

Addressing user capacity in the Merced River Plan



**Yosemite National Park
National Park Service
U.S. Department of the Interior
Summer 2012**

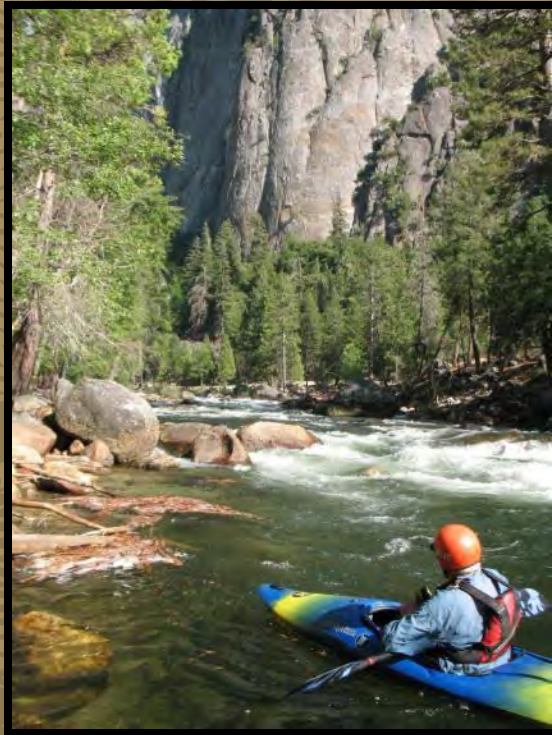
Presentation topics

- Defining capacity and FAQs
- How capacities fit with and protect river values
- Tradeoffs – capacity, infrastructure, & conditions
- Example tradeoffs through a range
 - Access and transportation system
 - Biological: Meadows and riparian values
 - Social: densities at beaches and attraction sites



Capacity definition

Type and amount of use that protects river values



Types of uses

- **Visitor use**

- **Frontcountry vs. wilderness / backcountry use**
- **Overnight vs. day use**

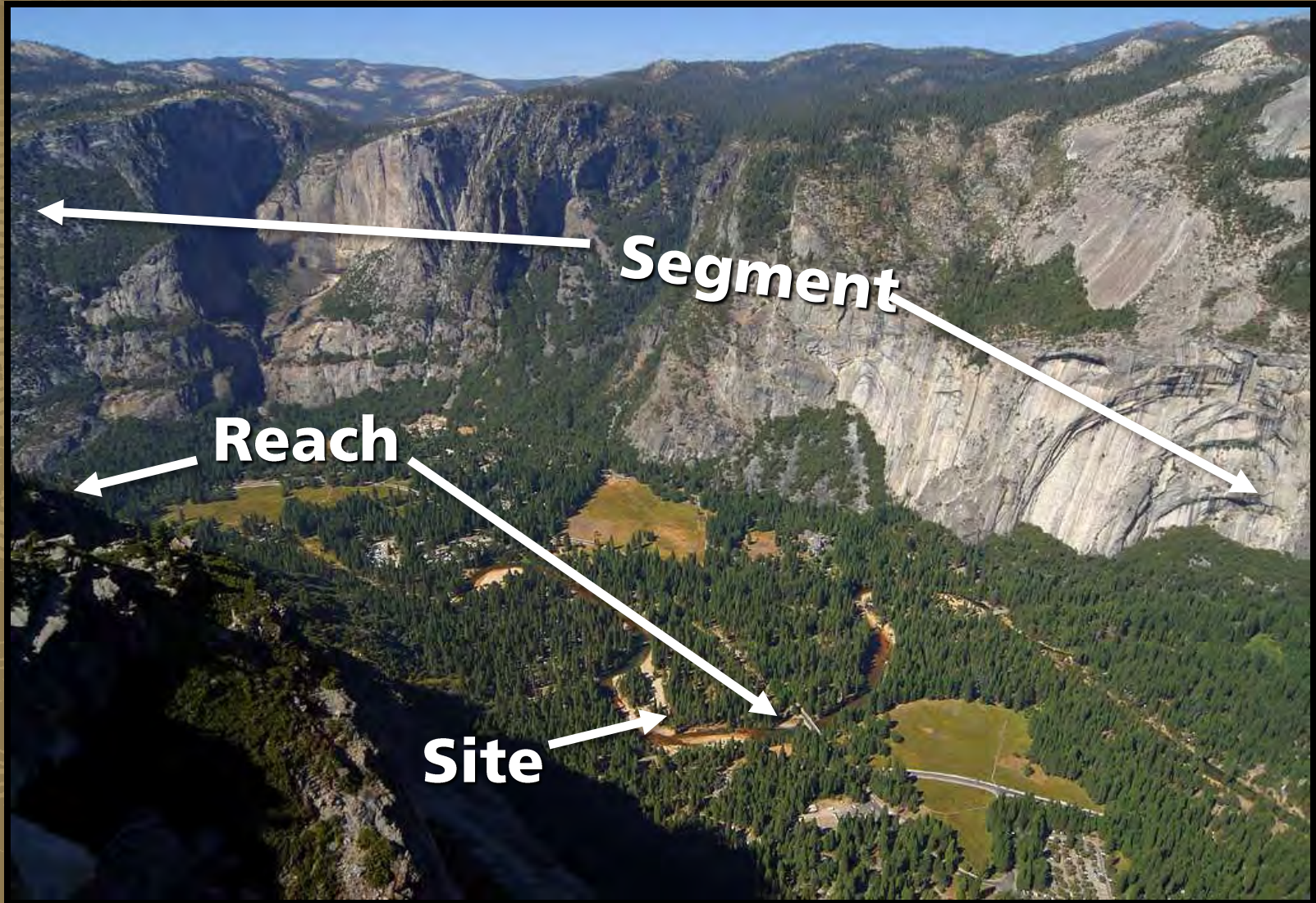
- **Administrative use**

- **NPS vs. concessioner**
- **Overnight vs. commuting use**

Units



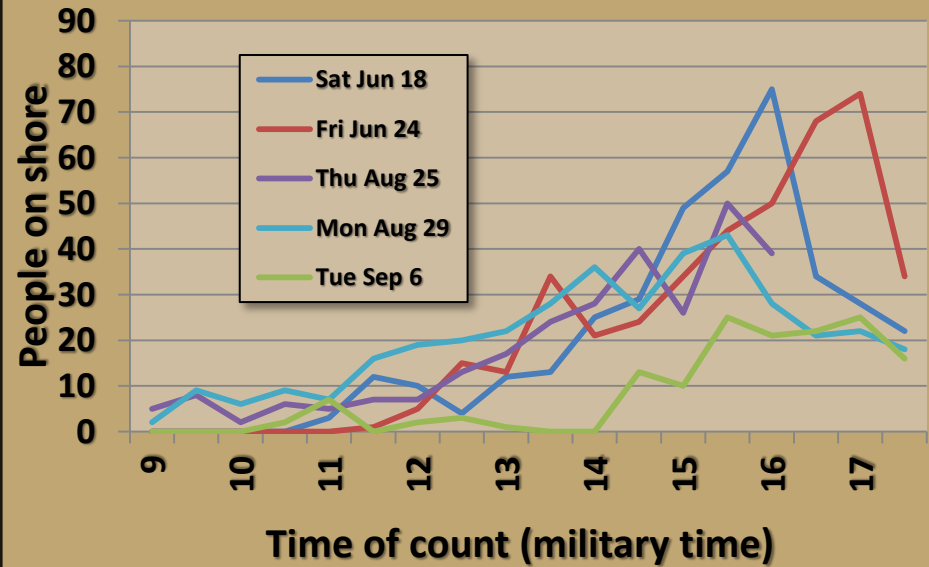
Location



Time



Per day



Indicators and standards

- **Indicators:**
 - Variable chosen to represent a condition
 - WSRs: related to river values
 - For capacity purposes, must be related to use
- **Standard:**
 - Point on an indicator scale
 - Differentiates acceptable from unacceptable
 - Management commitment

“Other actions”



FAQs about capacity





Is there one capacity based on an area's inherent characteristics?



Do capacities require
value judgments?

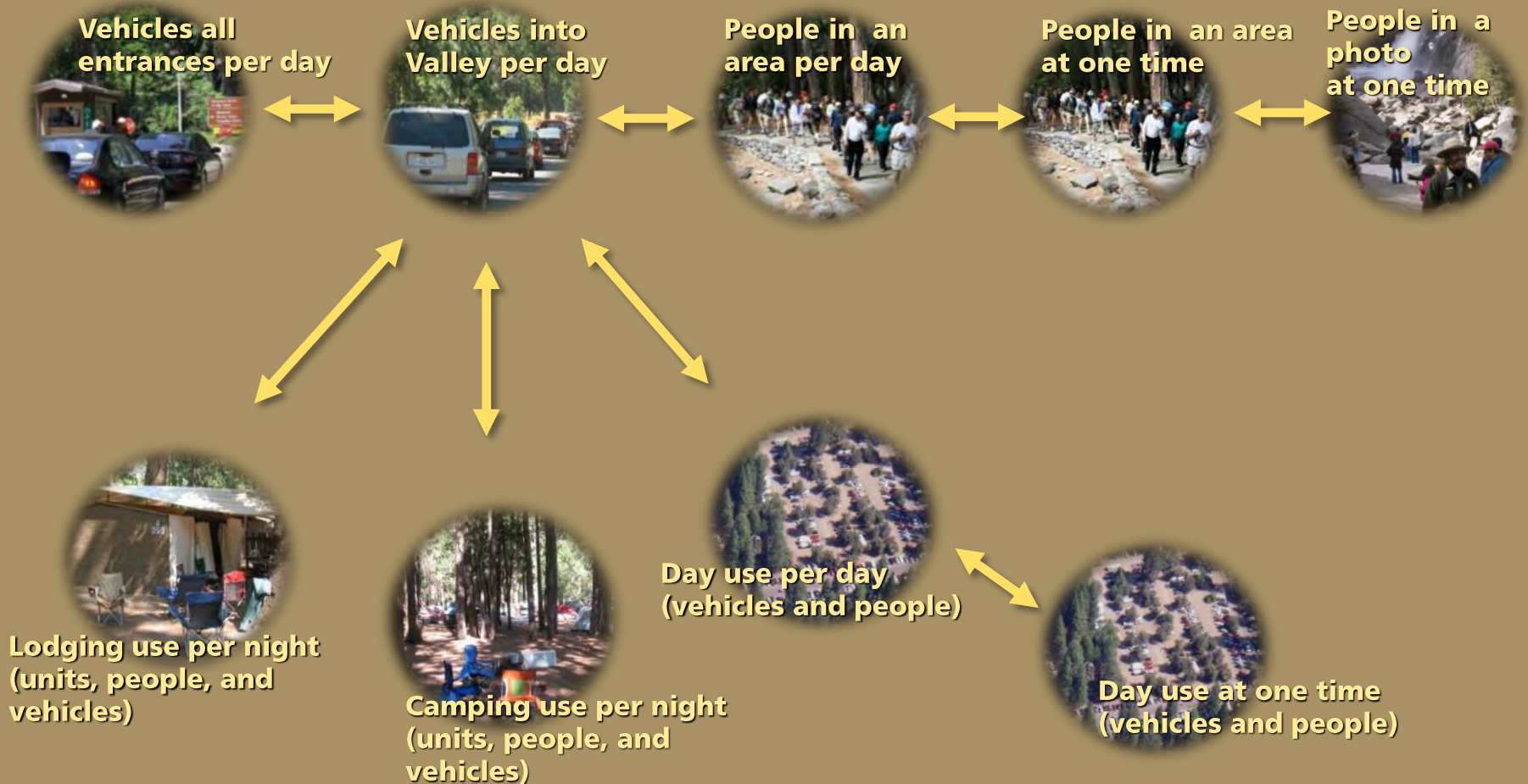


How do biological values fit with other values when developing capacities?

What calculations are involved?



“Translating” capacities at different spatial or temporal scales



Mechanics of capacity calculations

Merced Wild and Scenic River Management Plan - Transportation Analysis						
Plan Alternatives as of 2/27/2012	2011 - Acceptable Parking and Traffic	2011 - Maximum Parking and Traffic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Overnight Units - Visitor Units Only						
4 Lodging	1,077	1,077	481	704	600	1,070
5 Camping	437	437	437	457	703	598
6 Wilderness (Parking Spaces for Overnight)	111	111	111	113	113	111
Total Overnight Units	1,627	1,627	1,031	1,274	1,706	1,691
Parking Spaces in Visitor Areas - East of Camp 4 and Swinging Bridge						
7 Camp 6	511	800	590	550	750	750
8 At Lodging Sites	1,257	1,200	500	938	1,063	1,279
9 Other Existing East Valley Parking Lots	1,282	1,304	1,211	1,211	1,211	1,249
10 Overflow Parking at El Capitan Crossover	--	--	--	--	--	250
11 West of Yosemite Lodge	--	--	150	150	--	--
12 Wahoga	--	--	5	5	--	--
13 Lost Arrow	--	--	50	50	--	--
14 Ahwahnee Day Use	--	--	30	30	--	--
15 Roadside	454	553	119	149	20	147
16 Vehicles in Campgrounds	716	711	749	775	1,179	911
Total East Valley Visitor Parking Spaces	4,212	4,647	3,853	3,353	4,220	5,008
17 Employee/Administrative Vehicles in Other Areas	851	837	853	756	795	795
Parking Spaces with Administrative Vehicles	5,063	5,484	4,706	4,127	5,285	5,804
18 Vehicles Parked in Endorsed Spaces	4,552	4,936	3,975	3,984	4,753	5,295
19 Vehicles on Roads	400	400	400	400	400	400
20 Overflow - Congestion and Improper Parking	--	872	--	--	--	--
Maximum Vehicle Accumulation	4,952	6,208	4,015	4,384	5,153	5,695
Floors and Traffic						
21 Southside Drive - Sentinel Drive to Curry 4-way						
22 Southside Drive - El Capitan Crossover to Sentinel Drive						
23 Northside Drive - Curry 4-way to Camp 6						
24 Northside Drive - Camp 6 to Sentinel Drive						

	Scenario 1 Capacity @ 30%		Scenario 2 Capacity @ 30%		Alternative 1 Capacity @ 30%		Alternative 2 Capacity @ 30%		Alternative 3 Capacity @ 30%		Alternative 4 Capacity @ 30%	
	People	Trucks	People	Trucks	People	Trucks	People	Trucks	People	Trucks	People	Trucks
Parking Supply	706	825	710	833	745	814	775	837	789	861	945	821
Competition	100	101	101	101	100	101	100	101	100	101	100	101
Wilderness Lot	351	766	341	766	341	766	341	766	341	766	341	766
Lodging (Bldg)	406	265	406	265	406	265	406	265	406	265	406	265
Recreation Camp	851	766	837	756	853	795	853	795	853	795	853	795
Employee/Resident/Other Areas	1,000	1,440	1,016	1,323	1,016	1,323	1,016	1,323	1,016	1,323	1,016	1,323
Day Use Lots	854	409	853	438	853	438	853	438	853	438	853	438
Brookside	400	400	400	400	400	400	400	400	400	400	400	400
Cycling on Road	5,058	4,552	5,444	4,596	4,936	4,665	4,421	3,954	5,281	4,651	5,084	4,285
Total Parked	5,058	4,552	5,444	4,596	4,936	4,665	4,421	3,954	5,281	4,651	5,084	4,285
Estimated Day Use Vehicle per Day	15,018	0.35	16,344	0.28	14,487	0.30	16,000	0.30	16,000	0.30	16,000	0.30
Overnight Visitors in PDV (2.5 person per vehicle)	1,236	547	1,464	547	1,464	547	1,464	547	1,464	547	1,464	547
Day Visitors by Day (15% of Day Visitors)	1,809	657	1,809	657	1,809	657	1,809	657	1,809	657	1,809	657
Overnight Visitors by Day (15% of Lodging, Camp, etc. in Alternative)	244	244	244	244	244	244	244	244	244	244	244	244
Road Traffic	440	5,877	716	14,828	511	10,225	511	10,225	600	10,632	720	14,074
Admin Traffic	317	5,831	317	5,831	317	5,831	317	5,831	317	5,831	317	5,831
Peak Existing Traffic Volume	4,295	5,831	1,245	5,115	5,115	5,343	5,343	5,343	5,343	5,343	5,343	5,343
Lean Trips Sleeping Outside Park	0	0	0	0	0	0	0	0	0	0	0	0
Lean Trips Sleeping in El Capitan	4,295	5,831	1,245	5,115	5,115	5,343	5,343	5,343	5,343	5,343	5,343	5,343
Lean Trips Sleeping at El Cap	4,295	5,831	1,245	5,115	5,115	5,343	5,343	5,343	5,343	5,343	5,343	5,343
Lean Trips Sleeping Valley Chapel	0	0	0	0	0	0	0	0	0	0	0	0
Total Overnight	1,546	1,918	1,257	1,633	1,702	2,144	2,144	2,144	2,144	2,144	2,144	2,144
East Valley Overnight	1,546	810	1,157	1,583	1,574	2,040	2,040	2,040	2,040	2,040	2,040	2,040
Overnight East of Lodge	1,064	727	863	1,257	1,278	1,513	1,513	1,513	1,513	1,513	1,513	1,513
Overnight East of Camp 6	1,064	727	863	1,257	1,278	1,513	1,513	1,513	1,513	1,513	1,513	1,513
Total Day Parking in East Valley	2,809	3,235	1,739	1,822	2,305	2,563	2,563	2,563	2,563	2,563	2,563	2,563
Day Parking East of Lodge	1,064	1,312	1,367	1,586	1,315	1,653	1,653	1,653	1,653	1,653	1,653	1,653
Day Parking Sentinel Drive and East	1,800	1,336	1,326	1,543	1,814	1,736	1,736	1,736	1,736	1,736	1,736	1,736
Day Parking (500) West Area East of South	400	126	160	232	441	265	265	265	265	265	265	265
Day Parking in Sentinel East 500 to West	320	37	37	37	37	37	37	37	37	37	37	37
Day Parking Camp 6	890	545	545	545	545	545	545	545	545	545	545	545
Day Parking East of Camp 6-ND	361	391	391	391	391	391	391	391	391	391	391	391

1998 Traffic Split Assumptions

DATA 2011 AccumMaxDayJune18

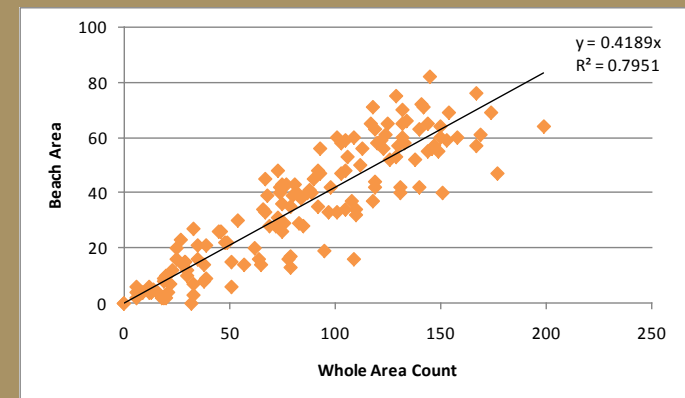
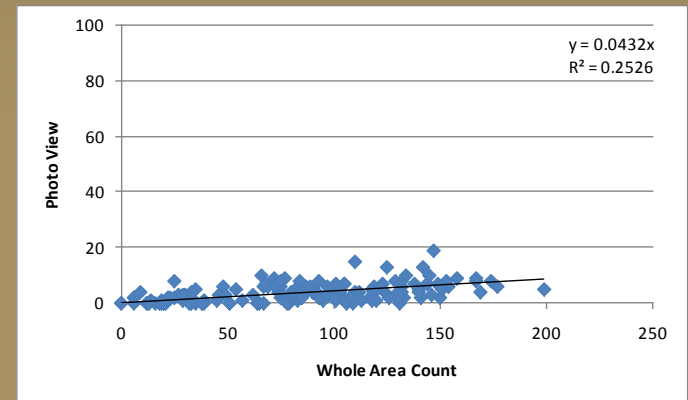
CALCULATIONS ASSUMPTIONS

Scientific studies / modeling -- social



Model Inputs

1. Visitor use by time of day
2. Hiking & lingering times
3. PAOT scale



Summary: Vehicles vs. area use relationships

Location	R ²
Bridalveil Fall 2007	.64
Bridalveil Fall 2011	.81
Yosemite Falls 2007	.34
Yosemite Falls 2010	.64
Vernal Fall 2010	.24
Vernal Fall 2011	.12
Systematic boat counts 2011	.11
DNC raft rentals 2011	.48
Housekeeping (East beach)	.10
Housekeeping (West beach)	.15
Swinging Bridge beach	.05
Valley shuttle passengers	.79
El Cap shuttle passengers	.45

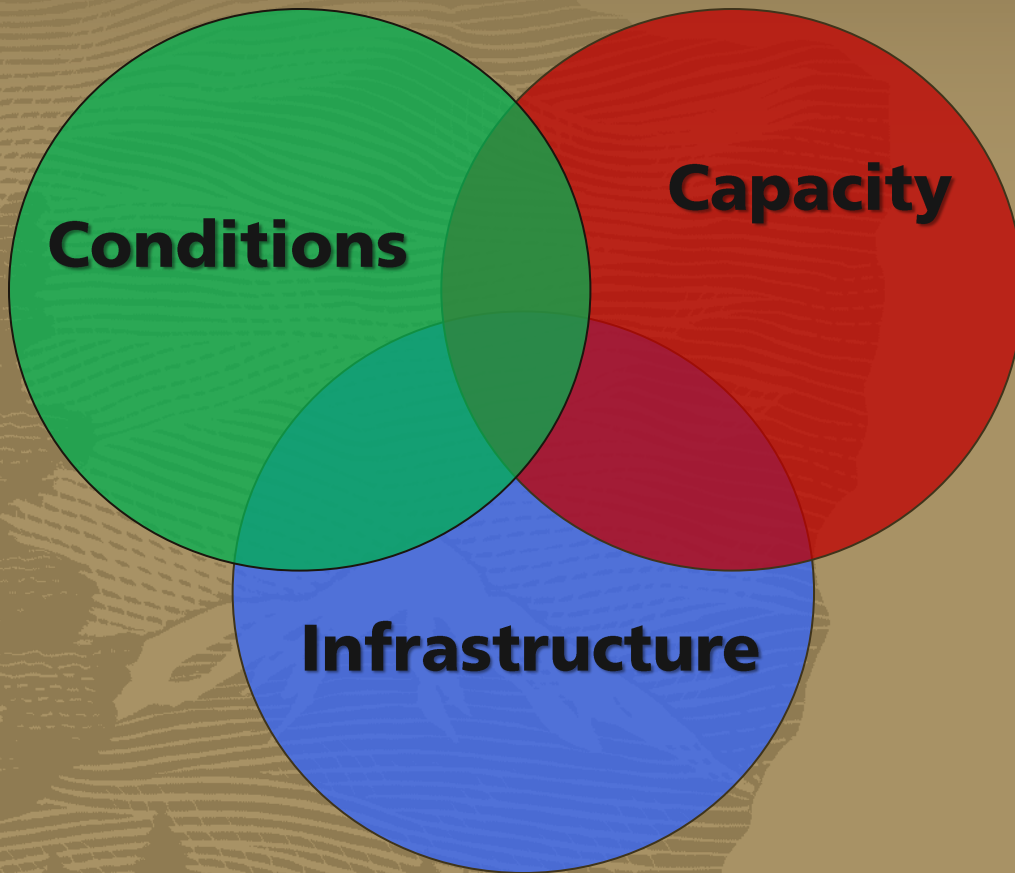
Other questions about capacity



Trade-offs



Trade-offs in the Merced River Plan





Parallel vs. head-in vs. lot parking

"Overnight overflow"

Parking

Efficiency

Acreage

Sense of
naturalness

East Valley parking proportions

- **Number of spaces:**
 - Existing: ~5,000 (approx. 4,000 visitor)
 - Workbook range: ~4,000 to 6,500
- **Existing proportions**
 - 49% overnight (lodge, CGs, & wilderness lots)
 - 27% day use lots (Camp 6, Curry orchard)
 - 18% employee/resident
 - 6% along roads



Roadside vs. lot parking

■ Parallel and angled parking

- Traffic "friction"
- Diminishes naturalness and viewscapes
- Resource damage w/o curbing
- Some safety problems
- Easy to see and use



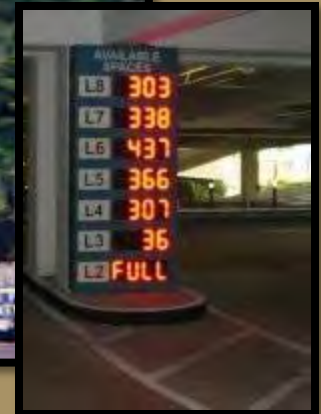
■ Lot parking

- Possible screening
- Improved safety
- Encourages visitor immersion
- More acreage per vehicle?
- Efficiency is an issue (next)



Parking efficiency

- **Within-lot efficiency**
 - Directed parking
 - Paving/stripping/borders vs. informal
- **Between-lot efficiency**
 - "85% rule" for city parking
 - Wayfinding
 - Parking information systems
- **Parking information systems**
 - Cost
 - Visitor comprehension
 - Information timing
 - Sign pollution



**Roundabouts vs.
stop signs?**



How many?



Intersections and circulation

**Northside
bottleneck**

Southside 2 way?

**Number and type of
pedestrian crossings**

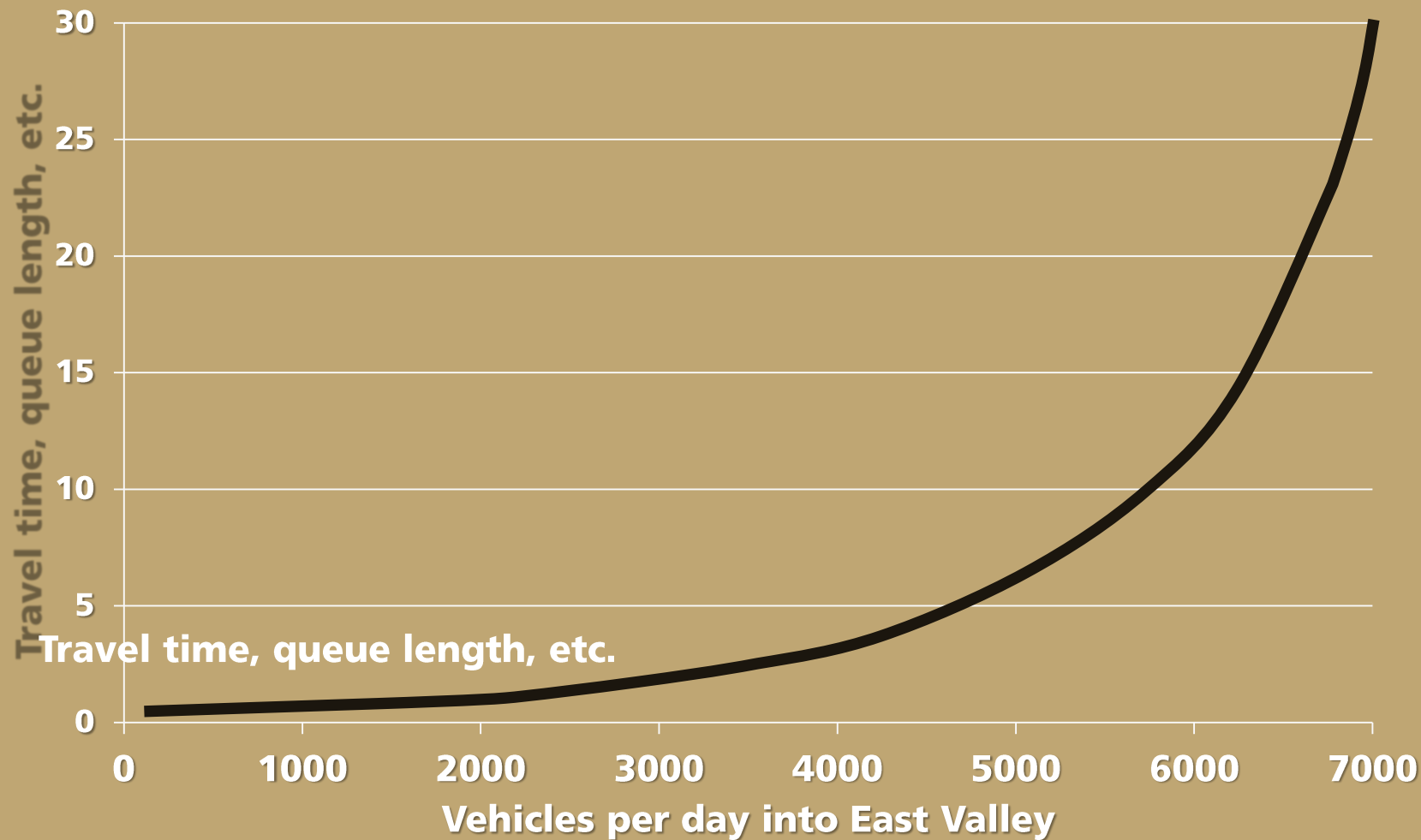


Improved intersections vs. traffic flow

- Development \leftrightarrow traffic flow correlation
 - Bottlenecks due to ped crossings, stop sign junctions, & 1-lane capacity
 - Affects travel times & queue lengths
- Other tradeoffs
 - Costs
 - Space for improved intersections
 - Loss of naturalness
 - Construction impacts
 - Opposition by the unfamiliar



“Approaching exponential”



Roundabout pros and cons

■ Pros

- Driver only looks one direction
- Improved safety
- No lights or stop signs
- Landscaping opportunities
- Improved traffic flow vs. signs
- Lower maintenance costs
- Reduced fuel consumption
- No left turns

■ Cons

- Initial construction costs
- More room at junction (maybe less on approaches)
- Unfamiliar to some (this is changing)



Pedestrian crossing tradeoffs

- **Development footprint vs. traffic flow**
- **Other issues**
 - Aesthetics and loss of naturalness
 - Cost and construction impacts
- **How many and where?**



Pedestrian crossing design notes

- **Will visitors use them?**
 - May need split-rail barriers
 - Importance of “outstanding” design
 - Minimize grades
- Takes some real estate
- Archeological impacts



Type of overnight use trade-offs



Camping vs. lodging

- **Space required**
- **Location in floodplain**
- **Amount/cost of infrastructure**
- **Affects parking, employees**



Meadow and riparian values



Users may not recognize natural riparian or meadow conditions



Meadow fragmentation indicator



- **Large patches Index**
 - 0 trails =100%
 - Good > 90%
 - Very poor < 40%
- **Related to...**
 - Meadow hydrology
 - Habitat quality
 - Soil moisture
 - Resist non-natives
 - Reduce barriers to wildlife



Stoneman Meadow 1978

LPI-5 = 40%



Stoneman Meadow 2011

LPI-5 = 99%

Other actions in meadows

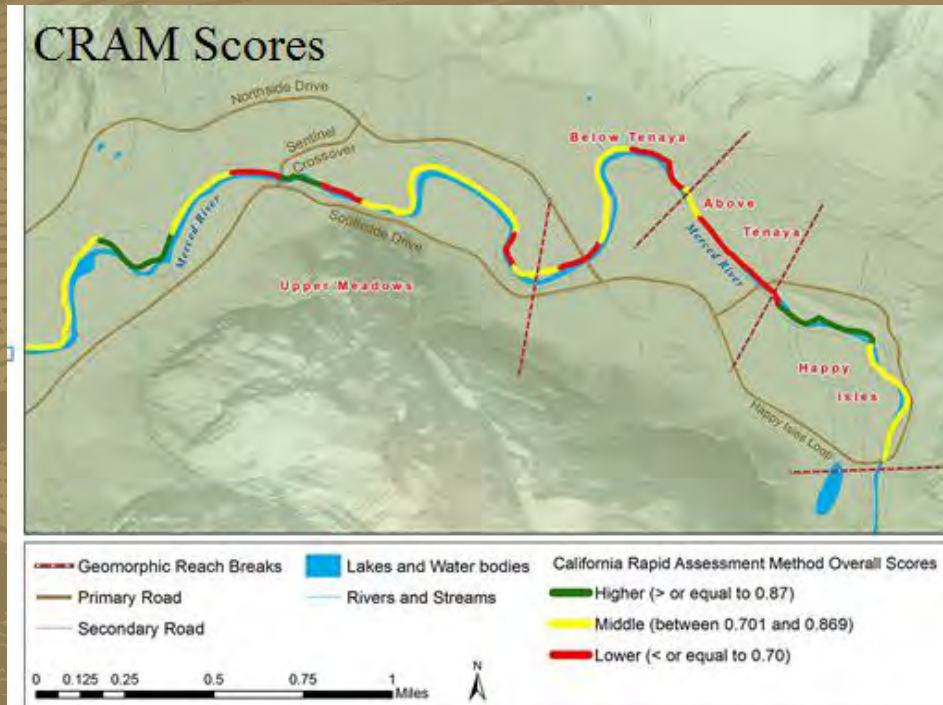
- **Boardwalks and defined trails**
- **Interacts with roadside parking**



Riparian condition values



California assessment score



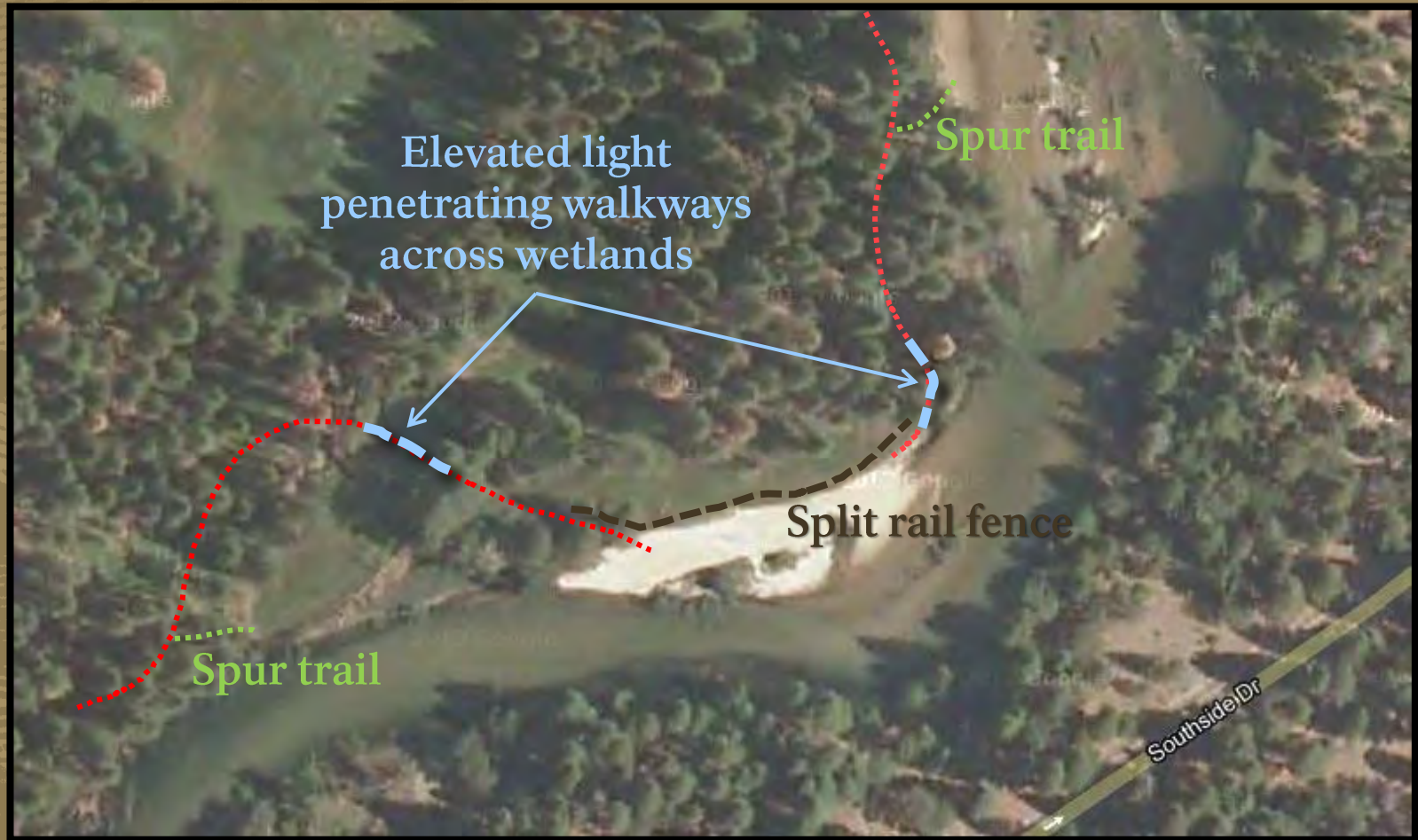
■ Rapid assessment technique

- Multiple condition index
- Three categories
- Alternating banks – 50% of entire river

■ Related to...

- Biotic structure
- Physical structure
- Hydrologic
- Buffer condition

Organizing use through sensitive riparian areas



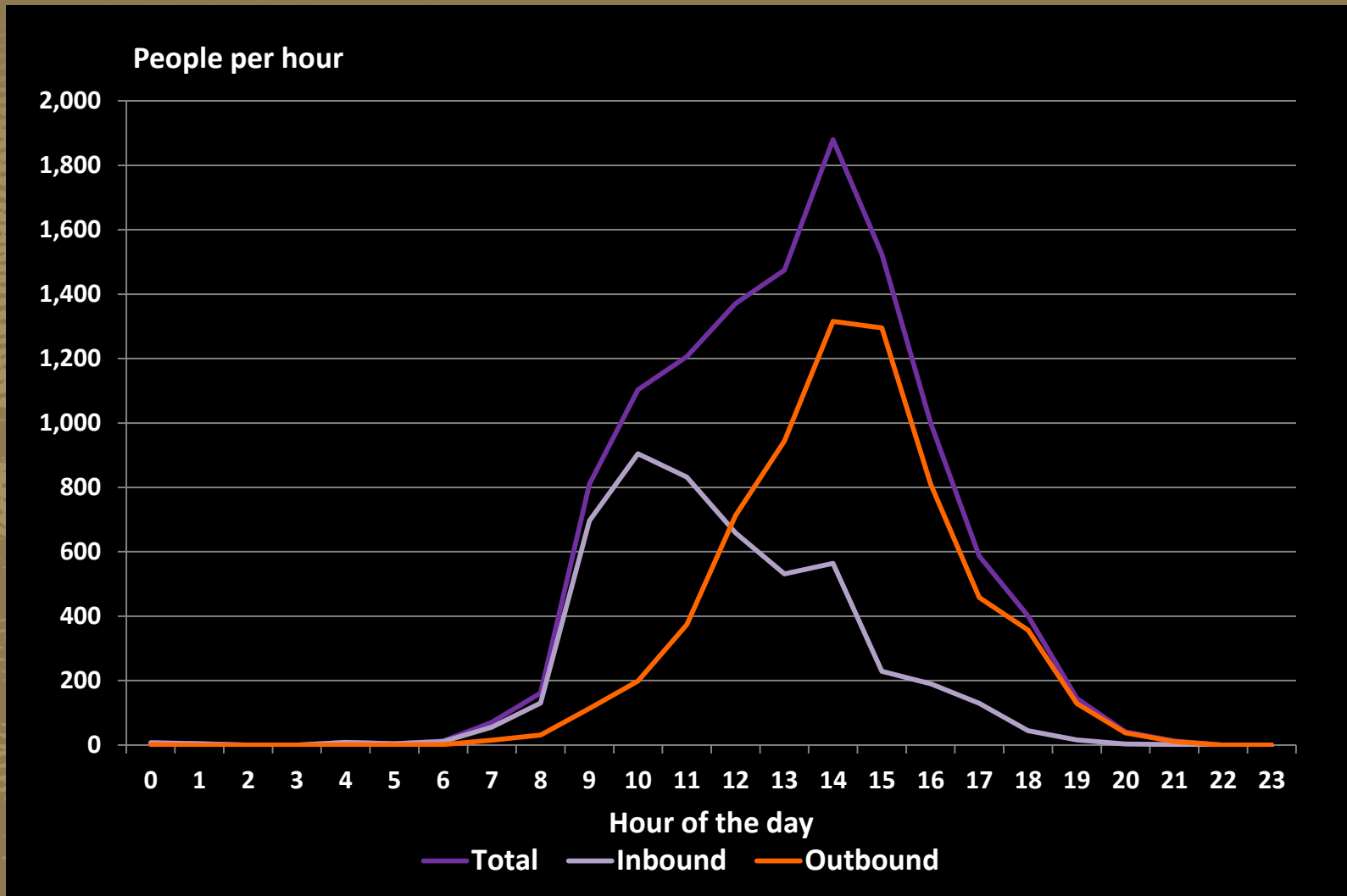
Other actions – fencing



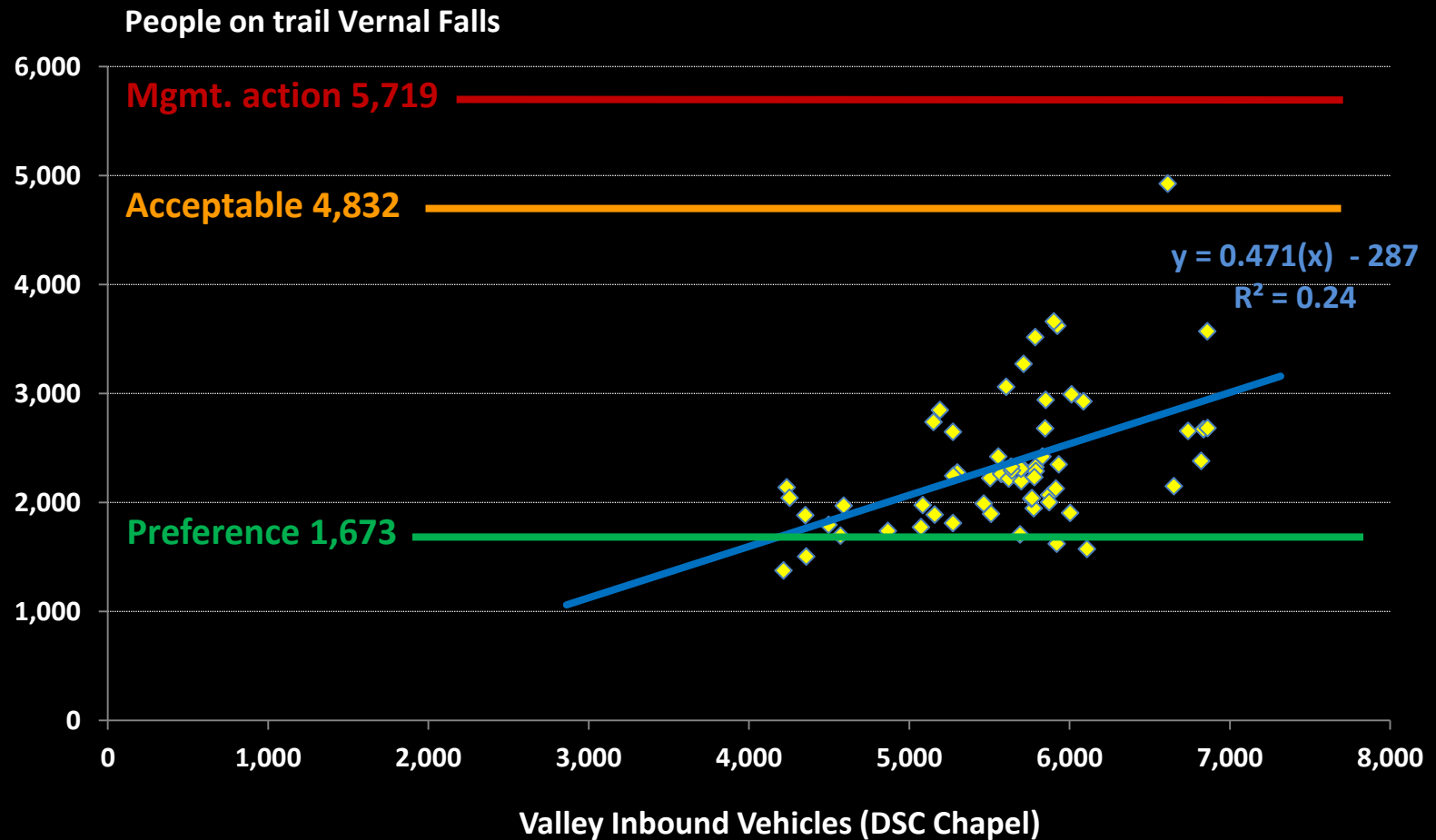


Mist Trail to Vernal – Hourly use

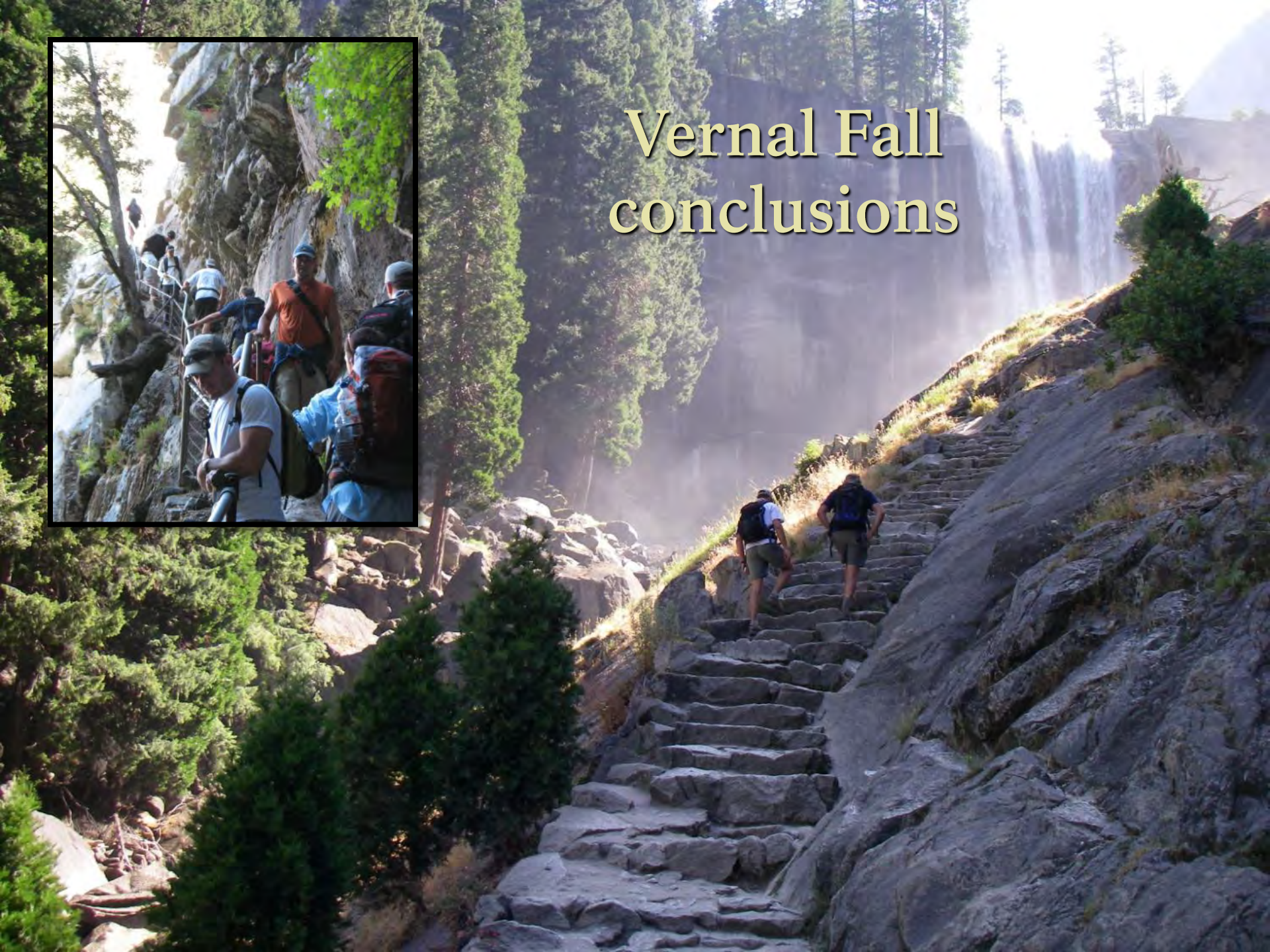
Example high use day (Sat. May 21)



Vehicles vs. Vernal trail use (2010)



Vernal Fall conclusions



Merced River

"Bridalveil Straight"
72 + 23 = 95 spaces

Bridalveil Fall

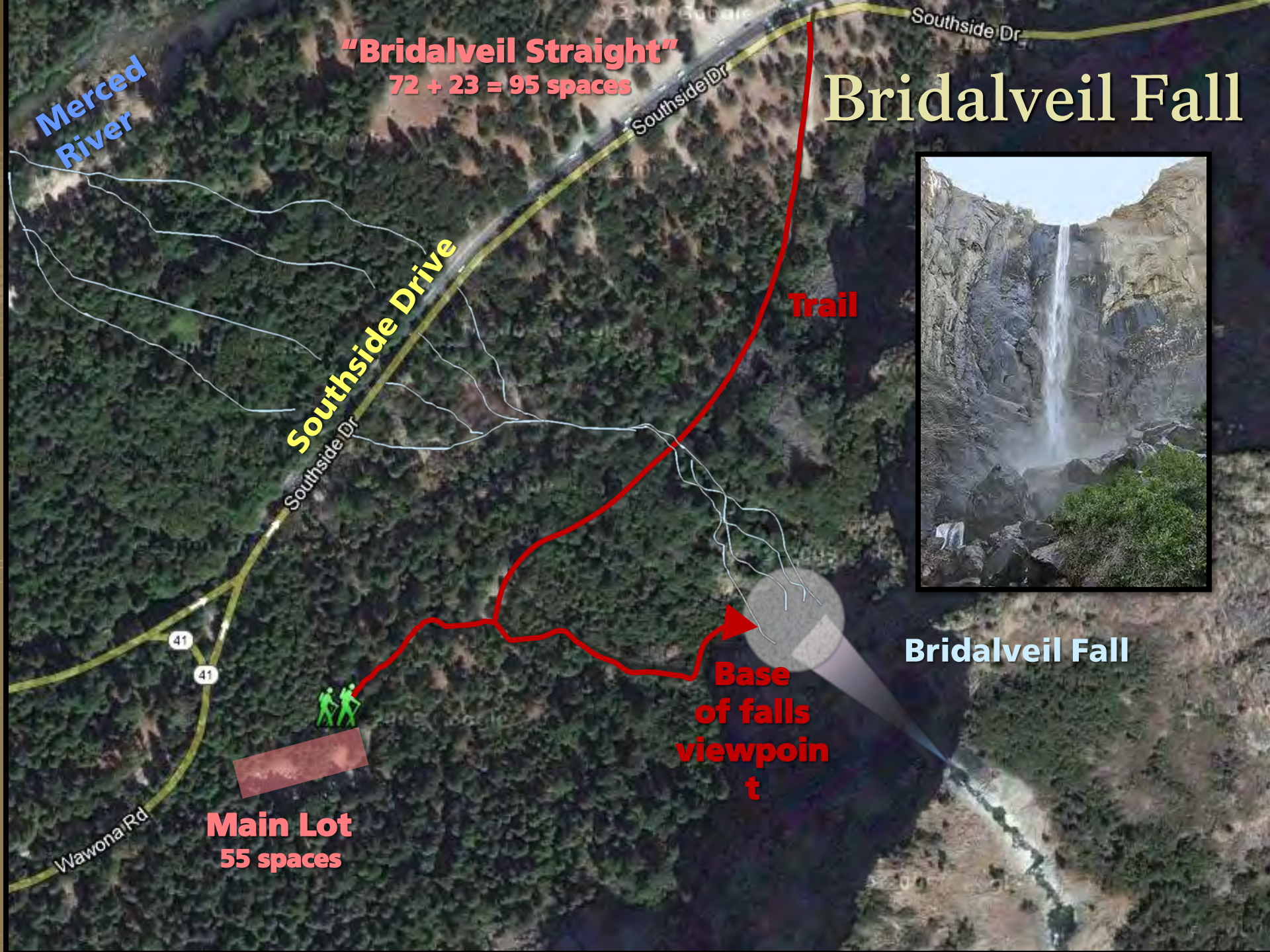
Southside Drive

Trail

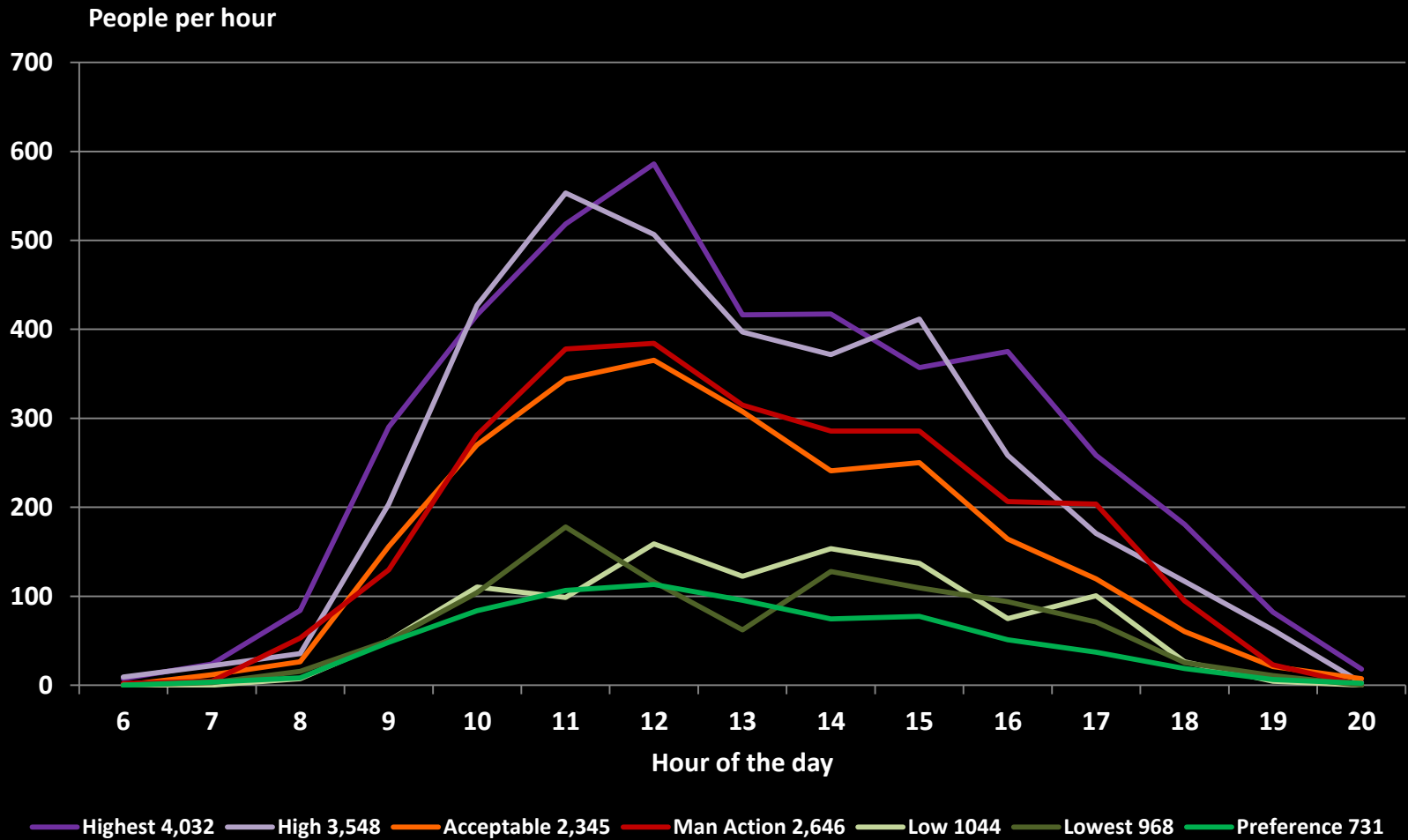
Bridalveil Fall

Base of falls viewpoint

Main Lot
55 spaces



Bridalveil example hourly arrivals



Bridalveil numbers

■ Parking

- 95 along “straight” + 55 spaces in lot = 150 total
- @100% capacity = about 440 PAOT
- @ 90% capacity = about 400 PAOT

■ Hourly arrivals

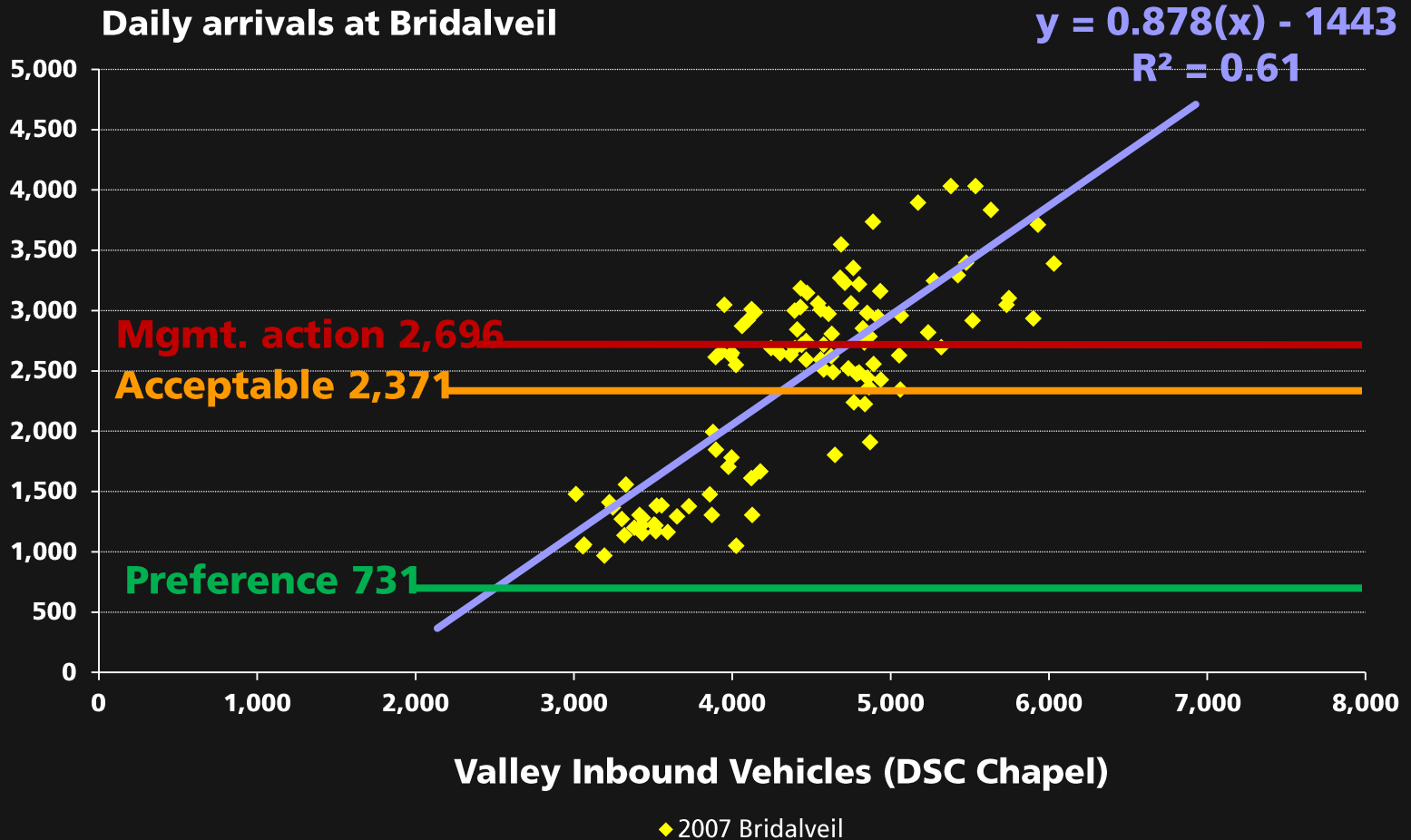
- Highest hour in 2007: 586 p/hr
- 53% of prime hours (9am to 7 pm) had over 200 p/hr
- 33% had over 300 p/hr
- 12% had over 400 p/hr

■ Days over standards

- 43% over management action standard
- 67% over acceptable standard
- 100% over preference standard

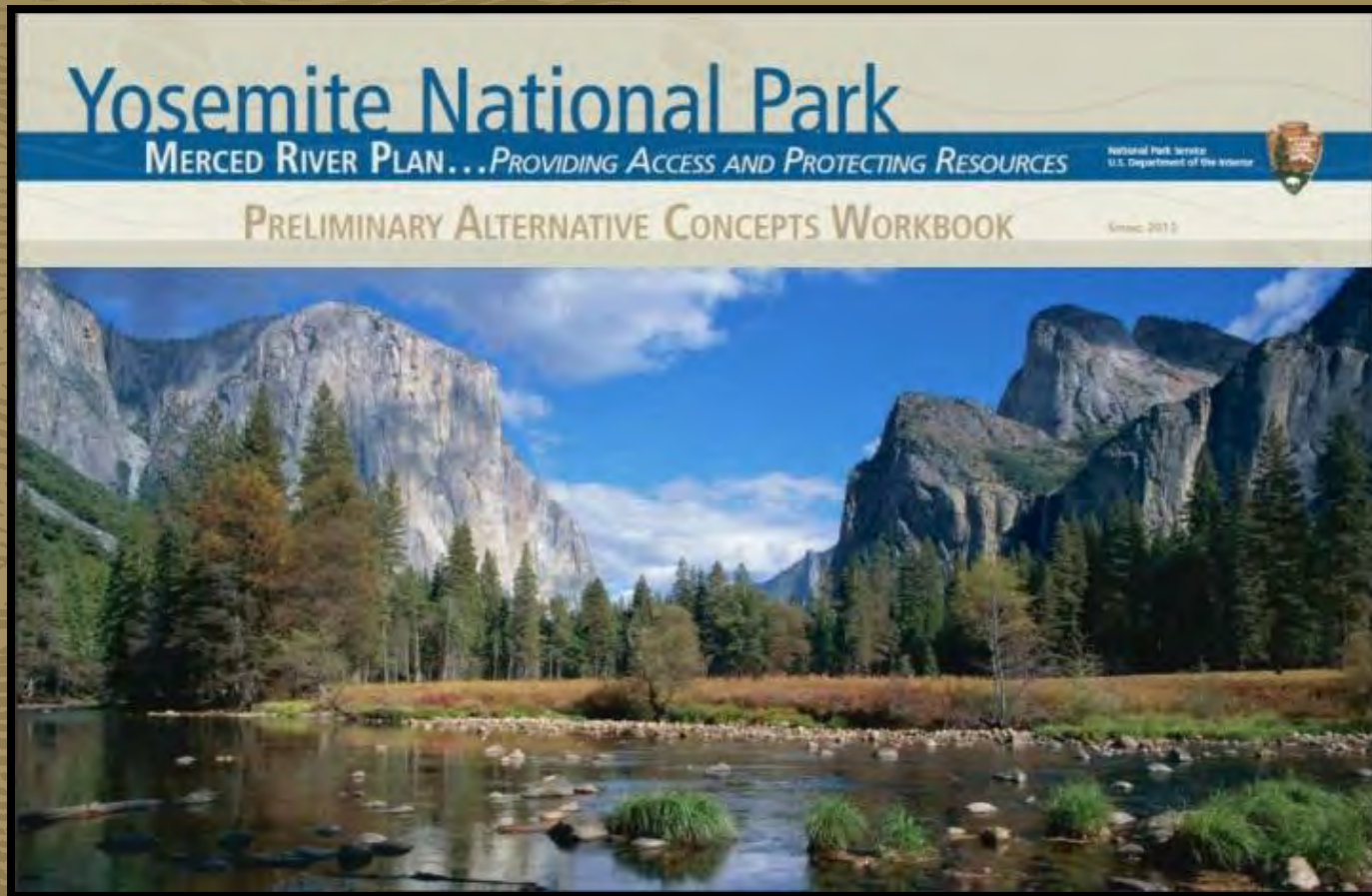


Vehicles vs. Bridalveil arrivals



Illustrating trade-offs

Lower vs. higher use alternatives



Lower vs. higher use alternatives

Parking system

	Existing	Lower use	Higher use
East Valley visitor parking	4,600	3,400	5,700
West Valley day parking	Informal	0	250
El Portal transit parking	Pilot	0	200
East Valley admin parking	850	700	800
<u>Total East Valley parking</u>	<u>5,500</u>	<u>4,000</u>	<u>6,500</u>
Parking occupancy standard	none	90%	90%
Rough acres parking	50	35	60

Lower vs. higher use alternatives

Circulation system

	Existing	Lower use	Higher use
Roundabouts	0	0	3
Ped crossings	0	0	2
Bridge removals	0	3	0
Overflow – improper parking or create congestion	900	0	0
Travel time Curry to Camp 6	20+	5	10
Vehicle accumulations AOT in East Valley	6,000	4,000	6,300

Lower vs. higher use alternatives

Restoration

	Lower use	Higher use
Wet meadow acres	90	25
Conifer → meadow acres	90	90
Riparian acres	160	55
Total river-related restoration	340	170
Miles of new fencing	Less	More
Feet of new boardwalk	Less	More

Lower vs. higher use alternatives

Lodging, camping, and admin residents

	Existing	Lower use	Higher use
Valley lodging units	1,100	500	1,300
Valley camping sites	470	460	860
Employees in Valley	1,200	600	920
New residents in El Portal	--	260	430

Lower vs. higher use alternatives

Social impacts at attraction sites & beaches

(Very rough – still developing)

	Existing	Lower use	Higher use
Vernal Falls (PPV photo)	25	15	25
Higher use beaches (PAOT photo)	40	20	45
Lower use beaches (PAOT photo)	15	10	20
Yosemite Falls (PAOT photo)	130	100	140
Bridalveil Falls (PPV photo)	70	50	75

Lower vs. higher use alternatives

Summary capacities / estimated use levels

	Existing	Lower use	Higher use
Peak eastbound vehicles past Chapel	7,000	5,000	7,500
Estimated peak day use	14,000	10,000	15,000
Estimated peak overnight use	6,000	4,000	8,500

