Labor Day San Diego, September 1, 2025: Crowd Size

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Summary

Accurate crowd size estimation is critical for understanding the scale and societal impact of large protests. Yet, estimates are often made subjectively, producing conflicting figures and fueling public distrust. Today, the widespread availability of cell phone photos and videos, combined with systematic ground-based assessments, enables more reliable and transparent estimation methods. By adapting the techniques described by Choi-Fitzpatrick and Juskauskas (2015), crowd sizes can now be calculated with both visual and quantitative documentation.

For the San Diego Waterfront Park "Labor Day" march on September 1, 2025, ground density assessments yielded an estimated 9,604 participants, with a 95% confidence interval ranging from 8,000 to 11,294, measured within 15 minutes of the scheduled march start. As the crowd was still growing when the final measurement was taken, the actual total attendance was likely greater than the upper bound of the confidence interval.

Crowd size estimation remains inherently complex—especially for marches, where participant movement creates constantly shifting densities and flow rates, and where the quality and availability of imagery can vary. Continued refinement of best practices will depend on collaboration between researchers and the public.

Methods

Waterfront Park pre-march estimate: Data collection procedures are detailed in Appendix A. Crowd density was assessed by trained ground observers using an adaptation of the Choi-Fitzpatrick and Juskauskas (2015) method. Density levels (DL 0, 1, 2, 3) were applied, and intermediate values were interpolated using the equation described in Figure 2.

Figure1. Waterfront Park, San Diego. Main turfgrass areas where participants are expected to gather. Estimated maximum crowd capacity for densely packed area (2.5 sq ft/person) is approximately 76,000 people.

20,411

10,680

6,950

Assuming 2.5 sq. ft
per person
Total: 75,946

6,577

9,766

14,840

Table 1. Areas of Waterfront Park and estimated square footage and crowd size at three Density Levels.

		Crowd Estimate Density sq ft per person		
		DL 1 10 sq per person	DL2 4.5 sq ft per person	DL3 2.5 sq ft per person
Waterfront Park Areas (south to north)	Sq ft	10	4.5	2.5
1	37,101	3,710	8,245	14,840
1-2 sidewalk	1,915	192	426	766
2	24,414	2,441	5,425	9,766
2-3 sidewalk	1,302	130	289	521
3	16,443	1,644	3,654	6,577
Fountain	10,331	1,033	2,296	4,132
4	17,375	1,738	3,861	6,950
4-5 sidewalk	1,336	134	297	534
5	26,699	2,670	5,933	10,680
5-6 sidewalk	1,922	192	427	769
6	51,028	5,103	11,340	20,411
total	189,866	18,987	42,192	75,946

Table 2. Static measurements taken prior to the start of the march when marchers were accumulated densely throughout the area.

9:47 am rating by Observer 3:

Waterfront Park Areas (south to north)	DL Ratings Observer 3, 9:47 am			
	A	B	C	D
1	0.0	0.0	0.0	0.0
1-2 sidewalk	0.3	0.8	0.0	0.0
2	0.5	1.5	0.0	0.0
2-3 sidewalk	1.0	1.0	0.3	0.5
3	1.5	0.5	0.5	1.0
Fountain	1.0	1.0	1.5	1.5
4	0.0	0.5	1.0	1.5
4-5 sidewalk	0.0	0.3	0.5	0.8
5	0.0	0.0	0.0	0.0
5-6 sidewalk	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0

Waterfront Park Areas (south to north)	Estimated crowd size				Average
	A	B	C	D	
1	0	0	0	0	0
1-2 sidewalk	2,851	722	0	0	893
2	5,701	1,444	0	0	1,786
2-3 sidewalk	3,337	2,642	1,920	807	2,176
3	973	3,840	3,840	1,614	2,567
Fountain	1,014	1,014	611	611	813
4	0	4,057	1,706	1,028	1,698
4-5 sidewalk	0	2,029	853	514	849
5	0	0	0	0	0
5-6 sidewalk	0	0	0	0	0
6	0	0	0	0	0
				Total =	10,782

10:03 am rating by Observer 3

Waterfront Park Areas (south to north)	DL Ratings Observer 3, 10:03 am			
	A	B	C	D
1	0.0	0.0	0.0	0.0
1-2 sidewalk	0.0	0.3	0.0	0.0
2	0.0	0.5	0.0	0.0
2-3 sidewalk	0.3	0.5	0.5	0.5
3	0.5	0.5	1.0	1.0
Fountain	1.0	1.0	1.0	1.5
4	1.5	1.5	2.0	2.0
4-5 sidewalk	0.8	0.8	1.0	1.0
5	0.0	0.0	0.0	0.0
5-6 sidewalk	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0

Waterfront Park Areas (south to north)	Estimated crowd size				Average
	A	B	C	D	
1	0	0	0	0	0
1-2 sidewalk	0	2,851	0	0	713
2	0	5,701	0	0	1,425
2-3 sidewalk	1,920	4,770	807	807	2,076
3	3,840	3,840	1,614	1,614	2,727
Fountain	1,014	1,014	1,014	611	914
4	1,028	1,028	717	717	872
4-5 sidewalk	514	514	359	359	436
5	0	0	0	0	0
5-6 sidewalk	0	0	0	0	0
6	0	0	0	0	0
				Total =	9,163

10:10 am rating by Observers 1 and 2.

Waterfront Park Areas (south to north)	DL Ratings Observer 3, 9:47 am			
	A	B	C	D
1	0.0	0.0	0.0	0.0
1-2 sidewalk	0.8	0.8	0.5	0.5
2	1.5	1.5	1.0	1.0
2-3 sidewalk	1.3	1.3	1.0	1.0
3	1.0	1.0	1.0	1.0
Fountain	1.5	1.5	1.0	1.0
4	0.0	0.0	1.0	1.0
4-5 sidewalk	0.0	0.0	0.5	0.5
5	0.0	0.0	0.0	0.0
5-6 sidewalk	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0

Waterfront Park Areas (south to north)	Estimated crowd size				Average
	A	B	C	D	
1	0	0	0	0	0
1-2 sidewalk	722	722	1,199	1,199	960
2	1,444	1,444	2,397	2,397	1,921
2-3 sidewalk	1,529	1,529	2,006	2,006	1,767
3	1,614	1,614	1,614	1,614	1,614
Fountain	611	611	1,014	1,014	813
4	0	0	1,706	1,706	853
4-5 sidewalk	0	0	853	853	426
5	0	0	0	0	0
5-6 sidewalk	0	0	0	0	0
6	0	0	0	0	0
				Total =	8,355

10:15 am rating by Observer 3

Waterfront Park Areas (south to north)	DL Ratings Observer 3, 9:47 am			
	A	B	C	D
1	0.0	0.0	0.0	0.0
1-2 sidewalk	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
2-3 sidewalk	0.3	0.5	0.5	0.8
3	0.5	1.0	1.0	1.5
Fountain	1.0	1.0	1.0	1.0
4	0.5	0.5	0.5	0.5
4-5 sidewalk	0.3	0.3	0.3	0.3
5	0.0	0.0	0.0	0.0
5-6 sidewalk	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0

Waterfront Park Areas (south to north)	Estimated crowd size				Average
	A	B	C	D	
1	0	0	0	0	0
1-2 sidewalk	0	0	0	0	0
2	0	0	0	0	0
2-3 sidewalk	1,920	807	807	486	1,005
3	3,840	1,614	1,614	973	2,010
Fountain	1,014	1,014	1,014	1,014	1,014
4	4,057	4,057	4,057	4,057	4,057
4-5 sidewalk	2,029	2,029	2,029	2,029	2,029
5	0	0	0	0	0
5-6 sidewalk	0	0	0	0	0
6	0	0	0	0	0
				Total =	10,116

Figure 2. Function used to extrapolate intermediate Density Level (DL) ratings to estimate the number of square feet occupied per person. The total area occupied divided by the square feet occupied per person = total participants.

$$\text{Square feet per person} = 10.185 \times 1/(DL)^{-1.25}$$

Square Feet Per Person vs Crowd Densityi Level Rating (DL)

$y = 10.185x^{-1.25}$
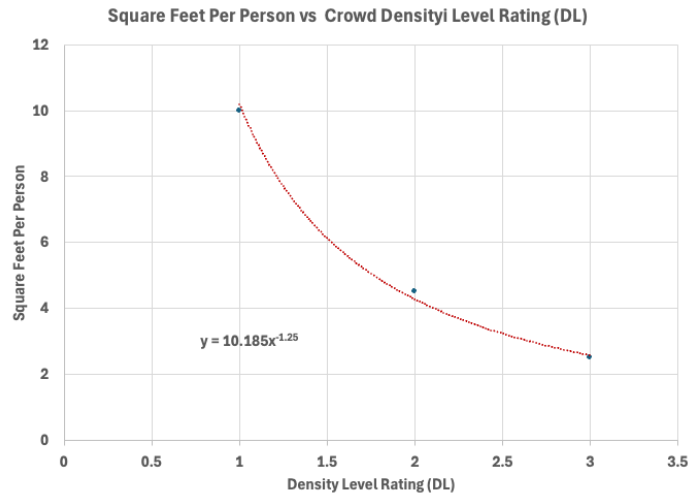
References

Choi-Fitzpatrick, A, T. Juskauskas and B. Sabur. 2018. All the protestors fit to count: using geospatial affordances to estimate protest event size. Interface. 10:297-321. Retrieved https://www.interfacejournal.net/wordpress/wp-ontent/uploads/2018/12/Interface-10-1-2-Choi-Fitzpatrick-et-al.pdf

Choi-Fitzpatrick, A. and T Juskauskas. 2015. Up in the Air: Applying the Jacobs Crowd formula to Drone Imagry. Procedia Eng. 107:273-281. https://www.sciencedirect.com/science/article/pii/S1877705815010358?utm_source=chatgpt.com

Wikipedia contributors. (2023). 'Crowd counting.' *Wikipedia, The Free Encyclopedia.* Retrieved 4/7/2025 https://en.wikipedia.org/wiki/Crowd_counting

Apendix A

Protocol for Estimating Crowd Size at Waterfront Park

Estimating crowds is hard because people cluster rather than spread evenly. To get a practical estimate at Waterfront Park, we'll use a rapid "quadrat" survey adapted from Choi-Fitzpatrick & Juskauskas (2015).

What you'll do (overview)

- Walk (rove) through the six grassy sections of the park (see illustration below) from south to north.
- In each section, estimate how densely people are standing in four quadrats (A–D).
- Record a **Density Level (DL)** from **0 to 3** for each quadrat.
- Note overflow areas (sidewalks, fountain plaza, edges) and take photos.

When to survey

- Start **around 9:45am** so your counts reflect peak pre-march conditions.
- Complete one full pass **south → north** without backtracking.

Where to survey

- See **Figure 1**: the park is divided into **six grassy sections** (1 = southernmost … 6 = northernmost), plus sidewalks and the fountain area.
- In **each section**, mentally divide the grass into **four equal quadrats**: **A, B, C, D**.

How to score density (DL 0–3)

Use quick visual judgments. Use these guidelines, as well as the information in Figure 2:

- **DL 0 – Empty:** No meaningful presence.
- **DL 1 – Moderate:** Conversational spacing; small clusters; some open ground.
- **DL 2 – Crowded:** Frequent shoulder-to-shoulder pockets; movement somewhat constrained.
- **DL 3 – Very dense:** Shoulder-to-shoulder throughout; movement constrained.
- **In between?** If the density is in between two DL levels, indicate using a decimal point. For example, if the density is in between DL 2 and DL 3, indicate as DL 2.5.

Sidewalk density will be computed by Take Action San Diego after data collection as the average of the two adjacent grassy areas.

How to record

- Print out this document and take it with you (ideally on a clipboard) to the march
- Use the provided data collection grids to record the density levels described above in each of the 4 quadrats in each Section (see sample entry below). There are 3 grids provided below, 1 for each pass you make through Waterfront Park. However, you'
- Write the **time** you started and finished each section.
- Mark any **blocked or closed** areas.
- Use the printout of the photo in Figure 1 to make any additional notes:

- o   note any visible bias such as around the stage where there are clusters of people.
- o   Note the density (using the DL rating system) of overflow areas such as park entrances, sidewalk along Harbor Dr., etc.
- o   If possible, take photos to document density in overflow areas.

SAMPLE Data Collection Sheet.

Start Time: 10:15am End Time: 10:30am	Record DL (density levels 0 - 3) below			
	QUADRAT			
SECTION #	A	B	C	D
1	2	2.5	1	1
2	3	2	2	2
3	1	3	2	2
Fountain	3	2	2	2
4	2	1.5	2	2
5	1	2	1	1.5
6	1	2	0	0

Quality checks (fast)

- If time allows, make a **second quick pass** of any sections that changed visibly.

After the survey

1. **Photograph** your annotated sheet and any context photos at **high resolution**.
2. **Email** everything ASAP to **takeactionsandiego@gmail.com** (subject: *Waterfront Park Crowd Survey*).
3. **Take Action San Diego will calculate crowd size from your information, and will provide it to the press and the police. It will also be used to prepare a report that will be published online.**

Reference

Choi-Fitzpatrick, A. & T. Juskauskas (2015). *Up in the Air: Applying the Jacobs Crowd Formula to Drone Imagery.* **Procedia Engineering** 107: 273–281.
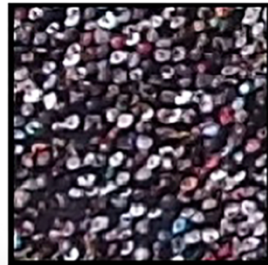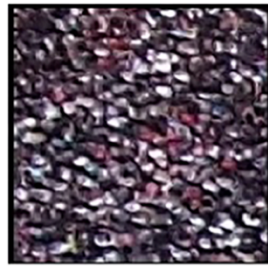https://www.sciencedirect.com/science/article/pii/S1877705815010358

Figure 1. Waterfront Park grassy areas where people primarily accumulate

Figure 2. Choi-Fitzpatrick crowd Density Level (DL) ratings

DL 0	Up to 100	DESCRIPTION: Very loose crowd with a very low density level. You could ride your bike through this crowd easily. ACTION: If it looks like there are fewer than 100 people in this grid, then count them manually and write that number in the grid.	b
DL 1	~109	DESCRIPTION: Somewhat loose crowd with a pretty low density level. This is a crowd you could walk through easily without bumping into too many people (imagine about 1 person per square meter). On average, at this density level there are usually about 109 people in the grid or one person in 10 ft2 (0.93 m2). ACTION: If you believe a grid is full of DL1, mark it as "1". If you believe it is a DL1 crowd in half of the image, write: 1 ½"	c
DL 2	~238	DESCRIPTION: This is a dense crowd. You would have a hard time moving through this crowd, but it would be possible (imagine more than 2 people per square meter). On average, at this density level there are usually about 238 in the grid or one person in 4.5 ft2 (0.41 m2). ACTION: If you believe a grid is full of DL2, mark it as "2". If you believe it is a DL2 crowd in half of the image, write "2 ½."	d
DL 3	~435	DESCRIPTION: This is an extremely dense crowd. It would be nearly impossible to move your arms in this crowd (imagine more than 4 people per square meter!). This is the same as the very front of a concert, just in front of the stage. On average, at this density level there are usually about 435 people in the grid or one person in 2.5 ft2 (0.23 m2). [NOTE: this density level rarely occurs] ACTION: If you believe a grid is full of DL3, mark it as "3". If you believe it is a DL3 crowd in half of the image, write "3 ½."	

Data Collection Sheet. Fill out one of the grids below for each pass you make through Waterfront Park.

Record Density Level observation (See Figure 2) for each quadrat within each of the six sections of Waterfront Park.

Start Time: _____
End Time: _____

SECTION #	QUADRAT			
	A	B	C	D
1				
2				
3				
Fountain				
4				
5				
6				

Data Collection Sheet.

Record Density Level observation (See Figure 2) for each quadrat within each of the six sections of Waterfront Park.

Start Time: _____
End Time: _____

SECTION #	QUADRAT			
	A	B	C	D
1				
2				
3				
Fountain				
4				
5				
6				

Data Collection Sheet.

Record Density Level observation (See Figure 2) for each quadrat within each of the six sections of Waterfront Park.

Start Time: _____
End Time: _____

SECTION #	QUADRAT			
	A	B	C	D
1				
2				
3				
Fountain				
4				
5				
6				