

Lady Bird Lake Capacity Report

Amanda Masino, Ph.D.¹, Jason Carter, Ph.D.², Wenxian Tan, Ph.D.¹, and Rohan Thompson, Ph.D.³

¹Department of Natural Sciences

²Department of Business Administration

³School of Business and Technology
Huston-Tillotson University, Austin TX

December 2022, Appendix 2 revised Jan 2023

Introduction

Lady Bird Lake is one of Austin's most treasured environmental and municipal resources. The lake, more correctly classified as a reservoir, was created by the impoundment of the Colorado River by the Longhorn Dam in 1960. Originally called Town Lake, the lake was renamed Lady Bird Lake in 2007 in honor of Lady Bird Johnson and her conservation efforts focused on the lake and the surrounding trail. The water level in Lady Bird Lake, which fulfills both recreational and flood-control purposes, is maintained at a fairly constant level due to (i) inputs from Lake Austin (via the Tom Miller Dam), Barton Creek, Bouldin Creek, and Waller Creek, and (ii) the activity of both passive flow and flood gates on Longhorn Dam. The lake has a reported surface area of 471 acres and maximum depth of 18 feet. The flow-through nature of the reservoir introduces both resilience and complexity in interpreting environmental impacts and accumulations. The Ann and Roy Butler Hike and Bike Trail forms a 10.1-mile-long loop along the shoreline of Lady Bird Lake, which is well vegetated for most of its circumference. The mostly-flat trail connects several park areas, including Roy G. Guerrero Colorado River Metropolitan Park, Festival Beach, Butler Park, Vic Mathias Shores, and Zilker Metropolitan Park. Trail extensions and bridges enhance connectivity and create alternate routes for users.

Lady Bird Lake and the Butler Hike and Bike Trail attract a high number of visitors, estimated at 5 million per year. Popular water recreation activities on Lady Bird Lake include kayaking, paddleboarding, canoeing, fishing, and rowing. Gas-powered boats are banned from the lake but electric-powered boats with engine capacity of 5 horsepower or less are allowed with City permission. Swimming is banned, as is diving or fishing from the bridges that span the lake. The Butler trail attracts runners, walkers, bikers, and visitors accessing the park areas for picnics, sports, nature activities, and socializing. The volume of visitors to Lady Bird Lake and the breadth of activities conducted on or near the water present a significant management task for the City of Austin's Parks and Recreation Department (PARC), which is charged with the stewardship of Austin's 300+ parks and green spaces.

PARD directly manages Lady Bird Lake concessionaires, events, and partnerships, and coordinates with the Watershed Protection Department, Texas Parks and Wildlife Department, and Austin Police Department for issues related to water quality, water safety, erosion, habitat quality, and enforcement. An 11-member Parks and Recreation Board advises the city council and city manager on matters relevant to PARD operations. In October 2022, responsibility for the management of the Butler Trail and the surrounding parkland was transferred to the Trail Conservancy (formerly the Trail Foundation), a 501(c)(3) which has played a long-term role in developing and maintaining the trail in partnership with PARD. Anticipating the continued popularity of Lady Bird Lake in a rapidly growing city, PARD, and the Parks and Recreation Board, sought to better understand the impact of human activity on the lake by commissioning this report.

Specifically, PARD asked the research team to define a carrying capacity for Lady Bird Lake and explore issues related to managing carrying capacity. The carrying capacity of a lake has several overlapping definitions. The *ecological carrying capacity* of an environment refers to the number of organisms that can be supported in that without deleterious ecological consequences. The *recreational carrying capacity* of a body of water is based on the number of watercraft or level of shoreline development that can be supported without ill effects on users, water, and environment. *Spatial or facility carrying capacity* focuses on whether there is sufficient physical space for safe watercraft operations, water access, and parking. *Experiential or social carrying capacity* references user experience and perception of crowding. We set out to explore the carrying capacity of Lady Bird Lake from a combination of these perspectives. We conducted user surveys and interviews, a watercraft census, a shoreline habitat assessment, and water quality testing. Based on these data, we analyze Lady Bird Lake's status with respect to carrying capacity, identify the metrics need to continue monitoring carrying capacity as a dynamic measure of lake health, and recommend several courses of action for PARD to consider addressing potential challenges to the lake's integrity.

Methodology

User Survey

An online survey was designed to assess the experiences and perceptions of Lady Bird Lake users. The study included 13 items about user experience, 11 items about concerns and threats to the lake, 3 questions specific to business owners, 3 open-ended responses, and 9 demographic questions. The survey, available in English and Spanish, was distributed to current Lady Bird Lake concessionaires, who were provided with a link, QR code, and flyers for distribution to their customers. The survey was also distributed through various groups affiliated with the lake and trail, including outdoor recreation groups, education groups, and

community groups. PARD and the Texas Parks and Wildlife Department distributed the survey through their networks, including, for PARD, social media and website. Survey participation was incentivized with the opportunity to win a gift card. Open-ended questions provided a platform for participants to give answers outside the survey options. The survey was open for 68 days, and 745 results were recorded. After the data cleaning process which eliminated incomplete entries and entries that failed quality control (e.g., failure to correctly answer a screening question, survey completed in under two minutes), 622 unique responses were used for analysis in Excel.

Interviews

Interviews were conducted to examine the survey themes of user experience, perception, and threat identification with more depth through seven main questions and three ancillary/probing questions. 23 individuals were interviewed. Potential interview subjects were identified among the survey respondents who responded positively to an item about their willingness to participate in follow-up. We also interviewed key City staff. The interviews were divided among four researchers. Interview participation was incentivized with a gift card. Interview subjects were provided with a consent letter; they could sign physically or via verbal consent. Interviews were conducted via Zoom and transcribed via Otter and by hand. Interview transcripts were analyzed for relevant themes by hand and via a word-frequency method in Nvivo.

Watercraft Census

Both an aerial census and a ground-based census were completed. For the aerial census, drone videos of the entirety of the Lake were taken on May 29, June 17, June 18, and July 2, 2022, during peak use hours of 11 am – 3 pm. The drone was operated by a licensed operator who collected 4900 K resolution video footage from a height of 150-250 feet above the surface, depending on wind conditions. Watercraft were counted in each of 6 lake segments identified by bridge or dam boundaries to allow for ease of counting. Acreage for each segment was calculated from satellite map polygons; segments were defined by the downstream borders of the bounding elements, thus, the Congress to I-35 segment began at the downstream border of the Congress Avenue bridge and terminated at the downstream border of the I-35 bridge. Aerial counts were complemented by ground-based boat counts collected from 6 observation points. Observations were made on 22 days in June, 23 days in July, 23 days in August, and 20 days in September 2022, with the earliest observation on 10 June and the latest on 30 Sept. Boat counts were taken randomly throughout the day and during different days of the week. To improve accuracy, all counts were limited to within 125 yards of the access point (i.e sight distance at which craft types were distinguishable by eye). Watercraft were classified as either kayak, paddleboards, motorboats, canoes, or other. The classification of watercraft was based

on design and intended purpose, not the activity engaged at the time of the observation. For example, some paddleboards were observed with individuals sitting and rowing as though they were canoes. However, this observation would be counted as a paddleboard and not a canoe, its intended use.

Parking Lot Census

Parking space occupancy was tabulated for 20 parking lot areas around Lady Bird Lake. Lots were a combination of free and paid lots. Counts were taken on two non-consecutive Wednesdays and two non-consecutive Saturdays in June and July 2022. The parking lot count was conducted as a measure of lake facility capacity. However, it must be noted that several of the parking lots are located around downtown Austin and users may be accessing areas other than the lake. Although the parking lot count is helpful to assist with understanding lake capacity, it should not be used alone to make critical decisions.

Lake Water Testing

Water samples were collected from three locations – approx. 100 feet south of the southernmost tip of Red Bud Isle (30.2872687, -97.7860304), approx. 1600 feet upstream of Lou Neff Point (30.2693612, -97.7660811) and approx. 500 feet downstream of Lou Neff Point (30.2663190, -97.7591190). The Red Bud site was chosen as a baseline most representative of input from Lake Austin. This site is adjacent to the Red Bud Isle site 5 used to calculate the Austin Lake Index by the Watershed Protection Department. The Lou Neff Point sites were chosen as this was the area of greatest congestion apparent from aerial boat census. Sampling was conducted two days before, during, and after a peak use Saturday at the two Lou Neff sites, after a holiday weekend at the two Lou Neff sites, and during a low use period at Red Bud Isle. Samples were collected at a depth of 0.3 m below the surface. Temperature and pH readings were taken at the time of collection. Samples were stored at 4°C, then delivered to the Lower Colorado River Authority Environmental Laboratory Services Lab for detection of: calcium, iron, magnesium, potassium, sodium, manganese, bromide, chloride, fluoride, nitrate (as N), nitrate/nitrite as N, nitrite (as N), ortho-phosphate (as P), sulfate, chlorophyll-a, pheophytin-a, bicarbonate alkalinity, carbonate alkalinity, hydroxide alkalinity, phenolphthalein alkalinity, total alkalinity (CaCO₃), total hardness (as CaCO₃), specific conductance, total dissolved solids (TDS), silica as SiO₂, and *E. coli* fecal coliform bacteria.

Shoreline Assessment

Habitat quality was assessed for ten access sites following the Austin Lake Index methodology developed by the Watershed Protection Department. Briefly, visual assessment of the substrate type (i.e. bedrock, boulder, cobble, gravel, sand, silt/clay/mud, woody debris, vegetation) and abundance and vegetation type (i.e. large canopy tree, small canopy tree, woody shrub

understory, herbaceous understory, woody ground cover, herbaceous ground cover, invasives) and abundance was made for the littoral, shoreline, and riparian portions of the shoreline. Three investigators made independent assessments, then conferred on site to reconcile discrepancies, if any. The abundance values were multiplied by a ranking factor reflecting desirability of each component as set forth in the Austin Lake Index methodology and summed for a site-specific score. Sites were selected to examine high human use areas.

Environmental Justice Profile

Analysis of the neighborhoods bounding Lady Bird Lake was conducted with the Environmental Protection Agency's EJ SCREEN. Population demographics, environmental vulnerabilities, and social vulnerabilities were compiled for residents living within 0.25, 0.5, and 1 miles of the Lady Bird Lake shoreline, and for residents of census block groups for which a portion of the area fell within 0.25 miles of the Lady Bird Lake shoreline. EJ SCREEN provides data on eleven environmental indicators (particulate matter 2.5 μ M, diesel particulate matter, air toxics cancer risk, air toxics respiratory index, lead paint, and proximity to hazardous waste sites, Risk Management Plan sites, Superfund sites, traffic, and underground storage tanks) and seven demographic indicators that denote potential vulnerability to environmental harm (race/ethnicity, education level, employment status, income level, linguistic isolation, the number of individuals below the age of 5, and the number of individuals above the age of 64).

Unpermitted Activity

311 data available from the City of Austin Open Data Portal, social media advertisements, and information from PARD staff was used to examine the extent of unpermitted vendor activity on Lady Bird Lake.

Results and Discussion

Watercraft Census

Results of the aerial watercraft census are presented in Table 1 and Figure 1. Over the four days recorded, the total watercraft on the lake during the aerial survey ranged from 188 boats on June 17, 2022 (a Friday) to 1100 boats on July 2, 2022 (the Saturday of July 4 weekend), and the lake wide acreage/boat ranged from 0.40 acres/boat on July 2 to 2.34 acres/boat on June 17. Comparing dates, the highest totals occurred on Saturdays (June 18 and July 2), regardless of whether the Saturday was associated with a holiday. The Sunday total count was 40% lower than the average count for the two Saturdays, and the Friday count was 83% lower. High use on the weekend is consistent with the average user, who may not have time on a weekday to spend hours recreating on the lake.

The distribution of watercraft was not uniform across the lake, with the greatest concentration of boats in the segment of the lake between Mopac and Lamar Ave regardless of sampling date. Boat density is typically expressed as acreage/boat (Table 1) to reflect the spatial requirements of distinct types of boats and uses. However, it can also be helpful to examine boat density as boats/acre to facilitate visualization. This calculation is depicted in Figures 1 and 2 below. The higher concentration of boats in the Mopac to Lamar segment relative to the rest of the lake reflects the concentration of access points and amenities in this area, as well as the large confluence of vessels that aggregate at the mouth of Barton Creek.

Table 1: Results of aerial watercraft count

Date	Lake region	Boat count	Acres/ boat
5/29/2022 (Sunday)	Tom Miller Dam to Mopac	92	0.91
	Mopac to Lamar	291	0.19
	Lamar to 1 st St	65	0.52
	1 st St to Congress	17	0.91
	Congress to I-35	79	0.93
	I-35 to Longhorn Dam	111	1.60
	Lady Bird Lake Total	655	0.67
6/17/2022 (Friday)	Tom Miller Dam to Mopac	38	2.20
	Mopac to Lamar	70	0.78
	Lamar to 1 st St	19	1.78
	1 st St to Congress	6	2.57
	Congress to I-35	17	4.31
	I-35 to Longhorn Dam	20	8.89
	Lady Bird Lake Total	188	2.34
6/18/2022 (Saturday)	Tom Miller Dam to Mopac	119	0.70
	Mopac to Lamar	727	0.08
	Lamar to 1 st St	99	0.34
	1 st St to Congress	4	3.86
	Congress to I-35	35	2.09
	I-35 to Longhorn Dam	64	2.78
	Lady Bird Lake Total	1048	0.42
7/2/2022 (Saturday)	Tom Miller Dam to Mopac	109	0.77
	Mopac to Lamar	756	0.07
	Lamar to 1 st St	75	0.45
	1 st St to Congress	39	0.40
	Congress to I-35	47	1.56
	I-35 to Longhorn Dam	84	2.12
	Lady Bird Lake Total	1110	0.40

On each census date, most of the watercraft in the Mopac to Lamar segment were most concentrated around the mouth of Barton Creek near Lou Neff Point (Figure 1). The Lou Neff boats comprised 178 of the 291 in the Mopac-Lamar segment (61%) on May 29, 39 of 70 (56%) on June 17, 396 of 727 (54%) on June 18, and 416 of 756 (55%) on July 2. The watercraft density, expressed as boats/acre, of this area was about 12-22 times higher than the average density of the entire lake on the same day (Figure 2).

Figure 1. Watercraft density by lake segment

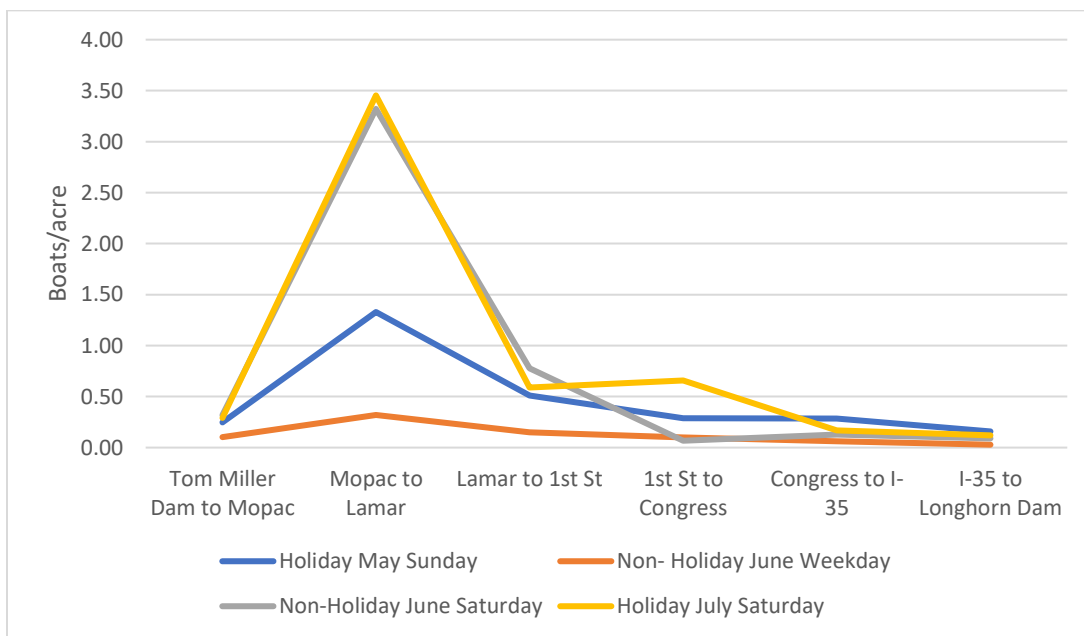
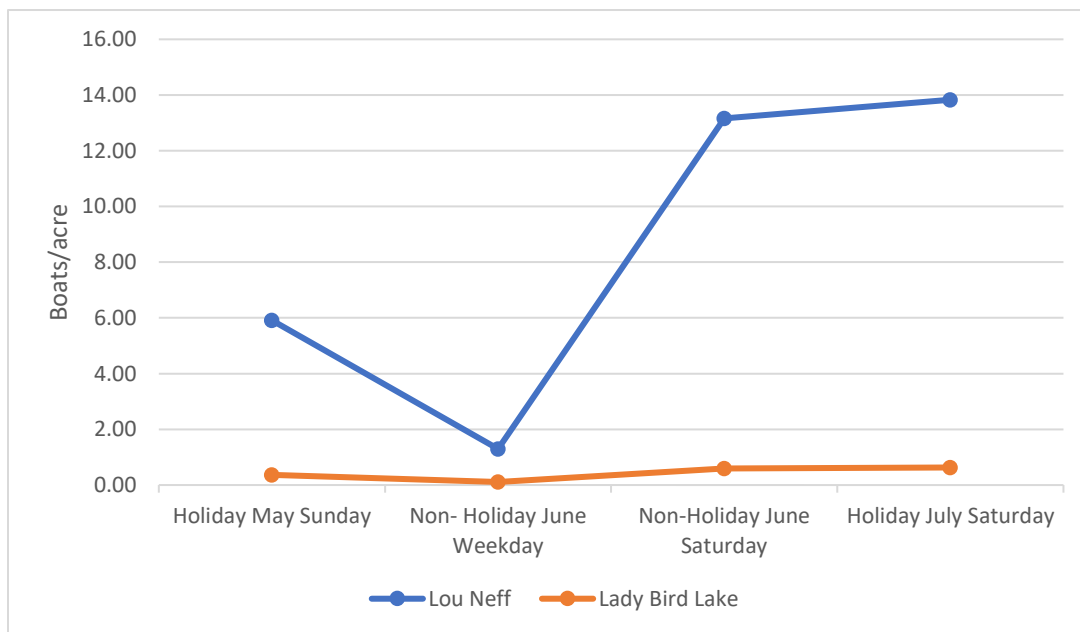
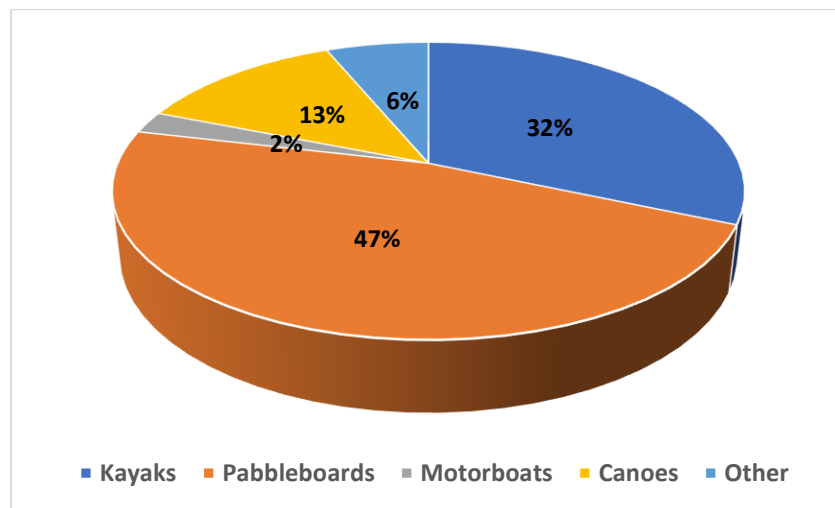


Figure 2. Watercraft density at Lou Neff Point and Lady Bird Lake



A ground-based count was conducted to complement the aerial count, with a particular focus on tabulating non-peak days and distinguishing watercraft type. A total of 150 separate counts were taken from six observation points: Texas Rowing Center boat ramp, Lamar Bridge, Congress Bridge, Holiday Inn Boat Ramp, Epic SUP boat ramp, and Festival Beach boat ramp. 115 counts were taken on weekdays, 22 on Saturdays, and 13 on Sundays. Counts were limited to the sight distance at which craft were distinguishable, typically 100-125 yards. Paddleboards were the most commonly observed craft at 2566 of 5438 observed craft over the 150 counts (or 47% of pooled observations) and kayaks the next most frequent, at 1718 of observed craft (32%).

Figure 3. Total observed watercraft by type of craft



The number of craft observed during any count ranged from 7 to 65, with an average of 36 watercraft observed /count (standard deviation = 12.5, variance = 158.3). Combining counts for all observation points yielded an average of 1.91 acres/boat, which is similar to the weekday aerial census count-based calculation of 2.34 acres/boat. Since most of the ground observations were taken on weekdays, it is understandable that the average skews towards lighter use days.

A slightly higher number of watercraft per count were observed for counts taken between 3 and 6 pm (Table 2) compared to counts taken between 9 am and 3 pm. This is consistent with a weekday use pattern that favors after-work and after-school use.

Table 2. Ground based count totals, by time of observation and craft type

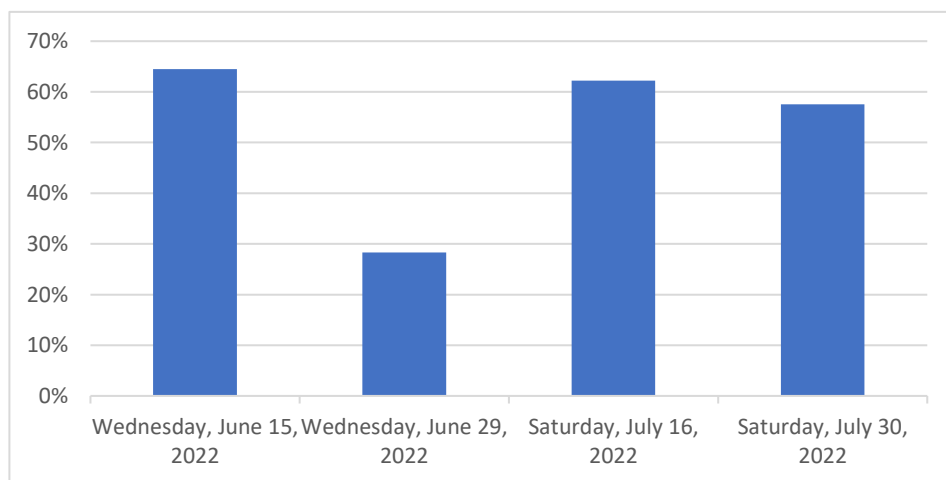
	Total watercraft	Number of counts	Watercraft/ count	Paddleboard count	Percent paddleboards	Kayak count	Percent kayaks
9- 10:59 am	1007	30	33.6	446	44.3%	342	34.0%
11 am – 2:59 pm	1795	51	35.2	834	46.5%	591	32.9%
3 – 5:59 pm	1288	34	37.9	661	51.3%	331	25.7%
6 – 8:00 pm	1348	34	39.6	625	46.4%	454	33.7%

Previous studies of spatial carrying capacity set optimal values for boat density of canoes and kayaks at 1.3 acres/boat (Warren and Rea, 1989) or 1 acre/boat (New York State Office of Parks and Recreation). Jackson set a much higher value of 8 acres/boat, but included sailboats in the same category as kayaks and rowboats. The observed boat density of Lady Bird Lake in many segments does not compare favorably to the 1-1.3 acres/boat benchmark. On July 17, a weekday, there was excellent boat density across most regions of the lake except the Mopac to Lamar segment, with 0.78 acres/boat. On May 29, a holiday weekend Sunday, most regions were close to favorable values, except for the Mopac to Lamar and Lamar to First segments, with densities of 0.19 and 0.52 acres/boat, respectively. This pattern is even more apparent on the two Saturdays. The average Saturday density is 0.075 acres/boat for the Mopac to Lamar segment, 0.395 for the Lamar to First segment, and 0.735 for the Tom Miller to Mopac segment. It is worth noting that even on these peak days, the density in the Congress to Longhorn Dam segment remains favorable.

Parking Lot Counts

Four separate parking lot counts were taken, two on Wednesdays and two on Saturdays. A total of 841 parking lot spaces were observed in 20 lots. Six lots were located East of I-35 (239 spaces), three were located around Barton Creek (140 spaces), and 16 were located between Mopac and First street (456 spaces). The average parking lot usage rate over all four counts was 53%, or 447 vehicles occupying spaces. The number of parking spaces in use ranged from 238 to 542 parking spaces. The percentage capacity usage ranged from 28% to 64%. There was no appreciable difference in percent usage if lots were grouped to compare among lots east of I-35, lots adjacent to Barton Spring, and lots adjacent to the south shore of the lake in the Mopac to First segment. The lot count was a sampling of lots and did not include street parking or unmarked parking areas, such as the gravel lot off Lou Neff Road.

Figure 4. Parking lot percent usage



Lake User Survey

622 responses were analyzed (see methods for details of data cleaning). A majority of the respondents were male (47.7%) and identified as non-Hispanic white (68.5%). Both categories are within 5% of the city's demographics. Of those surveyed, 20.4% identified as veterans, while

Table 3. Demographic characteristics of survey respondents

Race/Ethnicity	Number	Percentage
African American/Black	28	4.5%
Alaskan Native	3	0.5%
American Indian	28	4.5%
Asian American	10	1.6%
Hispanic/Latinx	33	5.3%
MENA	1	0.2%
More than One Race	65	10.5%
Native Hawaiian	2	0.3%
Non-Hispanic White	426	68.5%
Other	5	0.8%
Decline to Answer	21	3.4%
Total	622	100.0%

Gender Identity	Number	Percentage
Female	250	40.2%
Male	297	47.7%
Nonbinary	8	1.3%
Transgender	12	1.9%
Other	2	0.3%
Decline to Answer	15	2.4%
Total	584	100.0%

Veteran Status	Number	Percentage
No	439	75.2%
Yes	119	20.4%
Decline to Answer	26	4.5%
Total	584	100.0%

Disability Status	Number	Percentage
No	473	81.0%
Yes	93	15.9%
Decline to Answer	18	3.1%
Total	584	100.0%

Employment Status	Number	Percentage
Employed full-time	404	70.3%
Employed part-time	81	14.1%
Retired	56	9.7%
Student	17	3.0%
Unemployed	17	3.0%
Decline to Answer	0	0.0%
Total	575	100.0%

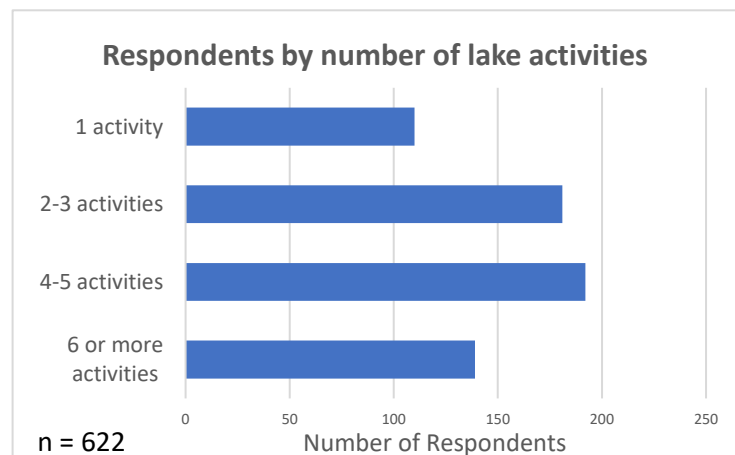
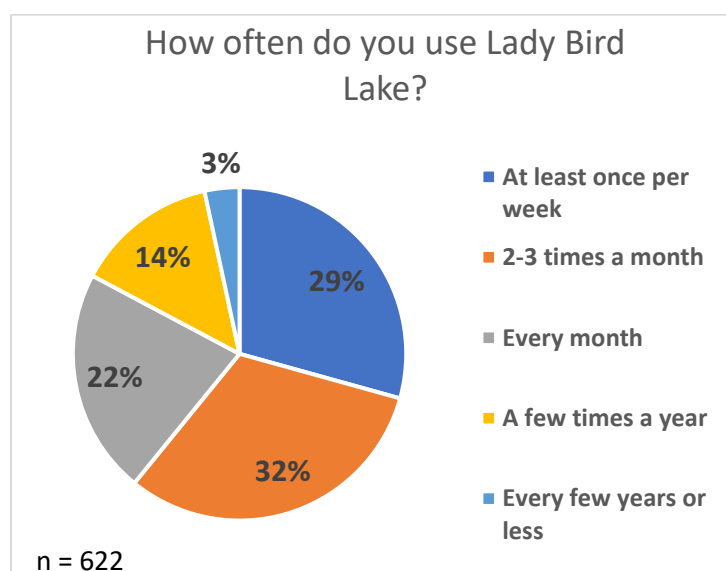
Housing Situation	Number	Percentage
Own a home/apt/condo	382	65.4%
Rent a home/apt/condo	159	27.2%
Stay with someone	31	5.3%
Unhoused	2	0.3%
Decline to Answer	10	1.7%
Total	584	100.0%

Annual Household Income	Number	Percentage
Less than \$10,000	4	0.7%
\$10,000 to \$19,999	15	2.6%
\$20,000 to \$29,999	39	6.7%
\$30,000 to \$39,999	43	7.4%
\$40,000 to \$49,999	45	7.7%
\$50,000 to \$74,999	98	16.8%
\$75,000 to \$99,999	123	21.1%
\$100,000 to \$199,999	118	20.2%
More than \$200,000	44	7.5%
Decline to Answer	54	9.3%
Total	583	100.0%

15.9% indicated they have a disability. Most (70.3%) of the participants are employed full-time, while 65.4% own their house, apartment, or condo. The results showed that 65.7% of the participants make at least \$50,000, while 17.3% make less than \$40,000.

Most survey respondents are frequent users of the lake, with 29% using it at least once a week, and 32% using it 2-3 times a month. Another 22% use it monthly. 88.6% of respondents participated in 2 or more activities at Lady Bird Lake. The most frequently reported activity was walking/hiking, with 256 of the 622 respondents indicating that they participated in this activity, closely followed by kayaking, relaxing outdoors, cycling, and dog-related activities.

Figure 5. Lake use frequency (a), preferred activities (b), and number of activities (c) among survey respondents (n = 622)

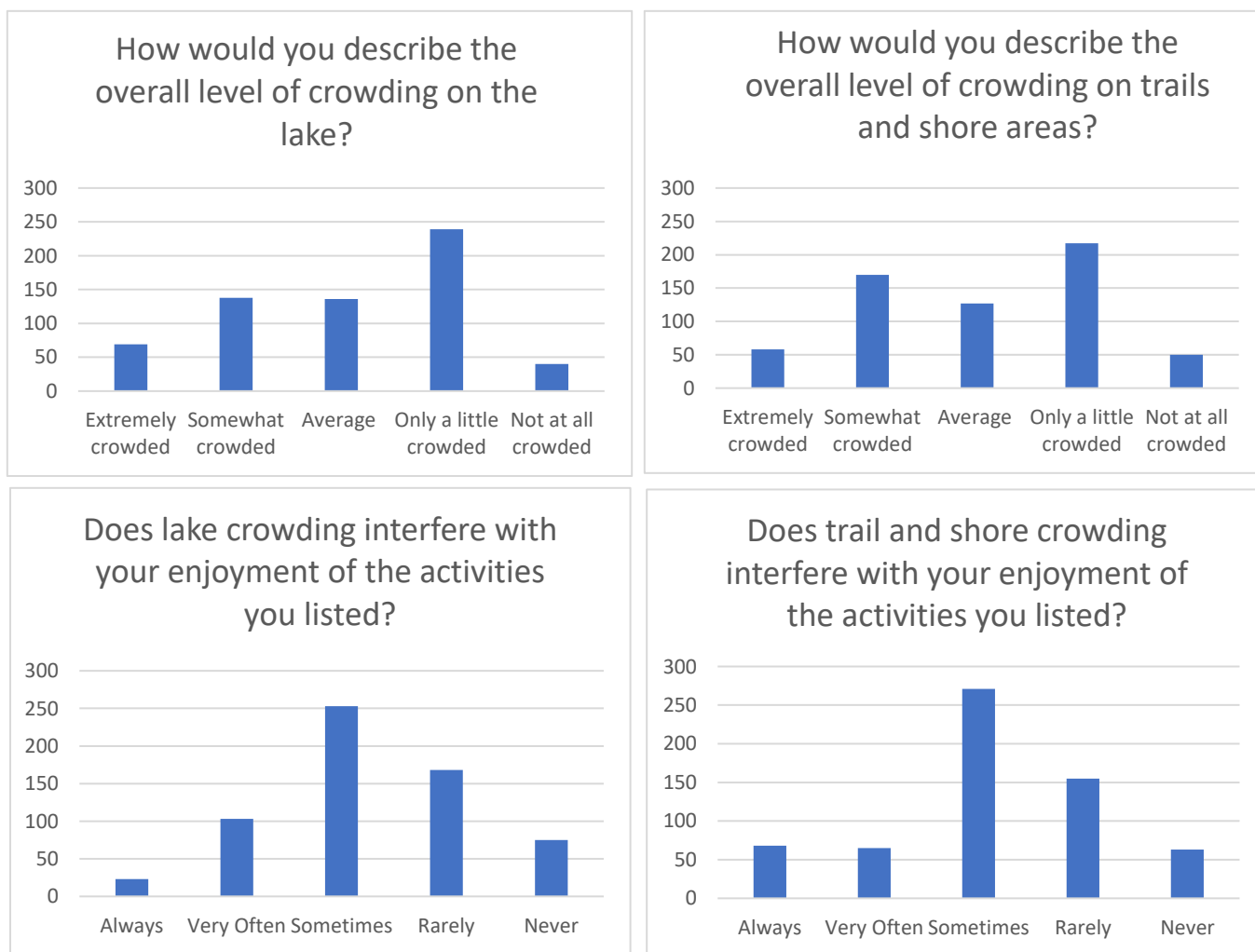


Activity	Respondents
Walking/Hiking	256
Kayaking	206
Relaxing Outdoors	194
Cycling	181
Dog-related Activities	169
Birding	154
Observing Wildlife	153
Kid's Activities	150
Running	140
Socializing	131
Fishing	111
Paddleboarding	109
Nature Photography	109
Canoeing	102
Floating/Tubing	93
Rowing	57
Sports	56
Sunbathing	40
Other	22
Other types of boating	17

In terms of the respondents' relationship to the lake, 114 respondents characterized themselves as business owners, 172 as government employees, 287 as environmental advocates, 133 as investors, 163 as naturalists or scientists, and 117 as tourists enjoying Austin. (Respondents could select multiple options.)

33.3% of respondents characterized the lake as extremely or somewhat crowded while 36.5% characterized the shore and trail in this way. 42.9% characterized the lake and 44.9% characterized the shore and trails as only a little crowded or not at all crowded. Thus, the percentages are very comparable for the lake versus the trails and shore areas. Crowding sometimes interfered with lake enjoyment for 40.7% of respondents and shore/trail enjoyment for 43.6% of respondents. 21.4% of respondents indicated that lake crowding interfered with their enjoyment always or often and 35.1% rarely or never. With respect to shore and trail

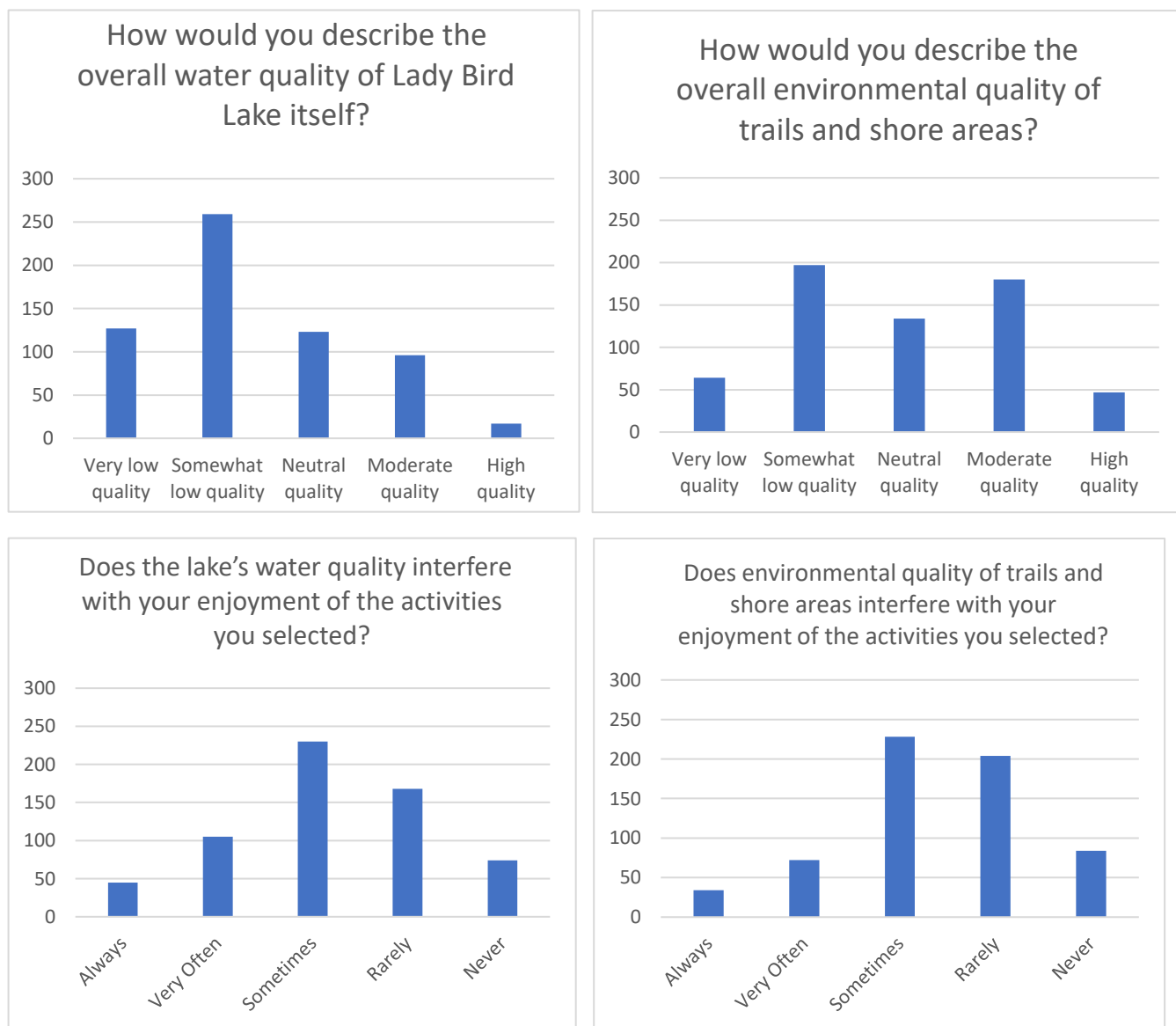
Figure 6. Responses to lake crowding questions (n = 622)



crowding, 22.7% fell into the always or often categories and 39.8% into the rarely or never groups. Thus, 61.4% experienced a loss of enjoyment due to lake crowding at least some of the time, and 60% experienced a loss of enjoyment due to shore and trail crowding at least some of the time.

Only 2.7% of respondents believe the overall water quality level in Lady Bird Lake is high, while 62.1% find it to be very low or somewhat low quality. 38.9% of respondents report that lake water quality rarely or never interferes with their enjoyment. If responses are filtered for respondents who reported participating in a water-based activity, such as canoeing, fishing, paddleboarding, or rowing, the percentage of “rarely” or “never” responses is similar.

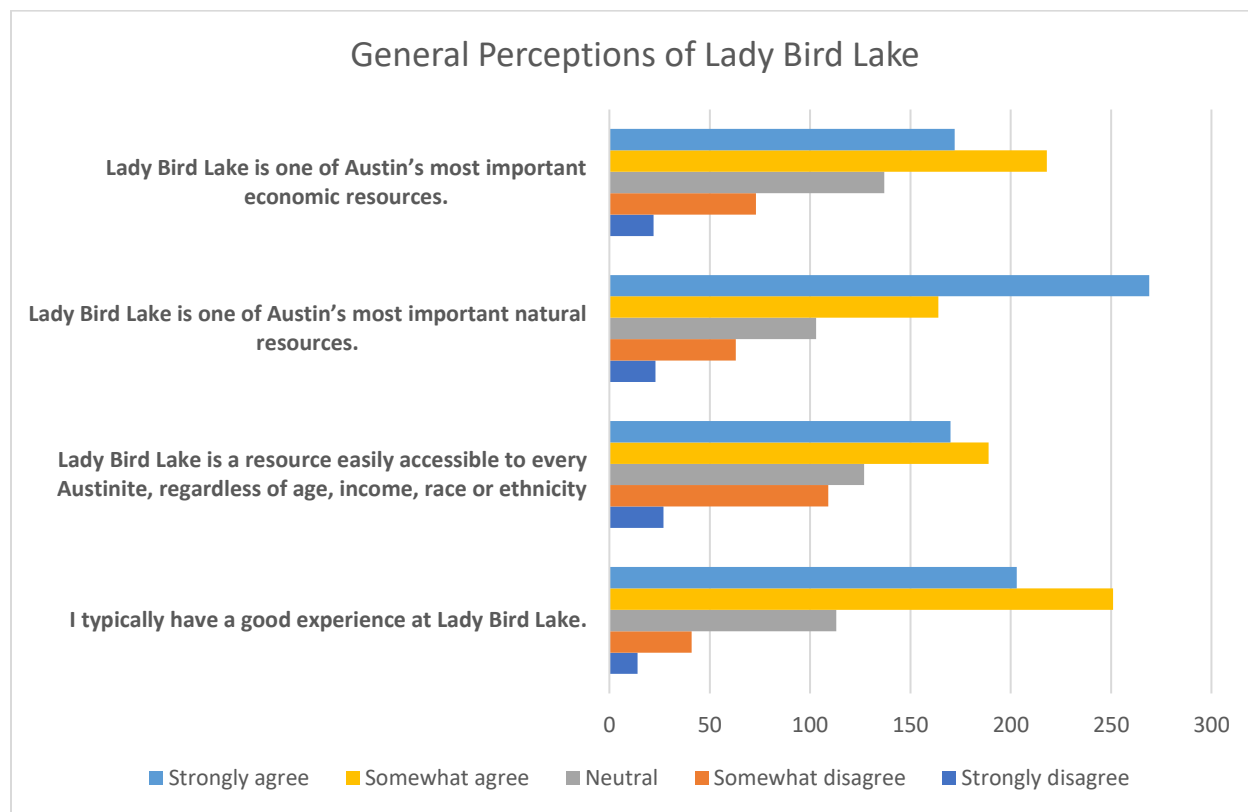
Figure 7. Responses to environmental quality questions (n = 622)



Interestingly, if filtered for kayakers, the “rarely” or “never” percentage jumps to 52.0%. The most common response across all respondents was that water quality sometimes interferes with enjoyment (36.9%). This pattern of responses is similar to that for loss of enjoyment due to crowding.

Respondents rated the environmental quality of the shoreline and trails as being slightly higher than the water quality, with a greater share of respondents indicating moderate environmental quality at 28.9%. 7.5% of respondents rated the environmental quality as high and 42.0% as very low or somewhat low. Enjoyment of lake and shore areas was slightly higher than for the water quality item, with 46.3% of respondents reporting that environmental quality rarely or never interferes with their enjoyment. It sometimes interferes for 36.1% of respondents.

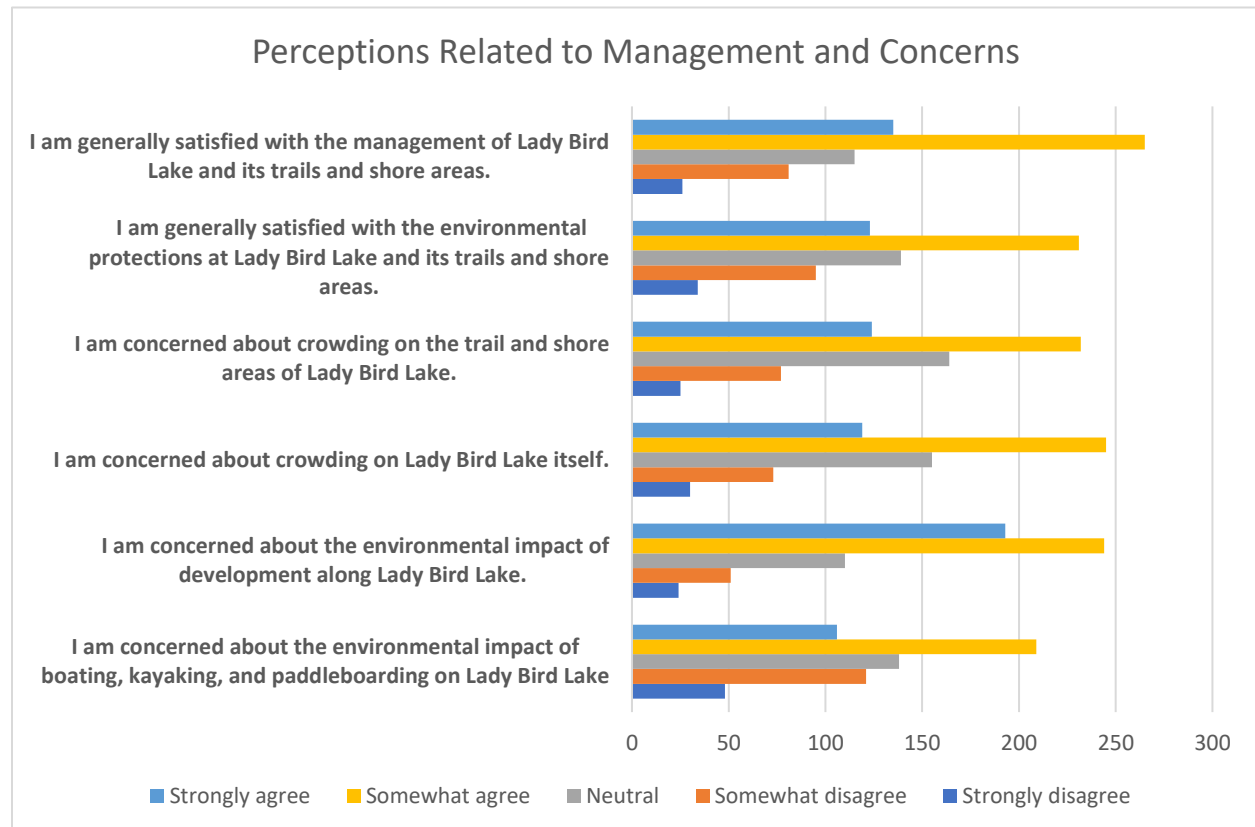
Figure 8. Responses to general perceptions of Lady Bird Lake (n = 622)



Among statements expressing general perceptions of the lake, the statement “Lady Bird Lake is one of Austin’s most important natural resources” garnered the most support, with 43.2% of respondents strongly agreeing. Indeed, 69.6% of respondents either strongly or somewhat agreed. The statement “I typically have a good experience at Lady Bird Lake” was similarly supported, with 73.0% of respondents strongly or somewhat agreeing. The statement with the

lowest agreement and highest disagreement is “Lady Bird Lake is a resource easily accessible to every Austinite, regardless of age, income, race or ethnicity,” with 21.8% somewhat or strongly disagreeing.

Figure 9. Responses to management and concern items (n = 622)



Respondents provided slightly less enthusiastic support for statements related to management and satisfaction, though the responses were still predominantly positive. 63.4% of respondents somewhat or strongly agreed with the statement “I am generally satisfied with the management of Lady Bird Lake and its trails and shore areas” and 56.9% with “I am generally satisfied with the environmental protections at Lady Bird Lake and its trails and shore areas.” However, the “somewhat” category was larger than the “strongly” category for both.

Respondents expressed the most agreement with a stated concern about the economic impact of development, with 70.3% somewhat or strongly agreeing, followed by concern with lake crowding at 58.5% and concern with trail crowding at 57.2%.

Rating of specific problems further detailed areas of concern. 57.6% of respondents indicated that algal blooms are a significant or critical problem, and 56.1% shared the same level of concern about water quality.

Table 4. Rating of potential current problems at the lake (n = 622)

	Algal blooms	Boat congestion	Costly amenities	Crowding	Degraded habitat	Environ. quality
Critical problem	23.0%	9.5%	10.6%	13.7%	17.7%	19.3%
Significant problem	34.6%	25.7%	21.5%	27.0%	30.7%	31.8%
Average problem	26.2%	37.1%	35.4%	35.5%	32.2%	31.7%
Small problem	12.2%	17.7%	20.4%	18.8%	14.3%	13.0%
Not a problem	4.0%	10.0%	12.1%	5.0%	5.1%	4.2%

	Few access points	Inadequate parking	Lack of rule enforc.	Litter/trash	Loose dogs	Noise
Critical problem	14.1%	16.1%	17.0%	19.1%	17.0%	10.3%
Significant problem	26.8%	33.0%	24.9%	32.2%	24.3%	22.5%
Average problem	32.6%	26.2%	32.6%	32.0%	31.5%	32.5%
Small problem	19.6%	16.4%	17.7%	13.8%	18.8%	20.6%
Not a problem	6.8%	8.4%	7.7%	2.9%	8.4%	14.1%

	Personal safety	Poor compliance	Property crime	Water level changes	Water quality
Critical Problem	12.2%	15.0%	13.3%	12.1%	21.4%
Significant problem	27.5%	26.8%	26.5%	22.0%	34.7%
Average Problem	30.7%	31.5%	32.8%	33.1%	27.8%
Small problem	18.8%	18.0%	19.8%	19.5%	12.2%
Not a problem	10.8%	8.7%	19.8%	13.3%	3.9%

To rank problems by respondent level of concern, a weighted composite score was calculated. The “critical problem” rating category was valued at 5 points and the “not a problem” category at 1. Each category’s point value was multiplied by the proportion of responses in the category and summed. Thus, the highest possible composite score (100% of respondents indicate that the issue is a critical problem) is 5 and the lowest (100% of respondents indicate no problem) is 1. The problems deemed highest concern by this ranking are water quality (3.75), algal blooms (3.6), litter trash (3.51), environmental quality (3.49), and degraded habitat (3.41). Inadequate parking (3.31) and property crime (3.30) are moderate concerns.

Respondents also rated their degree of concern with specific potential future threats to the lake. 94% of those surveyed thought that at least one of the activities listed threatened Lady Bird Lake over the next five years. Pollution was indicated as the most significant threat in the next five years with 60.3% of respondents deeming it a critical or significant threat, followed closely by population growth (57.7%), environmental degradation (56.4%), water scarcity (55.8%), and overuse (49.5%). Lost economic opportunity was rated as the least threatening, with 12% deeming it not a threat and 35.4% considering it a critical or significant threat.

Table 5. Rating of possible future threats to Lady Bird Lake. (n = 622)

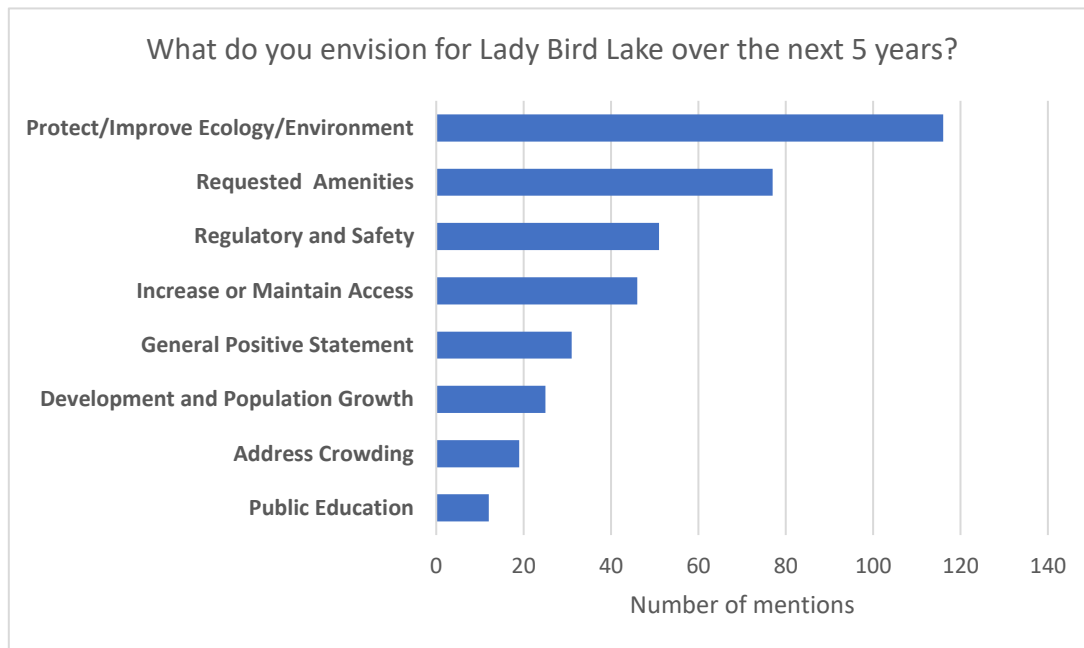
	Climate change	Environ. degradation	Inappropriate zoning	Increased costs	Lack of compliance
Critical threat	19.6%	23.2%	22.3%	14.8%	16.4%
Significant threat	27.3%	33.3%	25.6%	26.2%	25.4%
Average threat	31.0%	28.5%	26.8%	34.6%	36.2%
Small threat	13.5%	10.9%	19.3%	16.9%	16.4%
Not a threat	8.5%	4.2%	5.9%	7.6%	5.6%

	Lost economic opportunity	Overuse	Pollution	Population growth	Water scarcity
Critical threat	11.9%	18.5%	25.7%	25.2%	25.2%
Significant threat	23.5%	31.0%	34.6%	32.5%	30.5%
Average threat	32.2%	29.3%	24.9%	27.0%	27.7%
Small threat	20.4%	15.6%	11.3%	12.1%	12.1%
Not a threat	12.1%	5.6%	3.5%	3.2%	4.5%

239 respondents replied to at least one of three open-ended questions included in the survey. Their responses were categorized based on common topics and subtopics. The first open ended question, and the one with the most responses, was “What do you envision for Lady Bird Lake over the next 5 years?” Calls to continue or improve environmental protections were the most frequent topics mentioned in these 227 responses, with 116 mentions. The most common subtopics in this category included cleaning up trash/pollution, maintaining/increasing green space, and improving/maintaining water quality. The next most frequent category of response, with 77 mentions, included requests for specific amenities or improvements to Lady Bird Lake. These were similarly subcategorized, and included requests for trail improvements/widening, separation of bike and pedestrian traffic, parking, lighting, and volunteer activities. There were 51 mentions of safety and regulatory concerns (e.g., more patrols, maintaining regulations) and 46 mentions of maintaining or increasing access (e.g., increasing trail connectivity, increasing diversity). A second open-ended question “Is there anything else you would like us to know?”

yielded 60 expressions of concern, 34 requests, 24 statements of appreciation, and 4 informational responses from 101 respondents.

Figure 10. Categorized open-ended question responses (n = 239)



Interview Results

Interviews were conducted with 23 individuals. Interview subjects were ten females and 13 males, one of whom is Asian, three Black, five Hispanic, and 13 White. One subject declined to identify by race. The group included (as non-exclusive categories) four business owners, seven whose work involves the outdoors, two credentialed environmental experts, and four PARD staff who were interviewed as a group. Ten of the subjects report personal use of both the water and trails on a regular basis, with the remainder primarily using the trails and park areas. Questions prompted interview subjects to identify positive and negative attributes of the lake and share their perspectives on access points, diversity, environmental concerns (if any), economic/development concerns (if any), lake capacity, and safety. Subjects were also prompted to elaborate on any write-in responses they provided in the survey and share their perspectives on maximizing the potential of the lake and any potentially problematic lake uses.

Sentiment analysis for individual questions revealed a great deal of agreement on some of the topics listed above, with more divided results for others. 20 subjects shared environmental concerns, 1 subject had no concerns, and 2 had mixed feelings about whether there were any concerns. There were more environmental concerns expressed about the water than the trail/park areas, detailed further below. When it came to access points, 15 subjects had concerns, 7 indicated no concerns, and 1 provided a mixed response. These issues included

Table 6. Sentiment analysis of interview responses (n=23)

	Count of Subjects			Sentiment score
	Positive Sentiment/ Not Concerned	Negative Sentiment/ Concerned	Mixed Response	
Access Points	7	15	1	-2.6
Capacity	4	10	7	8.6
Development	3	7	12	-20.8
Diversity	4	11	7	-2.4
Environment	1	20	2	-30.8
Safety	3	13	8	-46.8

concerns about lack of access, distribution of access, and the effects of unofficial access points for environment and enforcement. On the topic of safety, 14 identified safety concerns, 3 had no safety concerns, and 7 provided mixed responses, most of which described the conditional nature of their concern (e.g., feels safe in a group but not alone). Responses to the capacity question yielded a similar pattern of responses, with 10 indicating a capacity concern, 4 reporting no capacity concern, and 7 mixed responses (e.g., capacity is only a problem in some areas, or on some days). 11 subjects shared concerns about the lack of diversity among lake users, 4 did not have concerns or observe a lack of diversity, and 7 had mixed responses (e.g., diversity efforts are improving,). On topic of economic/development concerns, 11 subjects expressed a negative response, 4 a positive response, and 7 were mixed (e.g., expressed a desire for more businesses while also maintaining environmental protections).

When interview subjects were asked about problematic activities, 18 expressed concerns: there were 6 references to electric scooters, 5 to the “brotilla,” 4 to electric bike speed, 3 to bike/pedestrian conflict, 2 to motorboats, and 2 to event congestion. The overall emotional tone of responses for each question was also analyzed with an automated software tool that scores sentiment of the responses on a scale of 100 (extremely positive in tone) to 100 (extremely negative in tone). The safety, environment, and development questions yielded the most negative language. Combining responses to all questions yielded several key themes and concepts.

Theme 1: Issues Relating to Health and Safety

Three invariant constituents and 81 references supported the theme that users have concerns relating to health and safety at Lady Bird Lake. Health concerns were frequently linked to the presence of trash or pollution. Safety concerns included enforcement, the camping ban, and water safety. Below are a few excerpts:

The biggest concern is runoff/sewage from the city going into the lake. When it rains, it's like a toilet flushing everything into the Lake. Also, people are inconsiderate with the

littering, throwing trash. Trash from encampments – drug paraphernalia, shopping carts, camps. Decriminalizing homelessness brought a big influx. [...] We should be aware of the health and safety issue. (Possible health problems; littering/trash is common)

Waste and dog contaminate the water. This is impacting the general health of the public. Lots of trash in the lake comes from the Creeks. (Possible health problems; littering/trash is common)

The safety at Lady Bird Lake is a major concern. There are not enough lights at nighttime. Also, the biggest issue is with the health of us who use the lake. People just drop trash all over the trails and sometimes the smell is very bad. (Lack of safety measures, littering/trash is common)

Rangers, cops, are understaffed and aren't around to enforce these things. There's not much to be done without funding. Signage can only do so much. (Lack of safety measures)

Flotillas are concerning, to have massive groups of people tied up together. [...] It makes it hard to see someone in distress and also makes it hard to find someone who has gone under. (Lack of safety measures)

Toxic algae is concerning to me and my students, also a lot to pet owners. It's just disconcerting to many. People aren't allowed to swim and this is also disconcerting. It is not 100% physically safe even if it is beautiful. (Possible health problems)

Table 7. Theme- Issues Relating to Health and Safety

Invariant Constituents	Number of Respondents	Number of References
Possible Health Problems	9	32
Lack of Safety Measures	12	30
Littering/Trash is Common	12	19

Theme 2: Concerns about Environmental Quality

Three invariant constituents and 94 references supported the theme that there is a concern with environmental quality, particularly water quality at Lady Bird Lake. Subjects typically discussed both concepts. Below are a few of the subject's words:

The real threat is the deteriorating water quality. The water does not seem safe for human beings. Even though people may not intentionally swim in the water, they still must get wet to into the boat. The water quality needs to be improved. (Poor water quality; declining water quality)

If development happens, then set aside some parts as parkland, and make sure environmental and water quality standards are met. We need education for people using the lake to know that it is a fragile ecosystem, and the city needs to improve the water quality to attract younger and more diverse individuals. (Environmental protection)

The city needs to help develop an environmental ethos to rally people to help protect water quality – not just at the lake itself but also the whole watershed. We may need this water if we ever get in dire straits. (Declining water quality; environmental protection)

I'd like to see work on the invasive species. We need to remove the invasives and plant natives. But there needs to be a comprehensive approach, not piecemealing. (Environmental protection)

We need to protect the ecosystem, all species, including humans. People do notice when there are algae blooms and it causes dog issues. But we are going to see more of these blooms with climate change and people need to understand that human and animal waste is not allowed in the water (Declining water quality; environmental protection)

I wrote about the water quality. I am not an expert but the water seems very nasty. I remember about 10 years ago, the water looked better, but it seems to be getting worse. I am very concerned about what the lake water will look like in another 10 years. (Declining water quality)

Table 8. Theme - Concerns about Water and Environmental Quality

Invariant Constituents	Number of Participants	Number of References
Poor Water Quality	11	34
Declining Water Quality	8	30
Environmental Protection	16	30

Theme 3: People Enjoy Nature and Green Spaces

As indicated in Table 3, three invariant constituents and 83 references supported the theme that people enjoy the green spaces at Lady Bird Lake and the experience of being in nature that it provides. Below are some excerpts:

The trails are a blessing to Lady Bird Lake. Even though they could do with more lighting at nighttime, I thoroughly enjoy walking the trails. I find the natural shade to be perfect, and I wish they could find ways to connect the trails together and even expand upon the existing ones. (Trails are appreciated)

The trails are the best part of Lady Bird Lake. People are bringing scooters on the trails, this is dangerous, but I don't see it too often. To protect the beautiful trails, the city should consider having bike lanes which are separate from others who are walking. When it rains, the bikes and other motorized vehicles destroy the trails and make it difficult to walk. (Trails are appreciated)

When people think of Austin, it is iconic to Austin, It is pretty, it is nice to have a relatively large natural area be at the geographical center of Austin. Austin takes a lot of pride in it and for good reason. (Very enjoyable scenery, enjoy being in nature)

I enjoy the trails at Lady Bird Lake. Sometimes I just go to see the wildlife or stare at the water. When my friends come to visit me from out of town, they always ask to walk the trails. The city of Austin must do everything to protect the trails from trash and other things that could destroy the natural beauty. (Trails are appreciated, enjoy being in nature)

It is beautiful and well-maintained and it feels like you are within an awesome area of Austin and it is not stressful. (Very enjoyable scenery)

The fact is that you don't get to see the true beauty of Austin unless you are on the water. This is the true part of Austin, the authentic part. When you are surrounded by nature, trees, the herons. The trail is always clean, accessible. You can enjoy it several different ways. It's a way to explore Austin to experience true nature and what Austin is about. The true beauty of Austin. (Trails are appreciated, enjoy being in nature)

Table 9. Theme- People Enjoy Nature and Green Spaces

Invariant Constituents	Number of Participants	Number of References
Trails are Appreciated	13	41
Very Enjoyable Scenery	6	20
Being in Nature	13	22

Theme 4: Need to Increase Access

Three invariant constituents and 84 references supported the theme that lake users would like more access points to Lady Bird Lake. Below are some a few of the participant's words:

There are not enough access points to the lake, which causes people to develop their own access points. The shoreline is nicely vegetated so when people create their own access points, it destroys some of the beauty. Perhaps the city should consider developing more access points and it make illegal to enter the lake at points that are not designated by them. (Too Few Access Points; informal access points)

There are not a lot of formal access points. The lack of formal access points is causing degradation. I have lived here in Austin for 47 years and I have seen the improvements of Lady Bird Lake, but I have also seen the degradation caused by lack of access points. I would like to see the lake be around for many more years in its natural beauty. (Informal few access points, access points can be damaging)

The lack of access points prohibits people with disabilities from accessing the lake and its trails. It's almost as though the lake is only for those who are 100%, and I don't think that is fair. (Too few access points)

Yes, particularly along shore from Congress to I-35. Lots of development was permitted without a lot of access. What happens in terms of access for emergency personnel? This will be even more true if the Statesman site is developed and you bring in thousands of people. (Too few access points)

Table 10. Theme- Lack of Access Points

Invariant Constituents	Number of Participants	Number of References
Too Few Access Points	12	39
Informal Access Points	10	28
Access Points can be Damaging	8	17

Theme 5: Need to address Diversity

Three invariant constituents and 57 references supported the theme that lake users would like more access points to Lady Bird Lake. Below are some a few of the participant's words:

I wish that the users were more diverse. I think it could be more diverse if there were ways logistically and socioculturally to bring people there. More transportation options. Public spaces like Lady Bird Lake in other cities are more diverse. (Current lack of diversity; diversity is needed)

There is no diversity. (Current lack of diversity)

I would love to have more diversity in the area, whatever gets put out there – diverse businesses will bring more people of color into the space. That seems to be what is lacking. [...] would love spaces that include more cultural events. (Diversity is needed)

The diversity in [outdoors organizations] is 100% white. Historically, there have been barriers to access about park information (Current lack of diversity)

Certain places are less diverse. Other areas that are more open are more diverse. The historical legacy of the eastern side is being more diverse. They are very different geographically too. People drive to different parts of the lake to get to the amenities

they want and the way the lake is managed differently on east and west contributes.
(Current lack of diversity)

I don't think the lake usage represents the demographics of the city. To encourage more minorities to use the lake, we must educate them on safety of the lake and the benefits of using the lake. Also, add signs, art or other things that make them feel welcomed.
(Current lack of diversity; diversity is needed)

Table 11. Theme- Lack of Diversity Among Users

Invariant Constituents	Number of Participants	Number of References
Current Lack of Diversity	7	26
Diversity is Needed	11	31

Water Quality Testing

The City of Austin Watershed Protection Department (WPD) conducts water quality testing on Lady Bird Lake multiple times a year for routine monitoring and to track specific phenomena, such as the presence of algal toxins. For routine assessment of water quality, samples are collected from three sites six times a year and used to generate a water quality score as part of the Austin Lake Index. These data, available via the City's open data portal, indicate good water chemistry for Lady Bird Lake as a whole. Values for ammonia (as N), nitrate (as N), orthophosphorus (as P), total suspended solids, *E. coli* bacteria, and conductivity are averaged across sites/dates, weighted, and combined to generate a lake score. The lake exhibits less favorable characteristics for chlorophyll-a, indicating the growth of photosynthetic algae. Algal growth indicates the accumulation of organic nitrogen and phosphorus in the lake, which is a particular challenge in Lady Bird Lake due to the large amount of urban runoff that drains into the lake.

Since routine monitoring by WPD focuses on central sites to reflect whole-lake parameters, this analysis focused on the areas that might be more susceptible to human impact due to boat congestion. Samples for analysis were collected upstream and downstream of Lou Neff Point, an area of high boat congestion, before, during, and after a peak use period in August and during a holiday weekend in Sept. This area also will reflect input of urban runoff via Barton Creek. Sample values were compared to a baseline sample collected off Red Bud Isle and to average values from the Red Bud Isle samples collected by WPD.

Nineteen parameters analyzed for the sample sites did not exhibit significant variation from the baseline and/or Austin Lake Index values and reflected fair - good water quality. These parameters include bromide, calcium, chloride, fluoride, magnesium, manganese, sodium, ortho-phosphate (as P), nitrite (as N), sulfate, bicarbonate, hydroxide, silica (as SiO₂), specific

conductance, total alkalinity, total dissolved solids (TDS), total hardness, and pH (see appendix for detailed results).

Table 12: Water Quality Parameters That Exhibited Variation from Baseline

Date	Site	Iron Total	Potassium Total	Nitrate (as N)	Nitrate/ Nitrite as N	Pheophytin -A	<i>E. coli</i> (MPN/ 100mL)	Period
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)		
8/18/22	LN US	<0.0500	4.48	0.0208	0.0208	0.876	8.52	Pre-Peak
8/18/22	LN DS	0.0559	<u>5.35</u>	0.0683	0.0683	1.65	1	Pre-Peak
8/20/22	LN US	<0.0500	4.04	0.0981	0.0981	1.5	nd	Peak
8/20/22	LN DS	0.243	4.2	0.11	0.11	4.23	nd	Peak
8/22/22	LN US	<0.0500	4.06	0.112	0.112	4.82	22.8	Post-Peak
8/22/22	LN DS	0.129	3.84	<u>0.254</u>	<u>0.254</u>	2.4	81.3	Post-Peak
9/4/22	LN US	<u>0.386</u>	3.94	0.0424	0.0424	5.23	138	Holiday
9/4/22	LN DS	<u>0.661</u>	3.99	0.0911	0.0911	6.66	222	Holiday
10/1/22	RBI	0.0634	4.2	0.0133	<0.0200	<0.500	3.06	Baseline
2020-21	RB ALI	-	-	-	0.1129	0.649	8.71	Baseline

There were deviations from baseline for a few parameters at one or more of the sample sites. These include iron levels on Sept 4, potassium on Aug 18, and nitrate/nitrite on Aug 22, indicated below with italic underlined values in Table 11. The most notable elevations from baseline occurred for *E. coli* readings, indicated in bold in Table 11. (*E. coli* is an indicator of fecal contamination.) The baseline value was 3.06 MPN/100mL at Red Bud Isle and an average of 8.714 MPN/100mL from the 2020 and 2021 ALI samples collected at Red Bud Isle. *E. coli* readings were elevated in samples collected after peak use on Monday August 22, 38 hours after the peak use period on Saturday, and in the samples collected on September 4, the Sunday of the Labor Day holiday weekend. These elevations are consistent with both increased human activity in the area and the input of storm drainage via Barton Creek. Pheophytin-a, an indicator of phytoplankton presence, was also elevated over baseline for seven samples, also highlighted in bold, raising concern about eutrophication. However, these values are difficult to contextualize with the use of such a limited baseline set of data. A more consistent analysis with more sampling points is needed to ascertain and distinguish the impacts of runoff and human activity on the water quality in the lake.

During this time period, WPD was conducting algal toxin testing on Lady Bird Lake, which yielded positive values for toxins in algae but negative values for toxins in water. A Phoslock treatment had been conducted in July 2022 to curb algal growth.

Habitat Assessment

Ten sites are assessed annually for habitat quality as part of the Austin Lake Index. The same methodology used for the ALI was applied to assess habitat at 9 informal/nonpublic access points on the south and north shores of Lady Bird Lake to focus on areas most likely to show the effects of human impact via foot traffic. An evaluation of a location with a prominent human structure (a boat dock) was included for comparison. The habitat assessment included evaluation of the shoreline and riparian areas. The shoreline extends one meter away from the water's edge and the riparian area between one and 15 meters from the water's edge. Both zones were evaluated in a 15-meter-wide tract at each site.

The shoreline assessment includes an evaluation of substrate type and abundance, the slope of the bank to the water, and the presence and location of any human-made structures. More favorable substrates (boulder, cobble/gravel, and vegetation) are given a higher rank score, which is multiplied by their abundance. Slope bank angles of less than 30° are most favorable, and vertical bank angles least favorable, with ranks assigned accordingly. Human made structures are most impactful (and thus scored lowest) when they are on the waterline. Each of these scores is converted to a percentage, then averaged for each site. The average shoreline habitat score for the nine informal access points assessed was 76.1 on a scale of 0-100, with a range of 61.2 to 92.2. This score reflects erosion and human traffic in these areas.

Table 13: Habitat Assessment Scores (Scale 0-100)

Site	South 1	South 2	South 3	South 4	South 5	North 1	North 2	North 3	North 4	Dock Site
Shoreline Score	79.1	83.5	61.3	71.9	92.2	76.3	76.3	79.4	65.2	19.4
Riparian Score	18.8	25.0	37.5	37.5	37.5	43.8	43.8	41.7	50.0	0.0

The riparian zone was similarly assessed to provide further insight into habitat quality. The components of this assessment include the width of the riparian zone, and evaluation of the abundance of distinct types of vegetation in the categories of canopy, understory, and ground cover. Invasive species and human structures are also tabulated. For this assessment, the vegetation abundance is multiplied by a rank score representing the width of the riparian zone, with the highest score for a zone that extends past 18 meters from the shoreline. Invasives and human structures represent negative rank scores that are similarly multiplied by the abundance factor. The scores are summed, converted to a percentage, and averaged across the sites. The average riparian zone score for the nine informal access points assessed was 37.3 on a scale of 0-100, with a range of 18.6 to 50.0. We did not note invasives at any abundance over 10% at any of the sites. We did note barren ground at many sites at abundance of 10% and up, which reduced this score considerably.

Environmental Justice Analysis

Environmental justice analysis has relevance to Lady Bird Lake given the history of segregation, redlining, environmental disparities, and other systemic and racial inequities perpetrated in east Austin. As a precious natural resource that physically spans the east-west divide of IH-35, Lady Bird Lake has exciting potential to serve as shared community resource that facilitates connection and mutual learning. Indeed, interview subjects, 40% of whom identify as people of color, expressed considerable pride in Lady Bird Lake even as they noted shortfalls in inclusion for people of color, individuals with disabilities, and lower income individuals. Thus, it is important to understand the demographics of the people who live nearest to the lake and are by virtue of proximity among those poised to benefit the most from additional amenities, programming, vendor capacity, and other shifts.

EJ screen data reflect demographic differences between the population residing near Lady Bird Lake west of I-35 and those residing near the lake east of I-35. The population considered “near the lake” was determined by delineating the 0.25-, 0.5-, and one-mile zones extending from the shoreline of the lake in any direction, and by combining the census block groups whose perimeters fell within 0.25 miles of the shoreline. 22 census block groups were included for the “West of I-35” group and 12 for the “East of I-35 group. Under any of these conceptions of proximity, there are notable differences between east of I-35 and west of I-35 with respect to percent people of color (20-29 percentage points difference, or 1.8-2 times higher in east Austin), percent low income (10-24 percentage points difference, or 1.6-2.7 times higher in east Austin), limited English speaking (3-7 percentage points difference, or 2.5-3.3 times higher in east Austin), and percent with less than a high school education (5-9 percentage points difference, or 2.46-4 times higher in east Austin).

Table 14: Demographic characteristics of the population residing near Lady Bird Lake

	0.25 mile radius		.5 mile		1 mile		Census Block	
	East of I-35	West of I-35	East of I-35	West of I-35	East of I-35	West of I-35	East of I-35	West of I-35
Population	5709	14070	18094	24299	41698	56158	12391	25407
Area (sq. miles)	1.360	2.950	2.770	5.810	6.730	12.670	2.03	7
People of Color	50%	29%	57%	28%	55%	30%	45%	25%
Low Income	31%	16%	38%	14%	38%	18%	25%	15%
Unemployment Rate	2%	2%	3%	2%	2%	3%	5%	2%
Limited English Speaking	5%	2%	6%	2%	7%	2%	10%	3%
< High School Education	8%	3%	11%	3%	12%	5%	12%	3%
Under Age 5	1%	3%	3%	3%	4%	4%	4%	3%
Over Age 64	5%	11%	7%	12%	7%	11%	11%	11%
Demographic Index	41%	22%	47%	21%	46%	24%	41%	20%

The unemployment rate and the percentage of the population who are children under age 5 in east and west sectors was comparable, except for when proximity was delineated by the census

block group method. The percentage of the population over the age of 64 was higher in the west (1-6 percentage points difference, or 1.3-2.2 times higher), except for when proximity was delineated by the census block group method.

Comparison of environmental exposures across 12 environmental parameters were comparable between east and west sectors of the lake with some exceptions. Exposure was similar for particulate matter 2.5, diesel particulate matter, ozone, the air toxic cancer risk index, the air toxics respiratory hazard index, and Superfund proximity. Traffic proximity was 1.5-2.5 times higher for the population living in the west sector, due to the combined exposures of I-35 and Mopac (the index is based on highway traffic). Proximity to regulated management plan sites was also higher in the west sectors under most definitions. Proximity to hazardous waste, underground storage tanks, and lead paint hazard (represented by the percentage of homes constructed before 1960) was higher in east sectors

Table 15. EJ Screen pollution sources

	0.25 mile radius		.5 mile		1 mile		Census Block	
	East of I-35	West of I-35	East of I-35	West of I-35	East of I-35	West of I-35	East of I-35	West of I-35
Population	5709	14070	18094	24299	41698	56158	12391	25407
Area (sq. miles)	1.360	2.950	2.770	5.810	6.730	12.670	2.03	7
PM 2.5 ($\mu\text{g}/\text{m}^3$)	9.88	9.89	9.88	9.89	9.88	9.89	9.89	9.88
Ozone (ppb)	38.30	38.60	38.30	38.60	38.40	38.60	38.37	38.69
Diesel PM ($\mu\text{g}/\text{m}^3$)	0.288	0.286	0.279	0.283	0.280	0.276	0.299	0.277
Air Toxics Cancer Risk	30	30	30	30	30	30	30	30
Air Toxics Respiratory HI	0.34	0.33	0.36	0.33	0.35	0.33	0.36	0.32
Traffic Proximity	1600	3500	1200	3000	1500	2200	1707	2539
Lead Paint	0.13	0.05	0.17	0.14	0.15	0.21	0.34	0.17
Superfund Proximity	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
RMP Facility Proximity	1.50	2.20	1.50	1.80	1.40	1.40	1.33	1.62
Hazardous Waste Proximity	1.60	1.00	1.60	0.99	1.60	1.00	1.53	0.90
Underground Storage Tanks	6.00	3.30	5.00	3.70	5.80	4.00	7.58	3.13
Wastewater Discharge	5.00E-05	9.20E-05	3.80E-05	6.50E-05	4.20E-05	3.90E-05	3.91E-05	5.52E-05

Units: Air Toxics Cancer Risk (lifetime risk per million); Air Toxics Respiratory Hazard Index (ratio of exposure concentration to health-based reference concentration, Traffic Proximity (daily traffic count/distance to road), Lead Paint (% Pre-1960 Housing), Superfund Proximity (site count/km distance), Regulated Management Plan Facility Proximity (facility count/km distance), Hazardous Waste Proximity (facility count/km distance), Underground Storage Tanks (count/km²), Wastewater Discharge

Unlicensed Vendors

Unlicensed vendors represent a pressure on lake capacity whose impact is not well quantified. It is impossible to easily distinguish by visual inspection which boats on the water belong to licensed vendors, which are brought in by unlicensed vendors, and which belong to private citizens. Analysis of 311 data did not offer much insight, with only three items logged in 2022 as “PARD - Commercial Use of Parkland.” PARD staff note specific 311 items being reported in 2021, which suggests that the calls may have been flagged differently prior to 2022, making

tracking difficult. PARD staff compiled information on at least nine unlicensed vendors utilizing parkland for lake access in 2021 and 2022. Five of these vendors were also noted in social media advertisements compiled by the research team. Two additional reported instances involved vendors who could not be identified by name, so it is unclear if these are distinct vendors or redundant with the identified nine. One of the vendors was associated with the aggregated “brotilla” that assembles at the mouth of Barton Creek on Saturdays. This aggregate represents about 40% of the previously noted concentration of boats in the Mopac to Lamar segment of the lake on Saturdays, contributing significantly to the lake exceeding carrying capacity on these days. Another vendor deploys craft that use battery-powered motors to reach speeds of up to 25 mph. Regulations limit the capacity of motorized craft on Lady Bird Lake to 5 horsepower. A 5 hp engine on a boat typically achieves 4-10 mph depending on lake conditions, thus this vendor is in violation not only of license requirements but also of the restriction on motorized vessels. Yet another unlicensed vendor runs night cruises, another situation that represents potential additional hazard. Enhanced enforcement will be needed to mitigate the safety and environmental issues caused by these unpermitted activities.

Conclusions and Recommendations

In this report, carrying capacity was approached through four frames: recreational, ecological, spatial/facility-based, and experiential. Boat census results indicate that the recreational carrying capacity of Lady Bird Lake is exceeded during peak periods (weekends). On those days, the average whole lake boat density as determined by aerial census is 0.5 acres/boat. The published target density for canoes and kayaks is 1-1.3 acres/boat, so overall the lake is about twice as congested as is desirable. In the most used segments of the lake on peak days, the boat density is 0.075 acres/boat or 13X more congested than the target density. The whole lake boat density on non-peak days (weekdays) is well within the carrying capacity at 2.34 acres/boat. However, even during non-peak days, the Mopac-Lamar segment of the lake exceeds carrying capacity, with density measurements of 0.78 acres/boat.

More data are needed to fully address the ecological carrying capacity of the lake, though the results of water quality testing and user feedback indicate reasons for concern. *E. coli* bacterial counts were elevated around the area of highest lake congestion both during and after peak use periods. An algal growth indicator was also elevated in this area during and after peak use. In addition, habitat assessments indicated concern is more trafficked areas. However, given the combination of factors that influence lake water chemistry, including recent rainfall and urban runoff, a more comprehensive assessment, both geographically and in terms of metrics, is needed to fully understand the impact of human activity on the lake and elucidate trends vs background fluctuations. The flow-through nature of the reservoir introduces both resilience

and complexity in interpreting environmental impacts and accumulations. Additional considerations for monitoring are recommended below.

Mixed results were obtained relevant to spatial or facility-based carrying capacity. Parking census data for selected lots indicated good parking availability. However, concerns about inadequate parking and, more broadly, concerns about crowding and access were frequently referenced in interviews and evident from survey results. Just under half (49.1%) of survey respondents considered inadequate parking a significant or critical concern, 58.5% expressed strong or moderate concern with lake crowding, and 57.2% with trail crowding. Finally, feedback from users suggests that the experiential/social carrying capacity of the lake is being exceeded by current use patterns for many respondents, with 61.4% experiencing a loss of enjoyment due to lake crowding at least some of the time. Interview subjects also commonly expressed concern about the effects of crowding on congestion on the lake. Both interview subject and respondents to open-ended survey questions identified population growth as a concern, and approached crowding as an inevitability.

It is important to contextualize these results in the face of anticipated challenges to the resilience of the lake, including population growth, climate change, and increased watershed pressures. While carrying capacity is not being exceeded every day by every definition, the results in this report highlight the need for proactive intervention, both to address current patterns of crowding and mitigate the impact of increased human pressure on the lake. These interventions can also help to address the other lake-related concerns raised by stakeholders in the interviews and surveys. Some recommendations for action (not in priority order):

1. Reduce Congestion

- a. The concentration of watercraft in the segment of the lake between Mopac and First Street, particularly at the mouth of Barton Creek, is a major contributor to unfavorable boat density. Introducing amenities and formal access points east/south of Congress and west/north of Mopac may help to alleviate this congestion, which is likely to intensify with the development of the former Austin American Statesman site.
- b. Adding more formal access points will help to protect the shoreline from erosion due to informal access points. Adding more formal access points and amenities east of Congress may also help diversify lake users.
- c. Amenities to consider include those that may welcome different users to the park, especially outside of the most congested areas. Suggestions from our respondents include food/coffee vendors, minority-owned businesses, picnic areas, art areas, and a fishing pier.

- d. Introducing a boat labeling/badge system for watercraft of licensed vendors can help PARD and others to monitor and control the contribution of watercraft from unpermitted vendors to congestion. This would require more resources for enforcement. However, we do not recommend badging, fees, or any similar measures for personal watercraft, as this would significantly interfere with access and the availability of Lady Bird Lake as a free resource to the public. The desirability of maintaining unrestricted public access was a key point in interview feedback.

2. Increase Connectivity

- a. Increasing the connectivity of the Butler Trail system to other trails and parks would help to alleviate congestion, relieving traffic and increasing facility and amenity availability. This could also help to distribute users who currently concentrate in one area if paired with amenities and programming offered in the connected parks. Interview subjects frequently referenced the appeal of Lady Bird Lake as centering around natural beauty and the ability to experience green spaces in an urban environment. Efforts to offer this level of experience at connected parks may help to alleviate Lady Bird Lake congestion.
- b. Increases to connectivity, if conducted strategically and with community involvement, may enhance the issue of low user diversity and increase access for groups who typically do not utilize Lady Bird Lake. Trail connectivity may also be linked to public transit connectivity to alleviate parking pressure around the lake.

3. Enhance/Expand Programming

- a. In tandem with amenities and access points, offering programs outside of the highest congested area (Mopac to First Street) may help to relieve crowding and mitigate its consequences. These programs can also extend to connected parks to enhance trail connectivity efforts and may include expansion of PARD's current programming as well as programs developed with partnering organizations. However, these efforts should be balanced to ensure that Lady Bird Lake also remains a resource for those who do not live in the immediate vicinity, with continued efforts to introduce Lady Bird Lake to segments of the population who may not have previously made use of the lake.
- b. Culturally relevant programming can enhance efforts to diversify lake users and bring more people into the networked trail/park system. Specific examples from surveys and interviews include movie nights, sports competitions linked to community organizations, food events, and family events that include educational components for K-12.

- c. Educational programming can enhance safety and support environmental protection efforts. (See more below.) Educational programs also present opportunities to increase diversity and recruit new park ambassadors.

4. Enhance/Expand Public Education

- a. Enhancing water safety and boating etiquette education efforts will help to mitigate the dangers introduced by boat congestion. This can be coordinated in partnership with vendors and outdoors organizations. Consider more visible signage to enhance water safety, particularly in areas of high boat density. Floating aggregates of boats introduce increased drowning risk due to decreased visibility, making safety education more urgent. The consumption of alcohol is likely higher in these aggregates compared to a mobile kayaker or paddler, further increasing risk.
- b. Education about the impact of trash in the lake, particularly for users who float in large aggregates, may help to reduce the pollution introduced by this practice. Providing watercraft vendors and members of the public with reusable string bags to use in place of plastic bags can be linked to an educational campaign about lake impacts. Trash reduction efforts conducted in San Marcos were highlighted in a recent Watershed Protection report on trash in the watershed; this report detailed several user-level interventions.
- c. Watershed protection education, not just for lake users, but for all Austinites is also recommended to help reduce the pollution entering the lake (and all our bodies of water) via our urban watersheds.
- d. There is a disconnect between the actual water quality of Lady Bird Lake (good with some critical concerns such as algae) and the perception of many members of the public, who may interpret the appearance of aquatic vegetation and/or the swim ban as indicating dangerous water chemistry. This is an area for continued education/awareness.
- e. Diversity efforts should be enhanced through education, both through PARD and in partnership with other organizations and businesses. (See more below.)

5. Increase Diversity

- a. The issue of diversity in the outdoors is complex. Use patterns for underrepresented groups in outdoors activities and/or locations reflect a combination of factors, including socioeconomics, preference, level of outdoors access/awareness/exposure, relationship with government entities, discrimination, and a long history of systemic racism. Thus, current use patterns should not be interpreted as inevitable or as an accurate reflection of capacities and interests. A resource toolkit is recommended to help address this gap in understanding.

- b. Cultural relevance is critical in programming, both to broaden participation and create a sense of welcome. Education efforts also represent a channel for increasing diversity by simplifying the learning curve for new users of all ages.
- c. Organizations or businesses led by people of color, and/or volunteers who represent diverse demographics are potential lake ambassadors who can increase diversity of lake users and support the environmental protection and safety education efforts discussed above.
- d. Even advocates of outdoors diversity can benefit from training on understanding systemic racism, dissecting stereotypes, and learning how to be inclusive and engage new users. This type of training, and better yet, ongoing departmental assessment, will yield stronger community awareness of and action on behalf of the parks.

6. Leverage Interns and Volunteers

- a. Our respondents, via survey and interview, expressed a high level of appreciation for Lady Bird Lake as a treasured Austin resource. This good will can be channeled into existing or new volunteer efforts that support the protection of the lake's environmental quality.
- b. Several current Lady Bird Lake volunteer activities focus on trash clean up and trail maintenance. These efforts are important. However, volunteers may also be able to assist with invasive species tagging, public education campaigns, and/or helping to manage periods of congestion (e.g., lake ambassadors)
- c. Interns may be able to provide another level of support with public education (social media campaigns, campus and school programs) and citizen science approaches.
- d. Corporate volunteer programs sometimes provide funds to support these efforts along with a volunteer pool.

7. Increase Environmental Monitoring

- a. The flow-through nature of Lady Bird Lake allows certain pollutants to move downstream and ultimately pass into the Colorado River while others accumulate in sediment. To better assess human impacts and lake health, these pollutants, such as microplastics, should be monitored on a regular basis. It may also be useful to analyze sediment in a larger number of locations in the lake.
- b. Water quality measurements taken at key central sites provide insight into large scale trends over time, but are not suited to profiling and understanding the specific impacts of events such as storms and large amount of human presence. Monitoring the most vulnerable lake and shore areas may provide an early warning system for environmental quality challenges.

- c. One way to assess the resilience of the lake is to monitor how quickly it returns to baseline after a perturbation. This requires frequent sampling or continuous monitoring. It may be valuable to explore continuous monitoring solutions, such as those employed in Lake Tahoe (nearshore sensor system) or Lake Kentucky (buoy-based system) to understand these dynamic perturbations.
- d. Monitoring of species biodiversity is currently based on benthic macroinvertebrate assays carried out once per year. Sampling more frequently and from a greater number of sites will provide more comprehensive information, and help to understand variations and trends. DNA-based methods for invertebrate identification may be used to facilitate a more cost-effective and rapid analysis.
- e. Many student and citizen science groups engage in water quality testing, but varying methodologies may prevent this data from being actionable. Training for more citizen scientists, and/or coordination through an existing platform, such as TurbAqua, or organization may help to standardize and quality test these approaches for implementation and provide more data for assessing
- f. Strategic planning that considers the complexity and intensity of the combined pressures of urban growth and climate change on Lady Bird Lake over the next decades should be heavily informed by the expertise in Austin's Watershed Department in addition to PARD and other state and regional entities.

8. Address Administration and Enforcement

- a. Implementing all the above will require either new funding or a reallocation of funding. PARD may consider exploring the vendor fee models implemented in other cities and the extent to which new or existing partnerships may support these efforts.
- b. Public safety was a significant concern to survey and interview subjects, with many respondents expressing a need for more patrols. While this does not address capacity directly, public safety pressures will increase with increased growth. Particular concerns discussed involved personal safety, vehicle security, and the presence of encampments in the park.
- c. A more robust system for identifying unlicensed vendors and enforcing penalties is needed to support current regulations. These vendors represent a gap not just in addressing lake capacity, but in also managing and coordinating safety and environmental protection.

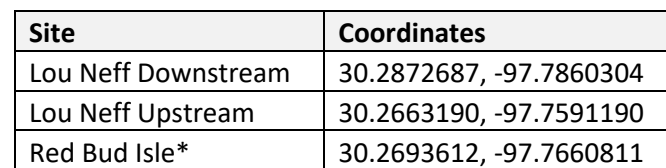
Acknowledgements

The authors are grateful to the staff at the Parks and Recreation Department for their assistance with the research project, especially to Suzanne Piper, Pat Rossett, and Maggie Stenz, who provided access to Department data and made key contacts for the research team. We also appreciate the personnel at Watershed Protection Department who provided assistance, especially Gavin Tabone for capturing drone footage and Brent Bellinger who provided guidance and contacts for water testing. Finally, we are grateful to the many lake users who responded to the survey and interview subjects who shared their insights. Your perspectives were critical to shaping this report.

References

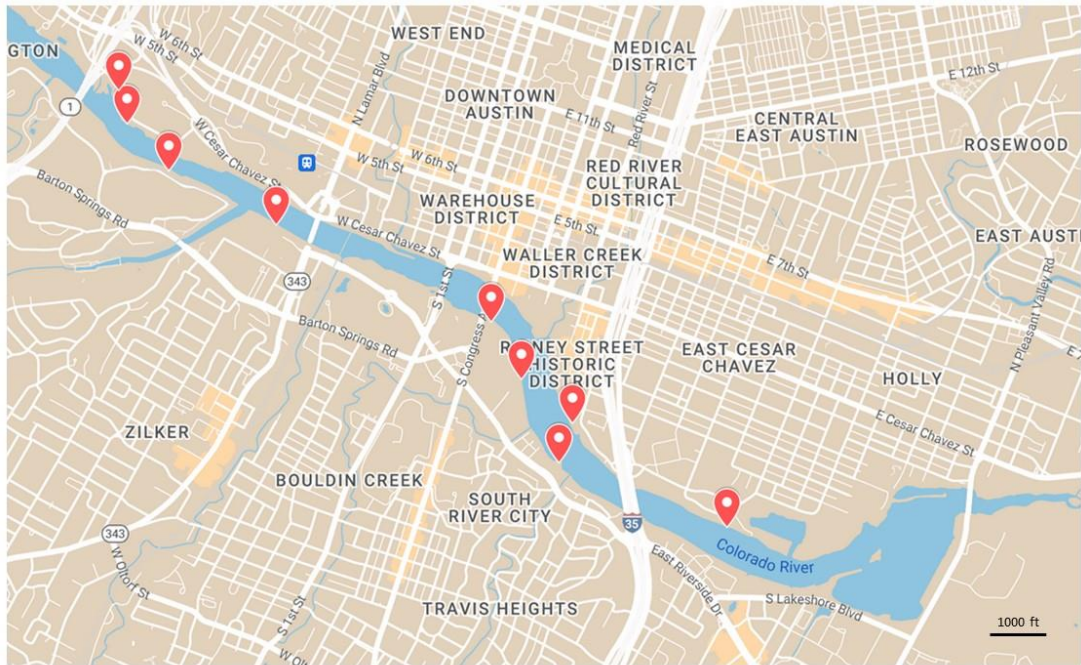
- Bellinger, B. Screening of phytoplankton blooms for Cyanobacteria species composition, abundances, and toxins. City of Austin Watershed Protection Department, September 2018.
- Bellinger, B. Contact Recreation Considerations for Lady Bird Lake. City of Austin Watershed Protection Department, October 2020.
- CDM Federal Programs Corp. Raystown Lake Carrying Capacity Study. Prepared for the U.S. Army Corps of Engineers, Baltimore District, May 2019.
- CDM Smith. Beaver Lake Boating Carrying Capacity Study. Prepared for the U.S. Army Corps of Engineers, Little Rock District, 2017.
- Clamann, A. Trash in Creeks Field Investigation Report and Benchmark Research Study. City of Austin Watershed Protection Department, November 2022.
- Doshi, Sheela. Recreational Carrying Capacity in Lakes: How Much is Too Much? Water Column, Indiana Clean Lakes Program 2006 (18) 2: 1-3.
- Doshi, S. 2011. Recreational Carrying Capacity in Lakes. Indiana Clean Lakes Program, Factsheet 10-02.
- Jaakson, R., Buszynski, M. D., & Botting, D. 1989. Carrying capacity and lake recreation planning. The Michigan Riparian 1989, 14: 11-12.
- Lake Ripley Development District. Lake Ripley Lake Ripley Watercraft Census & Recreational Carrying Capacity Analysis. Cambridge, WI 2003.
- Progressive AE. Four Township Recreational Carrying Capacity Study. Prepared for Four Township Water Resources Council, Inc. and the townships of Prairieville, Barry, Richland, and Ross, 2001.
- Richter, A. Creation of a multi-metric index for describing the environmental integrity of Austin-area lakes. City of Austin Watershed Protection Department, September 2011.
- Scoggins, M., Richter, A., Bellinger, B., and Strickler Warren, K. A review of surface water quality trends in streams and reservoirs in Austin, Texas: 1994-2018. City of Austin Watershed Protection Department, September 2018.
- The Texas Stream Team. Lady Bird Lake Watershed Data Report. The Meadows Center for Water and the Environment at Texas State University, September 2019.
- Texas Water Development Board. Volumetric Survey of Lady Bird Lake. December 2009.
- Votruba, A.M., and Corman J.R. Definitions of Water Quality: A Survey of Lake-Users of Water Quality-Compromised Lakes. Water 2020, 12, 2114.
- Warren, R., and P. Rea. Management of Aquatic Recreation Resources. Columbus, Ohio: Publishing Horizons Inc. 1989.
- Watershed Management Division. Lake Austin/Town Lake Water Quality Data Analysis. City of Austin Department of Public Works, February 1984.

Appendix 1: Water Sampling Sites



*not depicted on map

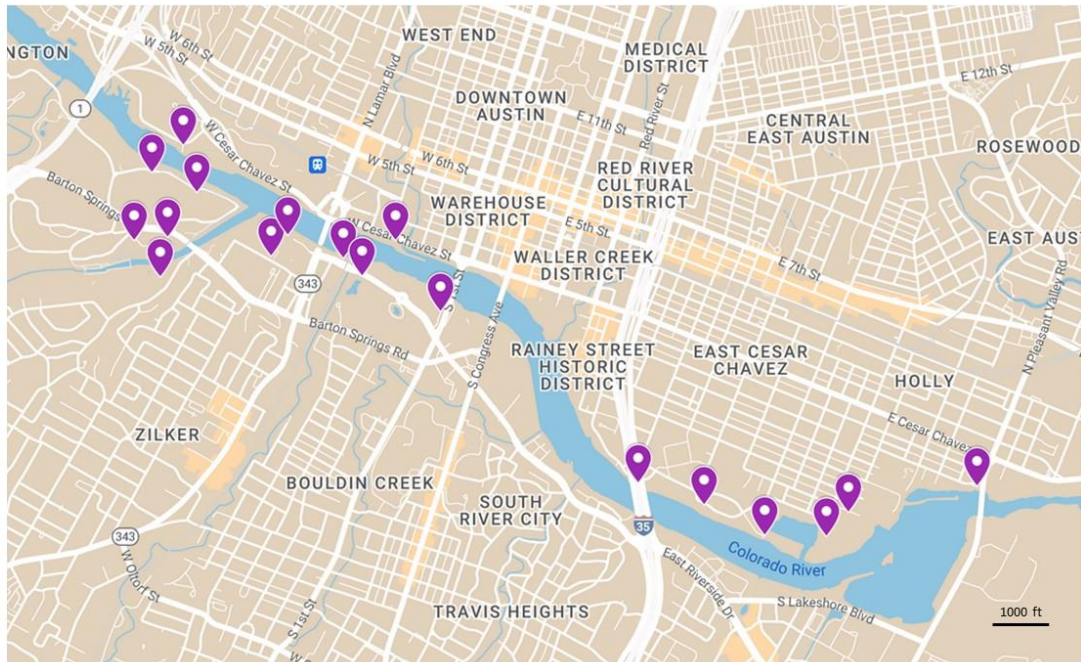
Appendix 2: Habitat Assessment Sites



Site	Coordinates
Lou Neff Water Site 1 (South 2)	30.2663190, -97.7591190
Lou Neff Water Site 2 (South 3)	30.2693612, -97.7660811
SoCo Apartments (South 1)	30.2572873, -97.7430017
Congress Bridge (South 4)	30.2605540, -97.7449898
Cidercade (South 5)	30.2525076, -97.7405888
Texas Rowing Club (Dock for Comparison)	30.2718240, -97.7689440
Marsh 1 (North 1)	30.2737799, -97.7695616
Marsh 2 (North2)	30.2737799, -97.7695616
Red Bud Isle* (North 3)	30.2878173, -97.7860079
Festival Beach (North 4)	30.2489282, -97.7294686

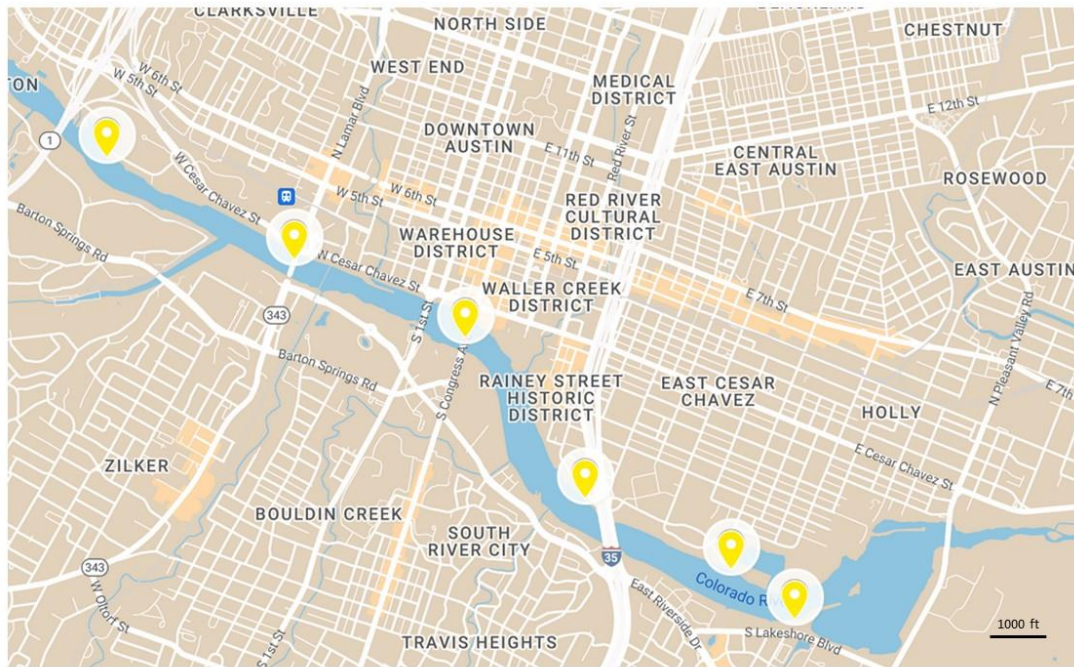
*not depicted on map

Appendix 3: Parking Lot Count Sites



Site	Coordinates
Holly Shores	30.251355, -97.713895
Central Austin Youth League	30.249843, -97.722300
Calisthenics Gym	30.248550, -97.723744
Expedition School	30.248648, -97.727765
Edward Rendon Park	30.250320, -97.731758
Under IH-35	30.251571, -97.736063
Shoal Beach	30.265319, -97.752030
Austin High Boat Launch	30.270691, -97.765930
Zilker Volleyball Courts	30.269158, -97.768030
Parking Lot near Austin Scoop	30.268071, -97.765091
Barton Creek Pay Parking	30.265280, -97.769251
Andrew Zilker	30.265487, -97.766999
Azie Morton Rd	30.263196, -97.767523
Butler Shores Pay Parking	30.264409, -97.760249
Lamar Parking	30.265579, -97.759072
Between the Bridges	30.264296, -97.755524
First Street	30.263315, -97.754237
Riverside PayParking	30.261321, -97.749022

Appendix 4: Ground Count Sites



Site	Coordinates
Epic SUP	30.245715, -97.723683
Festival Beach	30.249974, -97.732096
Holiday Inn Boat Ramp	30.252547, -97.737526
Congress Bridge	30.261481, -97.745292
Lamar Bridge	30.266364, -97.756393
Texas Rowing Center	30.271916, -97.768914

Appendix 5: Water Sampling Results

		Calcium Total	Iron Total	Magnesium Total	Potassium Total	Sodium Total	Manganese Total	Bromide	Chloride	Fluoride
Date	Site	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/18/2022	LN US	42.9	<0.0500	21.4	4.48	22.7	0.0161	0.172	38	0.214
8/18/2022	LN DS	46.9	0.0559	22.5	5.35	24.1	0.0131	0.182	38.8	0.23
8/20/2022	LN US	43.2	<0.0500	20.8	4.04	23.3	0.0219	0.162	35.7	0.21
8/20/2022	LN DS	45.9	0.243	21.4	4.2	24.3	0.0356	0.161	35.7	0.177
8/22/2022	LN US	46.6	<0.0500	21.8	4.06	24.5	0.0288	0.168	36.7	0.21
8/22/2022	LN DS	54.2	0.129	22.6	3.84	25.2	0.0206	0.183	36.9	0.225
9/4/2022	LN US	52.8	0.386	21.8	3.94	23.7	0.0462	0.172	39.3	0.228
9/4/2022	LN DS	59.2	0.661	22.8	3.99	24	0.0338	0.177	38.9	0.227
10/1/2022	RBI	46.9	0.0634	22.5	4.2	24.6	0.0561	0.169	39.5	0.23

		Nitrate (as N)	Nitrate/Nitrite as N	Nitrite (as N)	ortho-Phosphate (as P)	Sulfate	Chlorophyll-a	Pheophytin-A	pH	Temp C	Ecoli MPN/100mL
Date	Site	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L			
8/18/2022	LN US	0.0208	0.0208	<0.0100	<0.0100	24	1.75	0.876	8.3	32	8.52
8/18/2022	LN DS	0.0683	0.0683	<0.0100	<0.0100	25.5	2.85	1.65	8.3	32	1
8/20/2022	LN US	0.0981	0.0981	<0.0100	<0.0100	24.2	2.98	1.5	8	31	nd
8/20/2022	LN DS	0.11	0.11	<0.0100	<0.0100	24.5	8.33	4.23	8.2	30	nd
8/22/2022	LN US	0.112	0.112	<0.0100	<0.0100	24.8	5.89	4.82	8	29	22.8
8/22/2022	LN DS	0.254	0.254	<0.0100	<0.0100	27.2	3.27	2.4	8	29	81.3
9/4/2022	LN US	0.0424	0.0424	<0.0100	<0.0100	28.1	11.1	5.23	8.2	28	138
9/4/2022	LN DS	0.0911	0.0911	<0.0100	<0.0100	28.8	14.5	6.66	8.2	26.5	222
10/1/2022	RBI	0.0133	<0.0200	<0.0100	<0.0100	23.4	10.4	<0.500	8.3	26.4	3.06

		Bicarb. Alkalinity	Carb. Alkalinity	Hydroxide Alkalinity	Phenol phthalein Alkalinity	Total Alkalinity (CaCO3)	Total Hardness (as CaCO3)	Specific Conductance	Total Dissolved Solids	Silica as SiO2, Dissolved
Date	Site	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	umho/cm	mg/L	mg/L
8/18/2022	LN US	164	5.92	0	2.96	170	195	491	263	10.6
8/18/2022	LN DS	166	8.88	0	4.44	175	210	508	291	10.8
8/20/2022	LN US	169	5.92	0	2.96	175	193	483	242	11.1
8/20/2022	LN DS	165	7.44	0	3.72	172	203	480	249	10.9
8/22/2022	LN US	177	0	0	0	177	206	500	264	11.5
8/22/2022	LN DS	191	0	0	0	191	229	528	290	11.6
9/4/2022	LN US	182	0	0	0	182	222	505	283	10.5
9/4/2022	LN DS	186	0	0	0	186	242	513	314	10.2
10/1/2022	RBI	167	0	0	0	167	210	487	273	11.5

Appendix 6: Interview questions

All interview subjects:

1. Please describe how you use the lake, trails, and park.
2. What are some of the positive attributes of Lady Bird Lake?
3. What are some of the negative attributes of Lady Bird Lake?
4. You wrote specifically about X. Would you like to say more about that now?
5. Do you believe there is a safety issue at Lady Bird Lake? If yes, why. If not, why not
 - a. If yes, what can PARD do to improve the safety of Lady Bird Lake?
6. Do you believe there is a capacity issue at Lady Bird Lake? If yes, why. If not, why not.
7. Do you believe there is an access point issue at Lady Bird Lake?
 - a. If yes, what can be done to address this?
8. What are the top environmental concerns you have, if any, about the Lake?
9. What are the top economic/development concerns you have, if any, about the Lake?
10. What do you think about the diversity of users of the Lake?
 - a. If lack of diversity is a problem, what is contributing and what can be done?
11. Who benefits most from the Lake? Who benefits least?
12. Do you have concerns about any kind of Lady Bird Lake use?
13. Do you believe PARD is maximizing the potential of the lake? What other activities would you like in and around the lake?

Vendor questions:

14. What are your thoughts on the regulatory mechanisms in place to balance the lake's physical limitations and the lake users' demand?
15. As a proprietor of the lake, what are your concerns regarding the growth of your business?



**COMMUNITY SURVEY:
LADY BIRD LAKE**

**Do you walk, run, bike, hike, paddle, kayak, fish,
float, play, picnic, or relax at Lady Bird Lake?**

THEN WE WANT TO HEAR FROM YOU!

Huston-Tillotson University is helping the Austin Parks and Recreation Department understand what Austinites think about lake issues such as growth, safety, and environmental quality. Your input will help PARD with their next steps for the lake.

**GO TO [TINYURL.COM/HTLAKE](https://tinyurl.com/HTLAKE) TO REPLY
AND ENTER TO WIN \$100**

