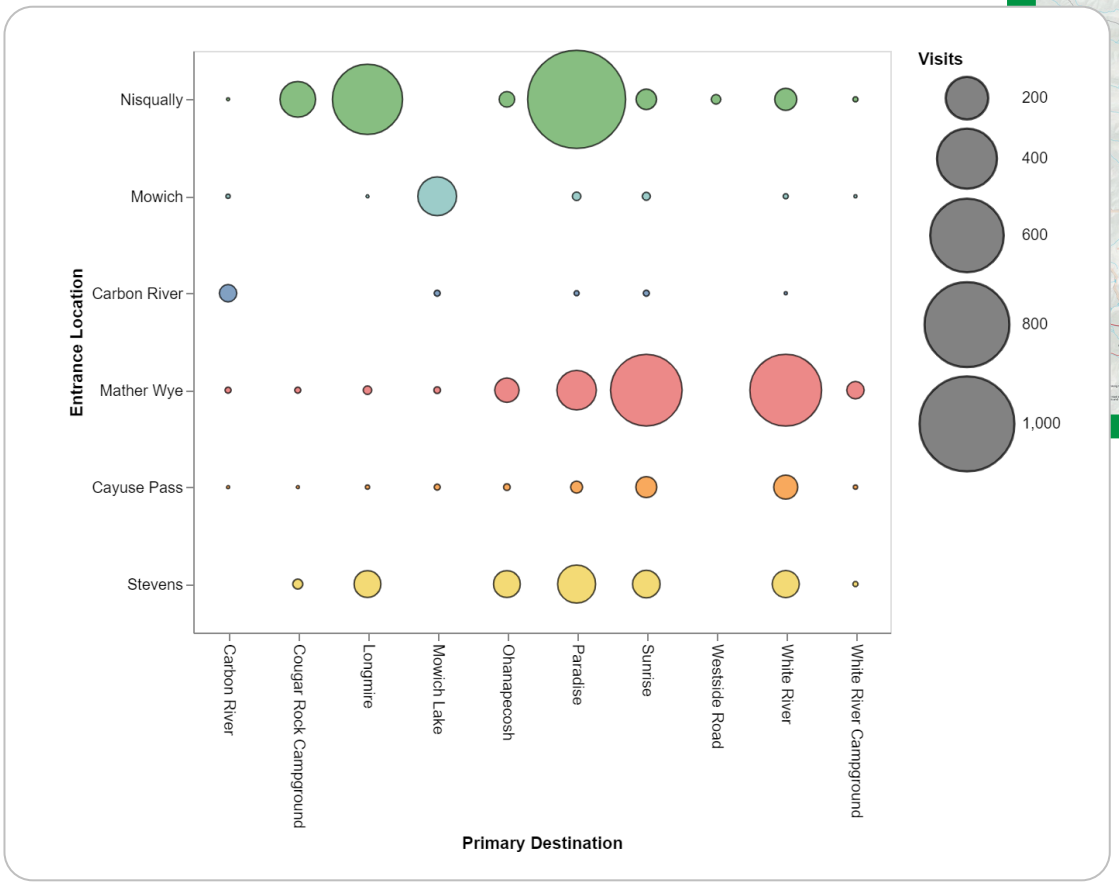
# What locations were popular with visitors inside the park?

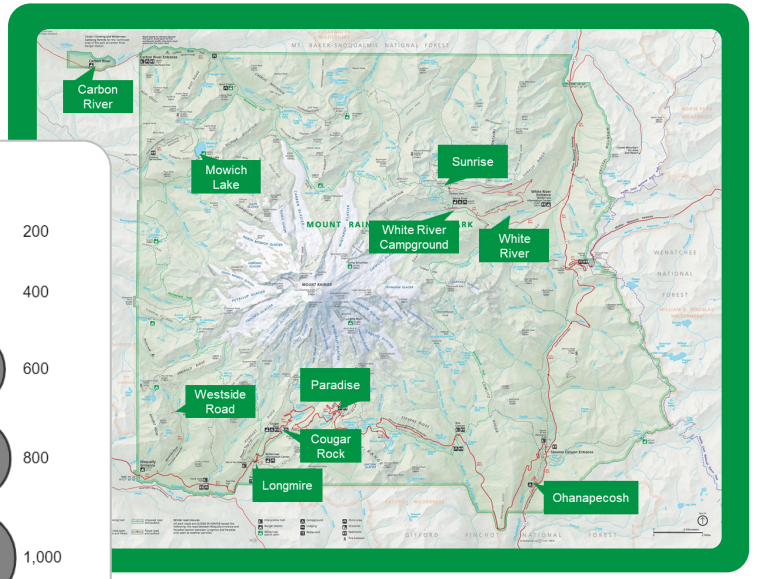



**GOAL 2**

Understand visitor travel patterns to and through MORA.

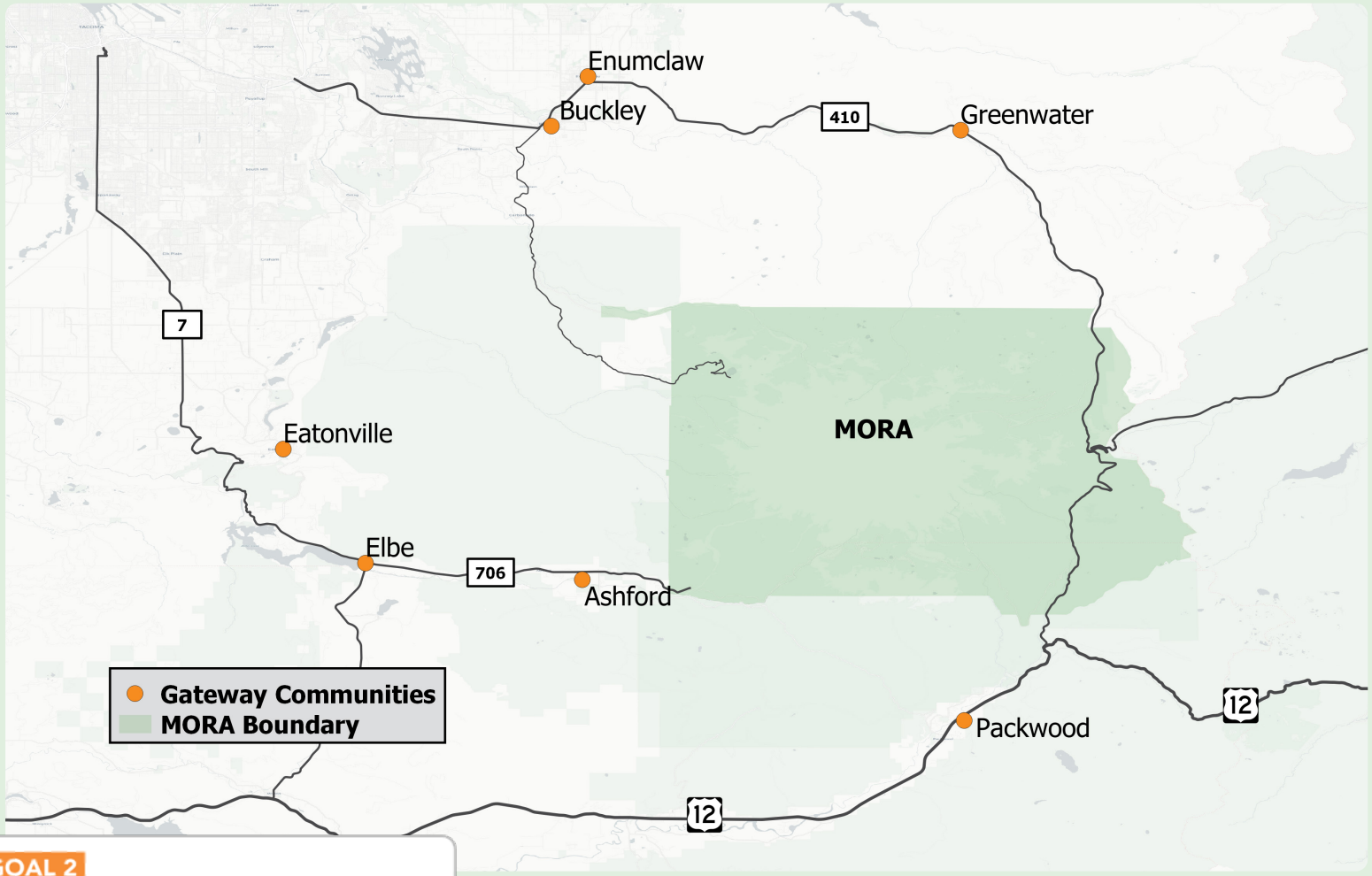
# Popular locations varied by park entrance location



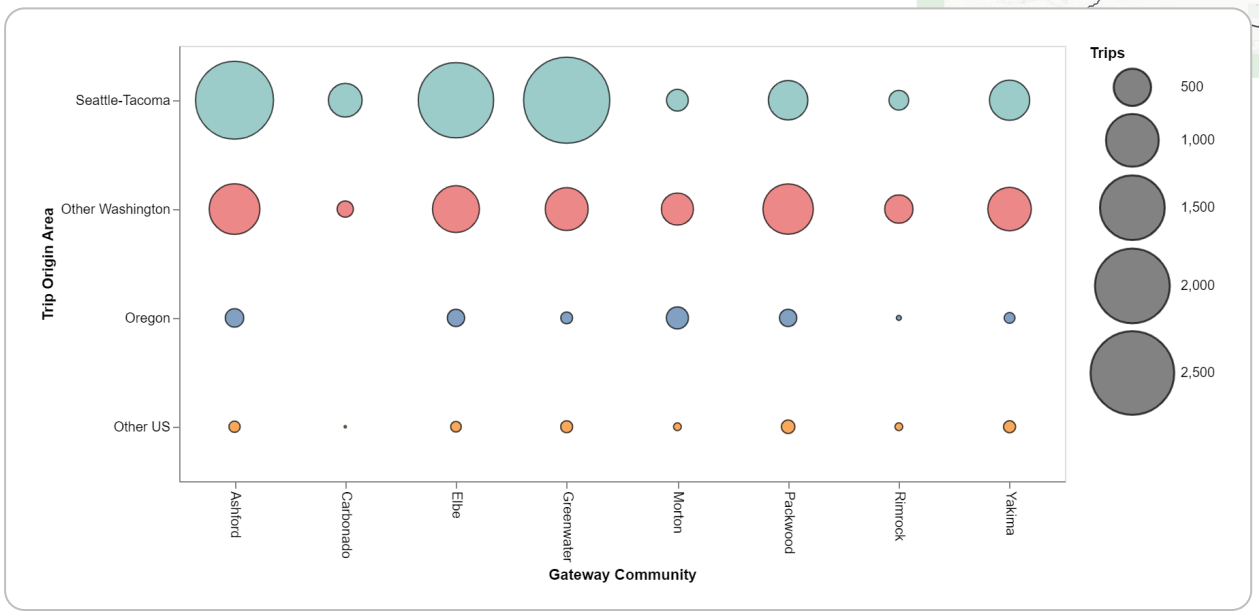

GOAL 2
Understand visitor travel patterns to and through MORA.

# What communities did visitors pass through en route to the park?



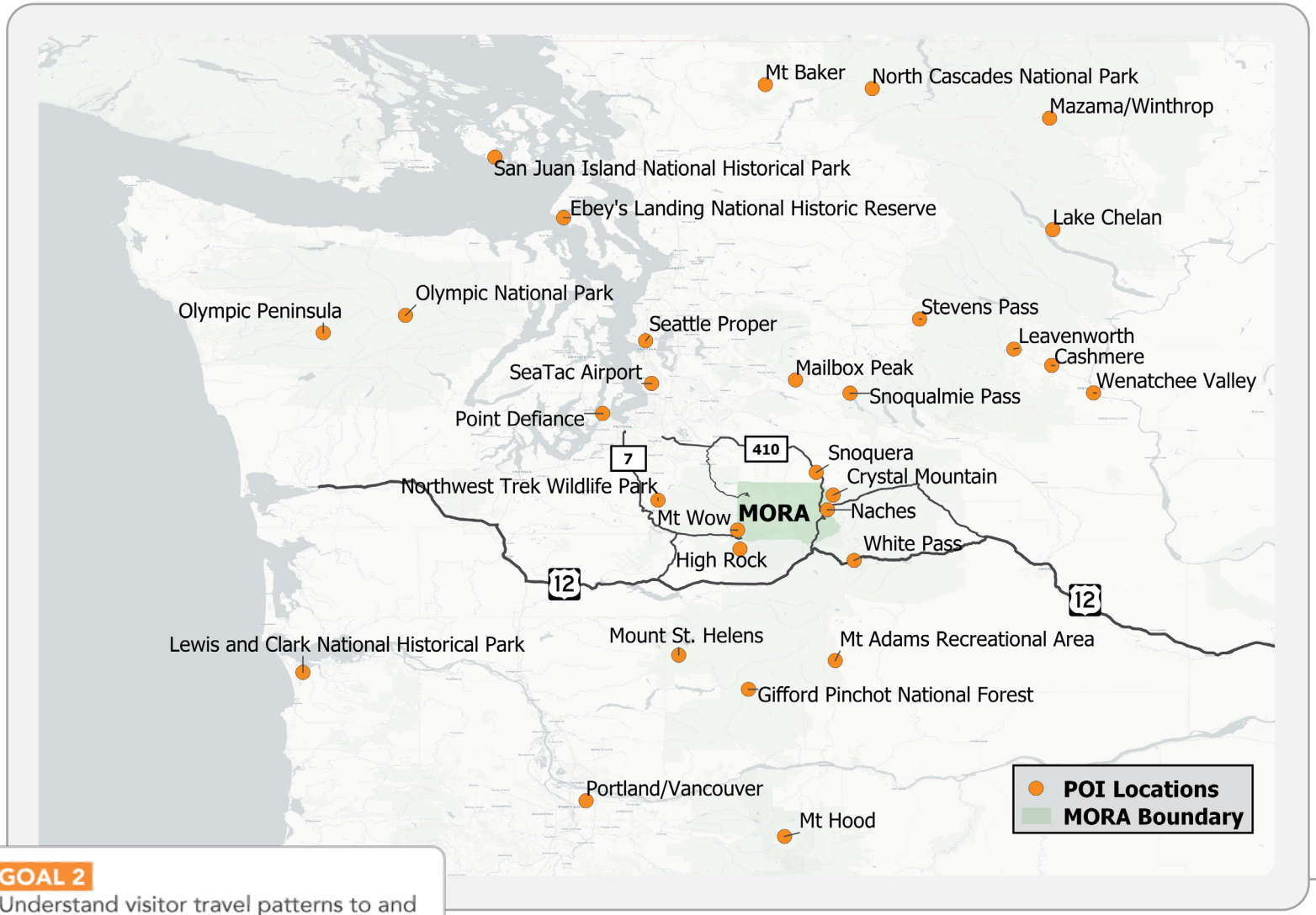

GOAL 2
Understand visitor travel patterns to and through MORA.

# What communities did visitors pass through en route to the park?


GOAL 2
Understand visitor travel patterns to and through MORA.

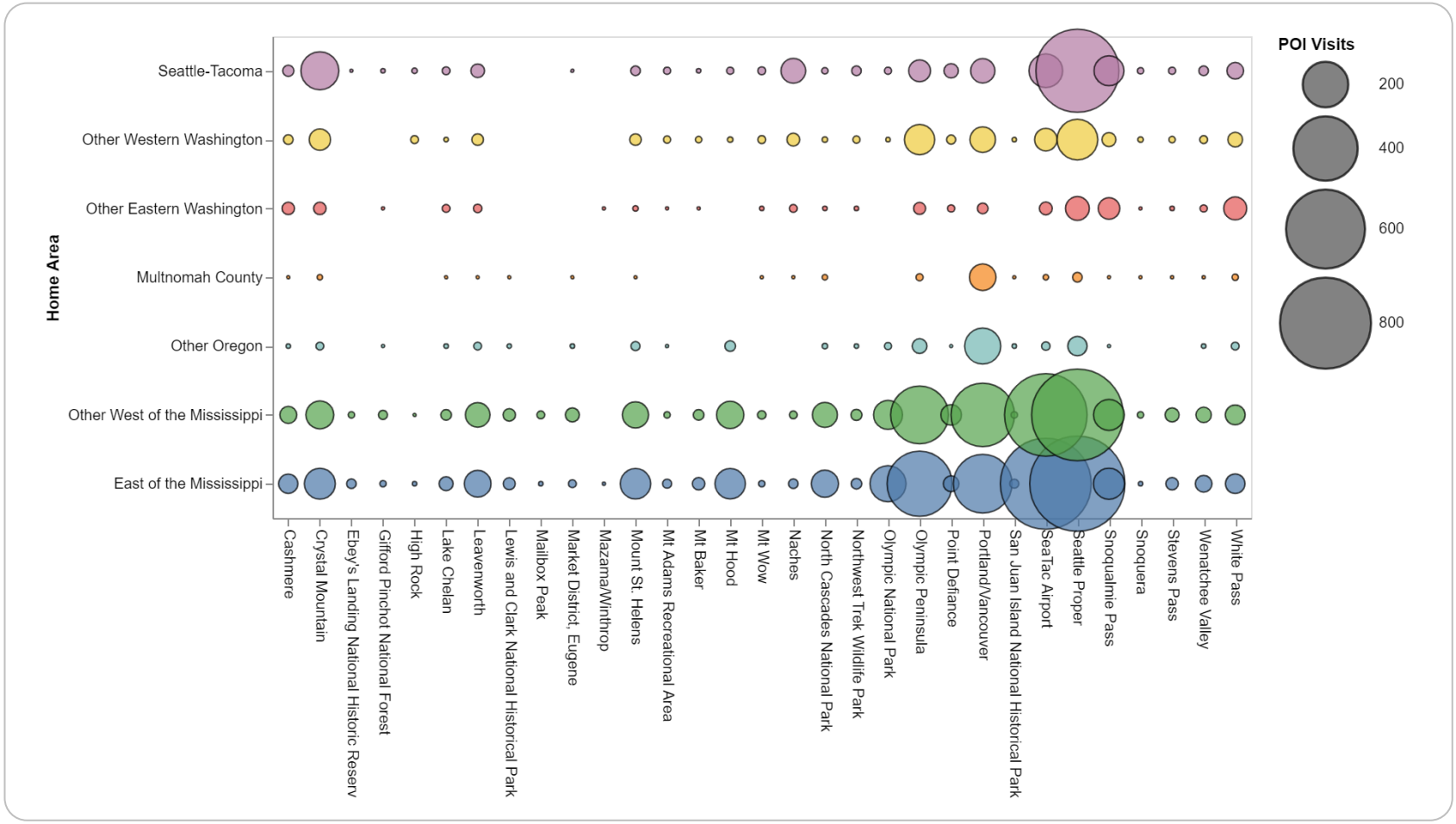
# What other regional points of interest did park visitors visit on their tour?




GOAL 2

Understand visitor travel patterns to and through MORA.

# What other regional points of interest did park visitors visit on their tour?



# LBS analysis enabled the Otak/RSG team to provide targeted recommendations to NPS

## Four topic areas identified; strategies developed for each

**TOPIC AREA 1**
Visitors' home locations

**TOPIC AREA 2**
Visitors' travel patterns en route to the park

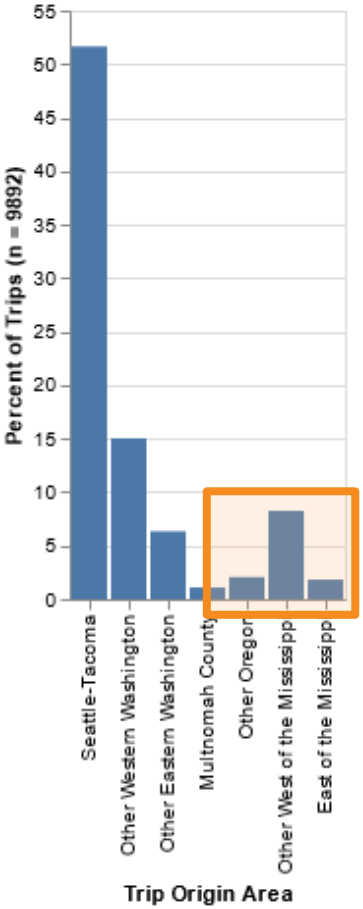
**TOPIC AREA 3**
Visitors' travel patterns in the park

**TOPIC AREA 4**
Research and development

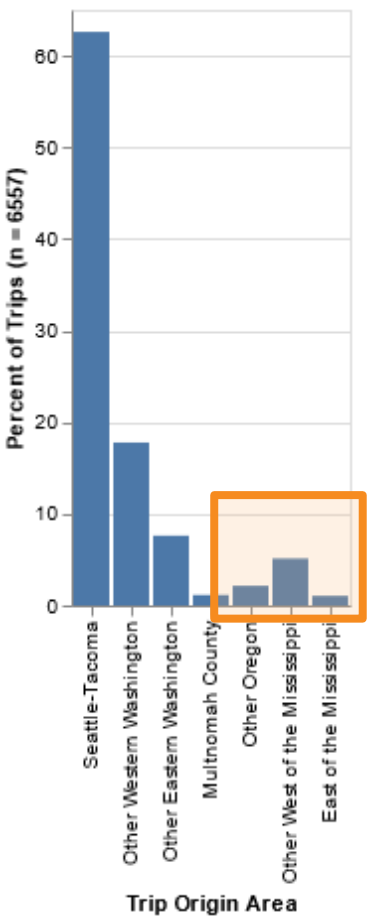
# Not all devices are useful for all analyses

## Some trip origins to park unreliable in lowest quality tier:

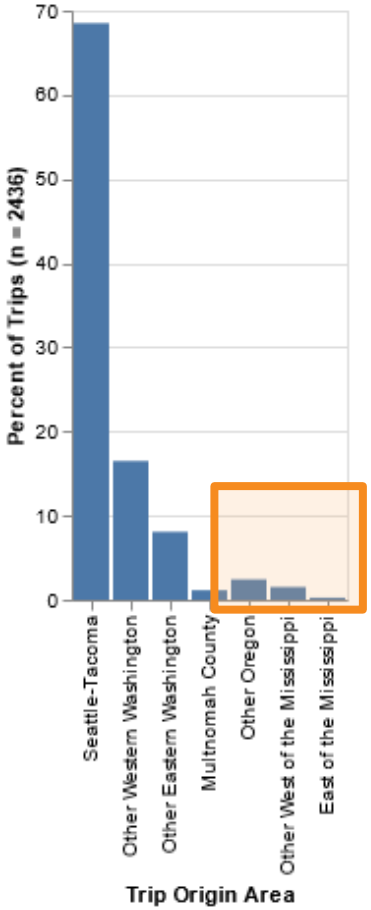
Bronze devices




Silver devices

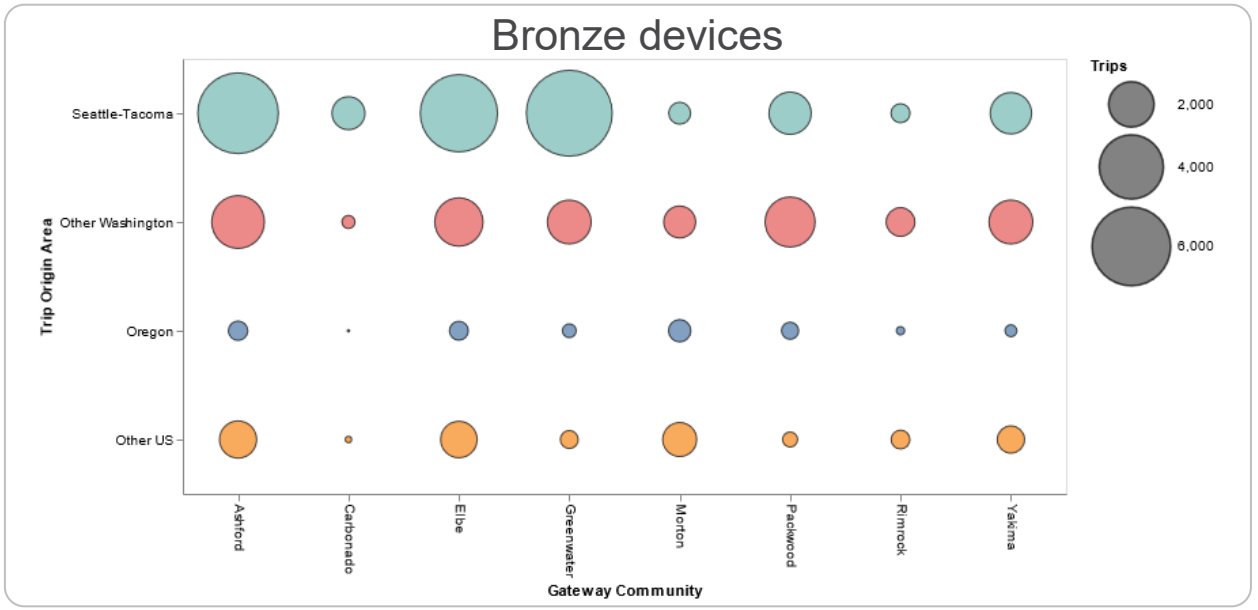


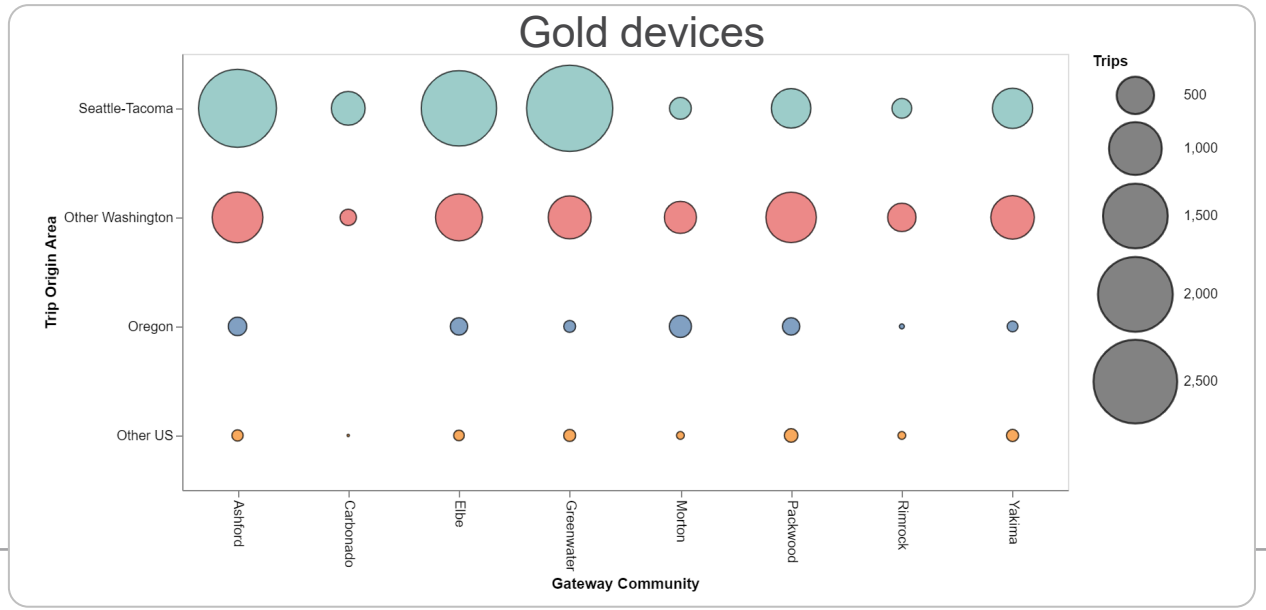

Gold devices



# Not all devices are useful for all types of analysis

**And some unreliable routes to the park in lowest quality tier**



RSG
the science of insight

**Ted Mansfield**
SENIOR CONSULTANT
theodore.mansfield@rsginc.com