



Chicago Riverwalk, Phases 2 & 3 Methods

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This investigation was conducted as part of the Landscape Architecture Foundation's 2019 *Case Study Investigation (CSI)* program. CSI matches faculty-student research teams with design practitioners to document the benefits of exemplary high-performing landscape projects. Teams develop methods to quantify environmental, social, and economic benefits and produce Case Study Briefs for LAF's *Landscape Performance Series*.

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The full case study can be found at: <https://landscapeperformance.org/case-study-briefs/chicago-riverwalk>

Environmental Benefits

- Increases ecological quality as demonstrated by an increase in Floristic Quality Index (FQI) from 0 to 38.2 in an area of 19,529 sf. An FQI above 35 is considered to be “natural area” quality.***

Methods: Area takeoff calculations of each “room” as represented by the Chicago Riverwalk Phase 2 and 3 bid drawings were taken and totaled using AutoCAD 2017 to determine the amount of habitat area (sf) created on the project site (Table 2).

The Universal Floristic Quality Assessment (FQA) calculator was used to evaluate the ecological integrity of the native plant communities on site. Plant schedules of species were provided per the construction documents for both before and after construction. The FQA calculator provided the coefficient of conservatism (C) for each species listed. The total Floristic Quality Index (FQI) was determined by multiplying the mean C by the square root of the total amount of species (N) on each list (Table 3). There was previously no vegetation along the riverwalk path, so the previous FQI value may be assumed to be 0.

Calculations:

	Habitat Area (sf)
Marina	3,542
Cove	2,386
River Theater	8,048
Water Plaza	1,821
The Jetty	3,732
TOTAL	19,529

Table 2: Habitat Area Calcs
Source: Sasaki Construction Drawings

Chicago Riverwalk Phases 2 and 3				
Cook	Illinois	United States		
FQA DB Region:	Chicago Region USACE			
FQA DB Publication Year:	2017			
FQA DB Description:	https://www.lrc.usace.army.mil/Missions/Regulatory/FQA.aspx			
Practitioner:	Matt Callone			
Latitude:	41.88708			
Longitude:	-87.631898			
Private/Public:	Public			

Conservatism-Based Metrics:				
Total Mean C:	5.4			
Native Mean C:	6.3			
Total FQI:	38.2			
Native FQI:	41.3			
Adjusted FQI:	58.4			
% C value 0:	14			
% C value 1-3:	14			
% C value 4-6:	26			
% C value 7-10:	46			
Native Tree Mean C:	3.7			
Native Shrub Mean C:	9			
Native Herbaceous Mean C:	6.3			
Species Richness:				
Total Species:	50			
Native Species:	43	86%		
Non-native Species:	7	14%		

Table 3: Chicago Riverwalk FQA Report* Source: Universal FQA Calculator

*Complete report found in Appendix A

Sources:

“Chicago Riverwalk Phases 2 and 3.” Universal FQA Calculator. July 28, 2019.
https://universalfqa.org/view_inventory/15067.

Freyman, W.A., L.A. Masters, and S. Packard. 2016. *The Universal Floristic Quality Assessment*

(FQA) Calculator: an online tool for ecological assessment and monitoring. Methods in Ecology and Evolution. 7(3): 380–383

Sasaki Associates, Inc., Ross Barney Architects, Alfred Benesch and Co., Infrastructure Engineering, Rubino and Mesia, Delta Engineering, Jacobs/Ryan Associates, Schuler Shook, Dynasty Group, and Geo Services. *Chicago Riverwalk State Street to LaSalle Street Bid Drawings*. PDF. Chicago: City of Chicago Dept. of Transportation Div. of Engineering, July 22, 2013.

Sasaki Associates, Inc., Ross Barney Architects, Alfred Benesch and Co., Infrastructure Engineering, Rubino and Mesia, Delta Engineering, Jacobs/Ryan Associates, Schuler Shook, Architect Consulting Inc., Fluidity Design Consultants. Dynasty Group, and Geo Services. *Chicago Riverwalk LaSalle Street to Lake Street Bid Drawings*. PDF. Chicago:

Limitations:

The planting schedules were not verified in the field by the research team, and plants actually present on site may vary from construction documents. A vegetation survey was not possible within the time frame of this evaluation.

Social Benefits

- Attracts approximately 780 visitors on a typical summer weekend afternoon. 73% of observed visitors engaged in commerce-related activities, 20% in leisure activities, and 8% in recreational activities. 34% of 353 surveyed visitors self-report that they visit the Riverwalk 1-3 times per month.***

Methods: On August 26, 2017, a University of Michigan (UM) research team counted the number of visitors to the Chicago Riverwalk from 9am to 5pm. The observations were conducted for the first five minutes of every 30 minutes (Figure 3). At the peak time of 3pm, 780 visitors were observed staying at the Riverwalk. The UM team defined “stay” as people who have already been in a room at the beginning of every 30 minutes.

On July 28, 2019, the LAF Research Team counted visitors to the Chicago Riverwalk and the Chicago River along the Riverwalk by type of activity engaged in from 1pm to 2pm on a sunny afternoon in ten-minute intervals in each “room” of the Riverwalk. The Gehl Institute protocols helped to guide how activities would be categorized (Table 5). The Gehl Institute categories selected for observation were recreation play/exercise, commercial, and cultural. Leisure activities were defined by the research team as unaffiliated activities involving stationary relaxation (i.e. sitting, lounging, laying down). A total of 1,120 visitors were observed engaged in either recreational, commercial, or leisure activities, and these results were tallied by category and taken as a percentage (Table 6). Cultural activities were not observed.

From August 17-21, 2017, the UM research team distributed surveys in each of the 6 “rooms” in the project scope, and received 354 surveys back. 92/270, or 34%, of those surveyed responded “1-3 times per month” to the question, “How often do you visit the Chicago Riverwalk?” (Figure 4).

<p>Recreation Play/Exercise* <i>*types of visitor observed on July 28,</i></p>	<p>Exercising in designated (formal) sports areas, using designated (formal) public sporting equipment, like fixed basketball net.</p>
	<p>Exercising outside of designated (informal) sports areas, using privately-owned equipment, like a jump rope, or no equipment at all.</p>

2019: runner, bicyclist, kayaker, child in fountain

Playing in a designated (formal) play area, or with designated (formal) public play equipment.

Playing outside of a designated (informal) play area, or playing with privately-owned play equipment. Also a person playing with a dog.

Commercial*

*types of visitors observed on July 28, 2019: restaurant customer/server, bar customer/server, tour boat customer/staff

Selling food or goods in an established/legal (formal) setting or in a self-constructed/illegal (informal) setting.

Person doing backend activities related to commercial activities, like a waiter bussing tables, a person loading commercial goods, or a person setting up a commercial stall.

the process of buying foods and goods. Both the person performing a transaction, and the people queuing are counted as buyers.

A person who is participating in a commercial situation, without being either a provider or a buyer/shopper in the moment of the survey, is

counted as participating by being an observer. This could be a person browsing the produce at a market stall, but who has not yet committed

to making a purchase, either by an exchange of money or by queuing up to making a transaction of money.

Table 5: Category descriptions for activities from the Public Life Date Protocol. Source: Gehl Institute

Calculations:

Visitors' Staying Behavior at the Riverwalk (non-stacked)

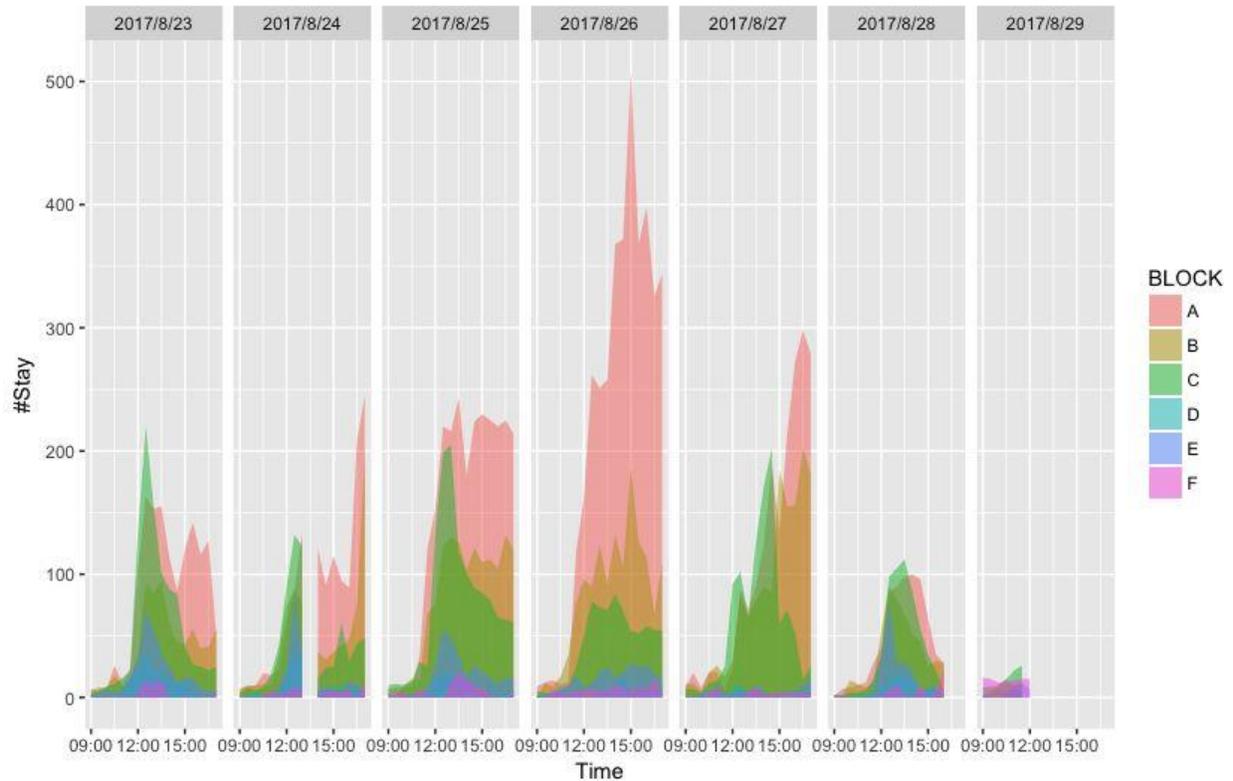


Figure 3: Visitors staying behavior at the Riverwalk. Source: University of Michigan

	Recreation	Commercial	Cultural	Leisure
Marina Plaza	24	307	0	84
Cove	9	348	0	29
River Theater	9	137	0	65
Jetty	32	0	0	20
Confluence	13	20	0	23
TOTAL	87	812	0	221
Percent of TOTAL	7.77%	72.50%	0.00%	19.73%

Table 6: Pedestrian counts taken on July 28, 2019 by category. Source: LAF Research Team

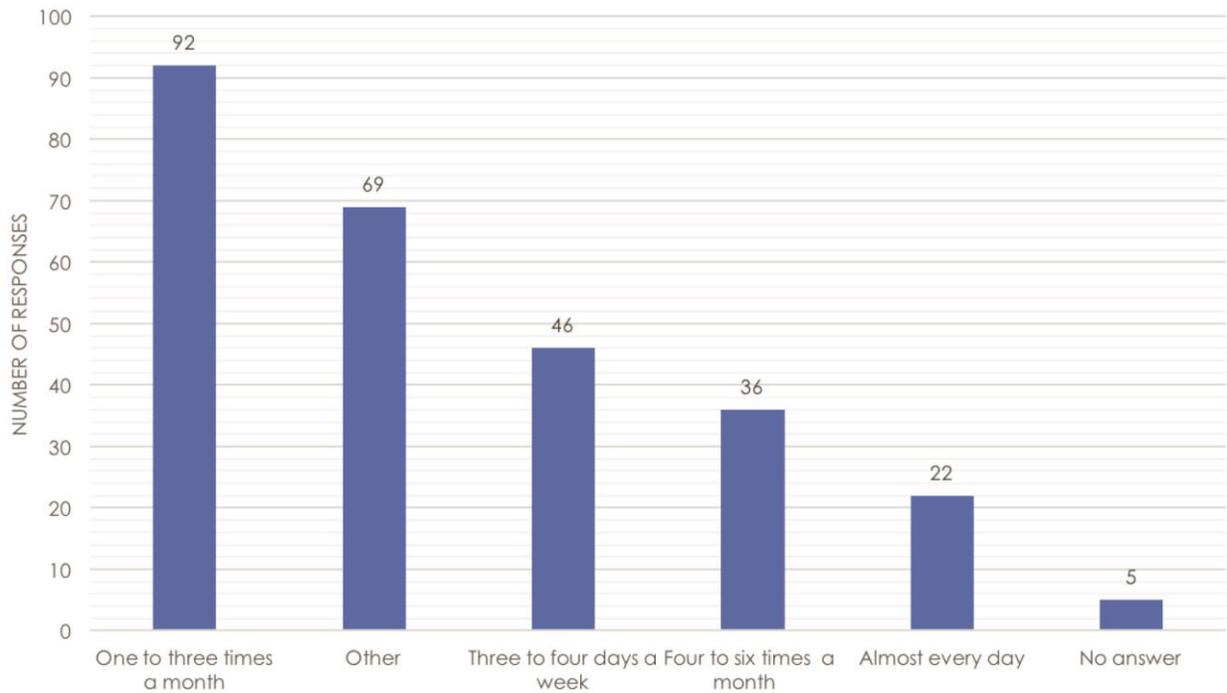


Figure 4: Frequency of visitation to the Chicago Riverwalk as self-reported by those surveyed in August of 2017. Source: University of Michigan

Sources:

Hsieh, Ho, Xuehan Li, Shui Wang, and Yifei Wu. "Post-Occupancy Evaluation of the Chicago Riverwalk." Master's thesis, University of Michigan, 2018. April 2018. Accessed May 29, 2018. <http://hdl.handle.net/2027.42/143161>.

The Open Public Life Data Protocol Version: Beta. PDF. New York: Gehl Institute, City of San Francisco's Planning Department, Copenhagen Municipality's City Data Department, Seattle Department of Transportation, Gehl, September 27, 2017. <https://gehl.institute.org/tool/public-life-data-protocol/>

Limitations: The “leisure” category was defined by the research team selected because of assumptions made that the stationary activity mapping’s predefined categories for postures were leisure positions. University of Michigan data was not independently verified by the LAF Research Team.

- ***Provides a venue for Chicago Park District public programming and large-scale events, including the Art on the MART launch (2018) with 32,000 attendees, the Floating Museum exhibit (2017) with over 90,000 attendees, and environmental programs (2018) for over 1,100 children.***

The expansion of the Chicago Riverwalk has facilitated an increase in programming and visitors to the promenade. Through partnerships, the Department of Fleet and Facility Management (2FM) continuously finds opportunities for Riverwalk programming, including opening day celebrations, free guided tours, and vendor and entertainment events in the Confluence room. 2FM continuously asks for performance evaluations of the Riverwalk programming and responds accordingly. For example, in response to vendor reports as Tuesdays being the lowest attendance day on the Riverwalk, 2FM launched Second Tuesday to draw more visitors to the Riverwalk.

Methods: 2FM provided an 8-year report of Riverwalk programming entitled “Chicago Riverwalk: 8 Years (2011-2018) Of Creating and Rebuilding”, listing programming highlights for 2017 and 2018. A full list of programming highlights is found in Table 7.

Calculations:

2017 Programming Highlights	
Opening Day Celebration	25 activities
Public Art on the Riverwalk	5 works of public art
2nd Tuesdays Music Cruise and Pyrotechnics	5 Chicago bands
Monthly Fish Parades along the Riverwalk	20 fish-inspired puppets
Floating Museum	50 artists, 12 organizations, 23 programs, 90,000 viewers
Unifest	28 sister cities over 6 weeks
Friday Night Flights	14 breweries, 2 local entertainers, 4 Riverwalk vendors, 700 attendees
Riverwalk Oktoberfest	22 local breweries, entertainment, specials along Riverwalk
2018 Programming Highlights	
Opening Day Celebration	20 activities
Chicago Loop Alliance ACTIVATE event	bazaar

Chicago Dance Month Closing Celebration and Scavenger Hunt	month-long celebration of dance, reception at City Winery
Park District Programming	8,000 individual fish from 11 individual species caught, 1,100 kids, 37 parks
Chicago Architecture Foundation Docent Talks	every Friday, 45-minute talks
Chicago Instagreater Walks	one-hour guided walks highlighting history, architecture and venues of the Riverwalk
Arts in the Dark Lantern Processions	Second Tuesday pageants, cultural organizations and participants from After School Matters
Friday Night Flights	15 breweries, local entertainers, specials along Riverwalk
Activate the Confluence events	five events, Riverwalk vendors, local entertainment, Chicago City Market vendors
Art of the MART launch event	32,000 people

Table 7: 2017 and 2018 Chicago Riverwalk Programming Highlights. Source: City of Chicago

Sources:

Chicago Riverwalk: 8 Years (2011-2019) Of Creating and Rebuilding. Chicago, IL: City of Chicago, 2018

Limitations: Information was not available for the total amount of visitors or events on site since opening, so data was gathered from the list of 2017 and 2018 program highlights and art installations in the Chicago Riverwalk: 8 Years (2011-2019) Of Creating and Rebuilding brochure.

- ***Increases the level of satisfaction with the riverfront as according to 89% of 28 surveyed visitors who were familiar with the site before reconstruction.***
- ***Provides a better understanding of the river’s water level and aquatic life according to 26% of 47 surveyed visitors.***
- ***Strengthens intermodal connections, with 42% of 50 surveyed visitors reporting using the Riverwalk as part of their commute. Of these, 24% travel by bicycle, scooter, or hoverboard and 62% travel on foot.***

Methods and Calculations: On sunny afternoons on Thursday, July 4 from 1pm-3pm and Monday, July 8, 2019 from 4pm-6pm, the LAF research team distributed 50 surveys to visitors. The full survey can be found in Appendix B.

The survey asked visitors how satisfied they were with the Riverwalk improvements. Responses were recorded and tallied. 25/28 (28 were familiar with the site pre-construction), or 89%, responded “more satisfied” (Table 8).

6. How would you rate your satisfaction with the Riverwalk in its current state compared with its previous state prior to its reconstruction in October 2016? (Please circle one)		
More satisfied	25	54.35%
Less satisfied	0	0.00%
Feel the same	1	2.17%
Neutral	2	4.35%
I was not familiar with the site prior to its reconstruction	18	39.13%
	46/50	

Table 8: User satisfaction as self-reported by surveyees on July 4 and 8, 2019 survey. Source: LAF Research Team

The survey asked visitors if they had a greater understanding of the water level and aquatic life of the river, and if so, which elements provided a better understanding of the river’s hydrology and water life. Responses were tallied and taken as a percentage. 12/47, or 26%, reported a better understanding (Table 9). 48/50, or 96%, selected elements of the Riverwalk as providing a greater understanding (Table 10).

The Chicago Riverwalk and associated programming provides various physical features and educational opportunities aimed at educating the public of the site’s various environmental features, such as the floating wetlands and flood resilient pedestrian walk. Though 26% of those surveyed self-reported a better understanding of some of these features, 96% of those surveyed viewed site features, observation, recreation, or tours as giving them a greater understanding of the river’s hydrology and water life. Public programming also promotes environmental awareness, including the 2017 monthly “Fish Parades” and 2018 children’s environmental programs where children fished and discovered over 8,000 individual fish from 11 different species. For the programming data, the Department of Fleet and Facility Management (2FM) provided an 8-year report of Riverwalk programming entitled Chicago Riverwalk: 8 Years (2011-2018) Of Creating and Rebuilding, listing programming highlights for 2017 and 2018 (Table 7).

10. By visiting the Chicago Riverwalk today, do you have a better understanding of the river’s water level and aquatic life, such as fish, within the river? (Please circle one)		
I better understand the river’s water level and aquatic life.	12	25.53%
I do not better understand the river’s water level and aquatic life.	19	40.43%
I have the same understanding of the river’s water level and aquatic life.	16	34.04%
	47/50	

Table 9: User understanding of river hydrology and aquatic life as determined by July 4 and 8, 2019 survey. Source: LAF Research Team

11. If you have a better understanding, which elements of the Chicago Riverwalk give you a greater understanding of the river's hydrology and aquatic life? (Please select all that apply)		
Floating wetlands	8	16%
Posts with water levels etched onto the surface	7	14%
Observation along the Riverwalk	20	40%
Physical recreation in the river such as kayaking, boating	10	20%
Educational tour	3	6%
Other, please list: _____		
	48/50	

Table 10: Elements that provide a greater understanding of the river's hydrology and aquatic life as determined by July 4 and 8, 2019 survey. Source: LAF Research Team

The Riverwalk promenade strengthens intermodal connections and better links trips by car, boat, bike, water taxi, public transit, and on foot. This includes a water taxi stop at the River Theater room. The survey asked visitors if they currently use the Riverwalk as part of their regular commute and their modes of transportation. 21/50, or 42%, selected at least one mode of transportation. Responses were recorded and tallied (Table 11).

13. If you currently use the Riverwalk as part of your commute, what is/are your mode(s) of transportation to arrive at your final destination? (Please select all that apply)		
Walking	13	61.90%
Biking	3	14.29%
Scooter/skateboard/hoverboard	2	9.52%
Train to Riverwalk	3	14.29%
Bus to Riverwalk		0.00%
Water taxi		0.00%
Other	1	4.76%
The Riverwalk is not part of my regular commute	29	58%
	50/50	

Table 11: Self-reported transportation modes as part of work commute as determined by July 4 and 8, 2019 survey. Source: LAF Research Team

Sources:

Callone, Matt. Chicago Riverwalk User Survey. July 8, 2019. Raw data. Chicago Riverwalk, Chicago.

Chicago Riverwalk: 8 Years (2011-2019) Of Creating and Rebuilding. Chicago, IL: City of Chicago, 2018

Limitations:

Survey data represents only one point in time. The research team is aware of the biases that occur with intercept surveys. The survey was limited to those surveyed at rush-hour times. For educational benefit: users surveyed by the LAF Research Team may have been confused by the two consecutive questions, as well as wording, concerning a better understanding of the river and habitat, and elements that provide a greater understanding, explaining the disparity between a minority of users questioned having a better understanding versus a majority associating elements of the Riverwalk that provide a greater understanding.

- ***Increased scenic quality of the Chicago Riverwalk, with scenic value index scores of views from the bridges increasing by 22 to 74 points. Additionally, 74% of 34 surveyed visitors reported an improved perception of the aesthetic quality of the riverfront.***

Improvements to the scenic quality of the riverfront include closer views of the river by bringing the elevation of the riverwalk down by 5 feet in some locations, redeveloping former industrial and commercial sites, and extending the promenade with material and plant choices.

Methods: Before and after pictures of each Riverwalk “room” taken from the bridges above the site sized 10x8 inches were each cross-referenced to measure the area of scenic view based on a set of criteria, categories including vegetation, circulation and proximity to the river. The LAF research team referenced the Bureau of Land Management’s Visual Resource Inventory’s evaluation of scenic quality categories of: “vegetation,” “water,” “cultural modifications,” and “color” and selected vegetation, circulation (a cultural modification and color choice) and proximity to the river as categories for scenic quality evaluation. The scenic quality was measured through a takeoff of the category areas for each photo in AutoCAD 2017. The positive area of vegetation and circulation (as expressed in square inches on a photograph) is considered a net increase in the area of scenic view. The negative area between the riverwalk and river, visually seen as a decrease in the distance between the ledge of the pedestrian walkway and the river, or, rather, a closer proximity to the water, is considered a net increase in the area of scenic quality of the Riverwalk. The total area of these three categories gives each before and after picture an equivalent scenic quality index (SQI) in units of square inches - higher scores mean a higher scenic quality (Figure 5).

To supplement this analysis, surveyed visitors were asked if they their perceptions of aesthetic qualities had improved after the redesign to see if there was a positive correlation between survey results and the SQI results. On sunny afternoons on Thursday, July 4 from 1pm-3pm and Monday, July 8, 2019 from 4pm-6pm, the LAF research team distributed 50 surveys and asked visitors if they find the Chicago Riverwalk to have improved in aesthetic, environmental, cultural and/or accessibility quality. Responses were recorded and tallied. 26/35, or 74%, of

surveyees who were familiar with the site before its reconstruction selected “aesthetic” as one of the ways they perceived improvement (Table 13). The full survey can be found in Appendix B.

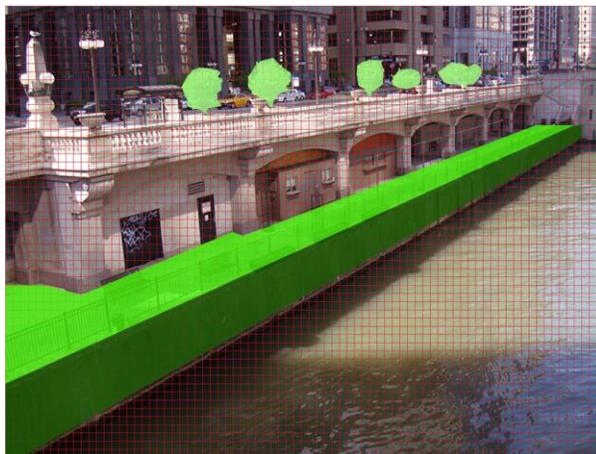
Calculations:

	Before (si)				After (si)				SQI Net Gain
	Vegetation	Circulation	Proximity to River	SQI	Vegetation	Circulation	Proximity to River	SQI	
Marina	1.85	6.52	-7.96	0.41	19.89	29.4	-0.48	48.81	48.4
Cove	1.31	6.61	-6	1.92	8.44	19.88	-0.5	27.82	25.9
River Theater	1.11	6.26	-10.53	-3.16	41.07	30.45	-0.66	70.86	74.02
Water Plaza	1.39	14.3	-4.3	11.39	25.13	18.06	0	43.19	31.8
Jetty	1.2	12.73	-8.39	5.54	14.7	19.37	-6.005	28.06	22.525
Confluence	0.65	0	2.89	3.54	4.48	25.96	-0.3717	30.06	26.5283
Total SQI				19.64				248.8133	229.1733

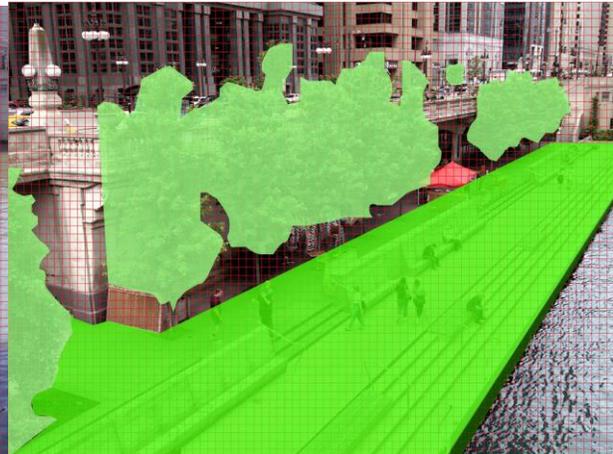
Table 12: Scenic Quality Calculations. Units are in square inches. Source: LAF Research Team

As shown in this table, a net gain of scenic quality is achieved in the project from these specific vantage points of the bridges over the Chicago River toward each “room”. A total area of 229 in² is visible in the study area after the project was installed. The increased visible gain area is 1166%. Light green signifies vegetation, bright green signifies circulation and dark green signifies proximity to the river.

Marina Before

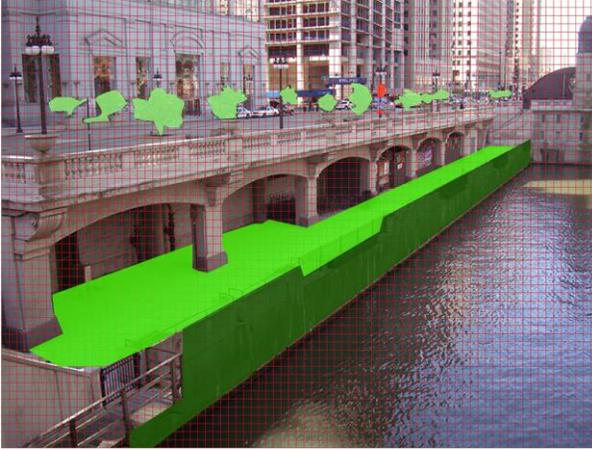


Marina After

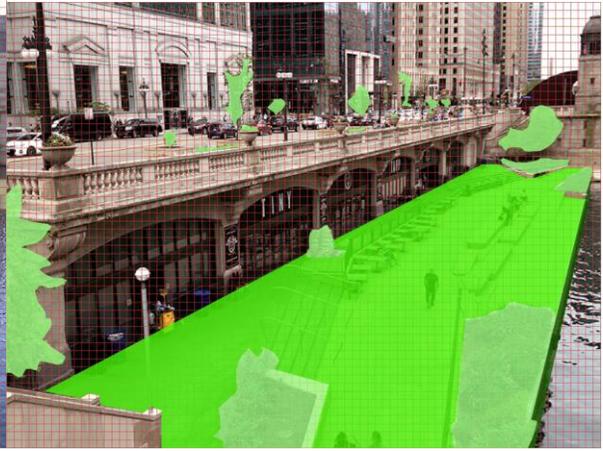


Cove Before

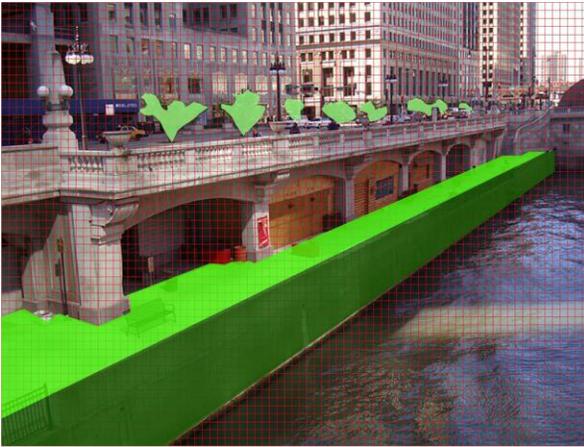
Cove After



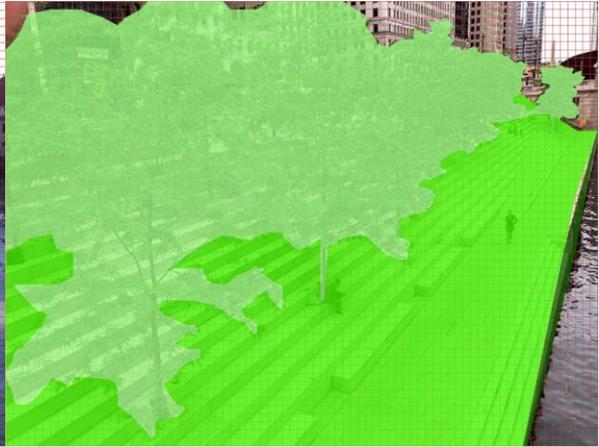
River Theater Before



River Theater After

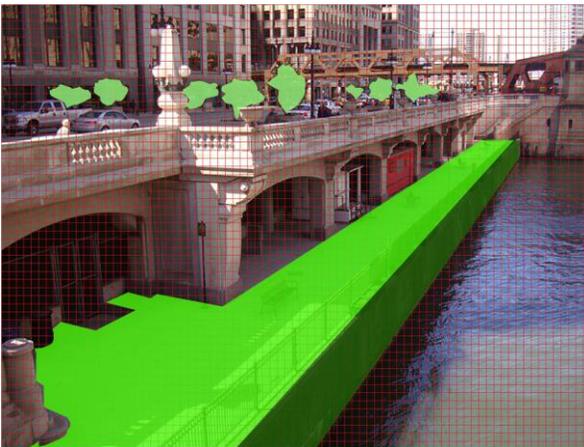


Plaza Before

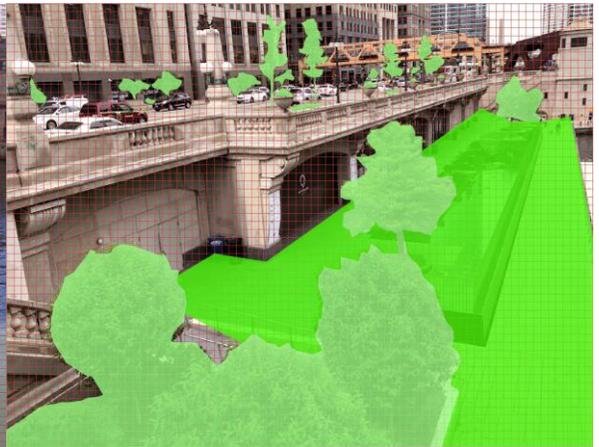


Water Plaza After

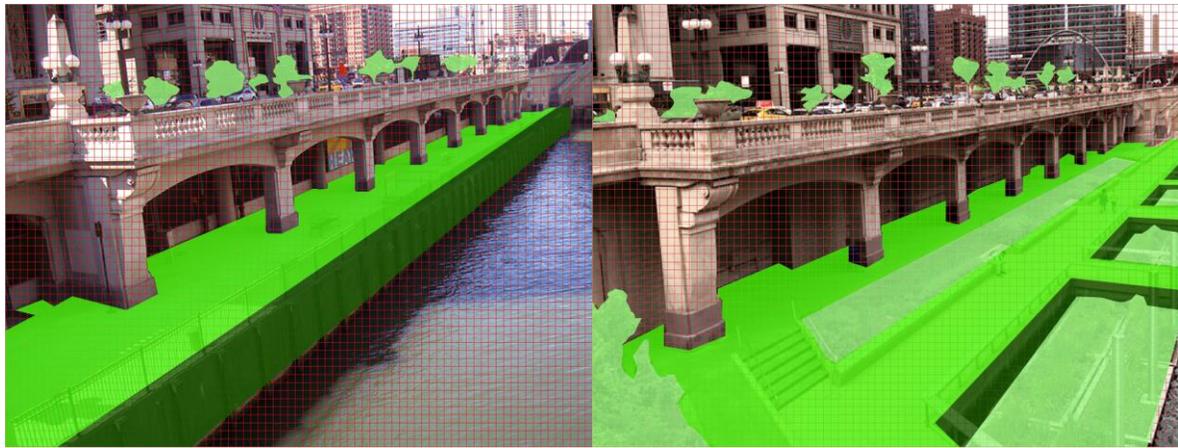
Water



Jetty Before



Jetty After



Confluence Before

Confluence After

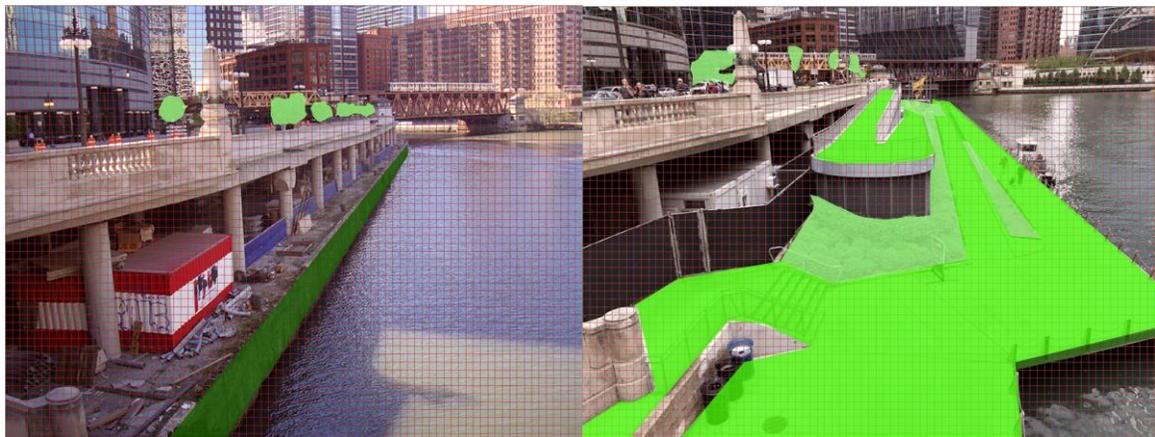


Figure 5: Scenic Quality Index* area takeoffs of the before and after conditions of the Chicago Riverwalk.
Source: LAF Research Team, Sasaki Associates

*Light green represents vegetation, bright green represents circulation and dark green represents proximity to the river.

7. Do you find the Chicago Riverwalk to have improved in the quality of any of the following categories? (Please select all that apply)		
Aesthetic	26	52%
Environmental	15	30%
Cultural	17	34%
Accessibility	17	34%
I was not familiar with the site prior to its reconstruction	15	30%

Table 13: User perception in quality of the site as determined by July 4 and 8, 2019 survey. Source: LAF Research Team

Sources:

BLM's Visual Resource Inventory. Accessed July 29, 2019.
<http://blmwyomingvisual.anl.gov/vr-inventory/blm/>.

Callone, Matt. Chicago Riverwalk User Survey. July 8, 2019. Raw data. Chicago Riverwalk, Chicago.

Limitations: There is a strong element of subjectivity to visual quality of an image. Furthermore, the analysis is conducted from only one vantage point in each “room,” only providing one estimation of a change in scenic quality. For survey limitations, see above.

Economic Benefits

- ***Created 170 new seasonal, 125 part-time, and 66 permanent jobs from 2016 to 2019, as reported by 9 surveyed Riverwalk vendors. Of 6 vendors that were on the site before and after the reconstruction, 83% said that the project made their business more profitable.***

The opening of the Chicago Riverwalk Phases 2 and 3 doubled the number of Riverwalk vendors from 5 to 10. 5 out of 6 (83%) of the vendors that responded to the survey and have been at the Riverwalk since prior to the reconstruction in 2016 stated that the reconstruction has made their businesses more profitable. One result of an increase in profitability is increased employment opportunities.

Methods: During the month of July 2019, a Google Form survey was distributed by the LAF Research Team to Chicago Riverwalk vendors. Responses were auto-totaled and provided as percentages and individual responses. Vendors were asked how many seasonal, part-time and full-time positions they have added since 2016 (Figure 6). These responses were interpreted in Table 14. They were also asked if their business has been more profitable since the reconstruction. 5/6, or 83%, self-reported that they are more profitable (Figure 7). The full vendor survey is found in Appendix C.

Calculations:

35-part time 35-full time

Approximately 140. Ninety of which are seasonal

10 part-time - 1 full time - seasonal

Currently - 60 full time seasonal and 20 part time - same last year

1 full time and 25 part time

30

2 full time, 20 full time seasonal

35 - part time; 30 full time

Negligible changes

Figure 6: Positions added by Chicago Riverwalk vendors since 2016 as self-reported by vendors in July 2019. Source: LAF Research Team Vendor Survey

Part-time	125
Seasonal	170
Full-time	66
Other	80

Table 14: Self-reported positions interpreted by LAF Research Team. Source: LAF Research Team

3. If your business was here prior to the reconstruction of the Chicago Riverwalk Phases 2 and 3, how has the r...ted the profitability of your business?

6 responses

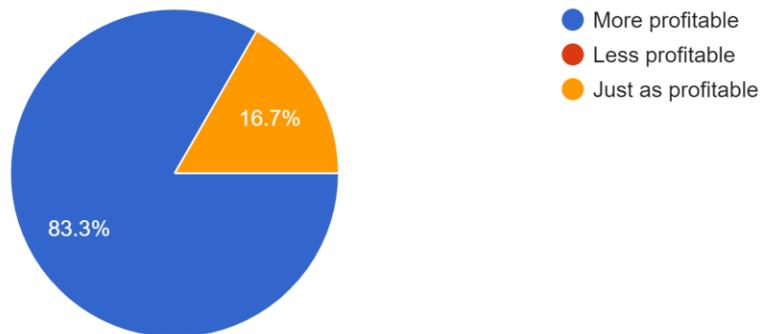


Figure 7: How has the reconstruction affected the profitability of your business?-Vendor responses
Source: LAF Research Team.

Sources:

Callone, Matt. Chicago Riverwalk Vendor Survey. July 2019. Raw data. Chicago Riverwalk, Chicago.

Limitations:

Only 9 out of 11 businesses reported actual numbers for jobs added, so this represents only a portion of jobs added. All business vendors with locations along the Chicago Riverwalk were surveyed since there are residual benefits of the Phase 2 and 3 improvements to vendors adjacent to other portions of the Chicago Riverwalk project.

- Doubled the number of Riverwalk vendors and increased profits by 164% from 2014 to 2018, with almost \$50 million in total revenue in 2018. 90% of 50 surveyed visitors reported that they also patronize nearby businesses not along the Riverwalk before or after their visit.***

Methods: The 2017 and 2018 Chicago Riverwalk Financial Plan provided the number of Riverwalk vendors and the metrics of Riverwalk (1) concessionaires and (2) tour boat revenue in 2014 compared to 2018 (Tables 15-18). Tables 15 and 16 show an increase in vendors from 5 in 2014 to 10 in 2018. The percent increase in profits was calculated by using the 2014 pre-construction and 2018 total revenue metrics for all Riverwalk businesses highlighted in yellow in Tables 15-18 (Table 19). Concessionaires' data and tour boat data were combined for the total profits. On July 4 and 8, 2019, Riverwalk visitors were asked in a survey if they patronized other businesses in the area before or after visiting the Riverwalk. Survey results were tallied and taken as a percentage (Table 21). The full survey can be found in Appendix B. See full survey information and limitations in previous benefit sections.

Calculations:

Concessionaire	2010	2011	2012	2013	2014
Bike Chicago (lower)	\$92,506	\$88,233	\$61,505	\$14,288	\$4,175
Bike Chicago (upper)	\$5,448	\$84,077	\$83,198	\$33,318	\$8,418
Cyrano's Café and Wine Bar	\$190,868	\$232,767	\$203,009	\$165,423	\$273,171
O'Brien's Riverwalk Café	\$884,493	\$790,435	\$755,743	\$567,314	\$629,725
Tree of Life Juice Bar				\$6,040	-
Urban Kayaks		\$63,015	\$286,903	\$294,919	\$331,291
Totals	\$1,173,315	\$1,258,528	\$1,390,358	\$1,081,303	\$1,246,780

As reported by Chicago Park District. The City is unable to guarantee the accuracy of these figures or provide any additional information.

Table 15: Chicago Riverwalk concessionaires' revenue 2010-2014. Source: City of Chicago

Vendor	Total Revenue	Taxes	Gross Sales	Percent	Actual Percent Fee	Projected Percentage Fee	Difference	Annual License Fee	Actual Percent Fee	Total Annual and Percent Fee
Urban Kayaks	\$ 680,764.25	\$ 56,211.75	\$ 624,552.50	2.0%	\$ 12,491.05	\$ 15,000.00	(2,508.95)	\$ 30,000.00	\$ 12,491.05	\$ 42,491.05
Island Party Hut	\$ 2,044,314.20	\$ 204,573.30	\$ 1,839,740.90	7.0%	\$ 128,781.86	\$ 184,856.00	(56,074.14)	\$ 37,502.00	\$ 128,781.86	\$ 166,283.86
Northman	\$ 196,938.80	\$ 20,303.88	\$ 176,634.92	0.0%	\$ -	\$ -	0.00	\$ -	\$ -	\$ -
O'Briens	\$ 2,065,185.85	\$ 215,729.50	\$ 1,849,456.35	8.0%	\$ 147,956.51	\$ 144,000.00	3,956.51	\$ 50,475.00	\$ 147,956.51	\$ 198,431.51
Chicago Brew House	\$ 857,307.87	\$ 87,049.30	\$ 770,258.57	5.0%	\$ 38,512.93	\$ 60,000.00	(21,487.07)	\$ 23,334.00	\$ 38,512.93	\$ 61,846.93
City Winery	\$ 5,438,646.30	\$ 544,740.72	\$ 4,893,905.58	10.0%	\$ 489,390.56	\$ 320,000.00	169,390.56	\$ 60,000.00	\$ 489,390.56	\$ 549,390.56
Tiny Tapp	\$ 2,313,130.72	\$ 235,904.86	\$ 2,077,225.86	4.0%	\$ 83,089.03	\$ 92,000.00	(8,910.97)	\$ 23,743.50	\$ 83,089.03	\$ 106,832.53
Chicago Water Taxi	\$ 42,127.30	\$ -	\$ 42,127.30	5.0%	\$ 2,106.37	\$ 2,602.50	(496.14)	\$ 18,003.00	\$ 2,106.37	\$ 20,109.37
Downtown Docks	\$ 636,420.30	\$ 58,935.59	\$ 577,484.71	5.0%	\$ 28,874.24	\$ 18,256.25	10,617.99	\$ 19,500.00	\$ 28,874.24	\$ 48,374.24
Frost Gelato	\$ 120,348.81	\$ 12,533.32	\$ 107,815.49	3.5%	\$ 3,773.54	\$ 6,921.25	(3,147.71)	\$ 14,004.80	\$ 3,773.54	\$ 17,778.34
Total	\$14,395,184.40	\$1,435,982.22	\$12,959,202.18		\$934,976.08		91,340.08	\$ 276,562.30	\$ 934,976.08	\$ 1,211,538.38

Table 16: Chicago Riverwalk concessionaires' revenue 2018. Source: City of Chicago

Historical Riverwalk Revenues				
Year	Tourboat Operator Revenue		Tourboat Rent Revenue	
	Location 1	Location 2*	Location 1	Location 2
1993	\$ 1,388,780	--	n/a**	n/a**
1994	\$ 1,664,865	--	n/a**	n/a**
1995	\$ 1,732,841	--	n/a**	n/a**
1996	\$ 1,793,841	--	n/a**	n/a**
1997	\$ 1,752,058	--	n/a**	n/a**
1998	\$ 2,254,917	--	n/a**	n/a**
1999	\$ 2,417,083	--	n/a**	n/a**
2000	\$ 2,923,194	--	n/a**	n/a**
2001	\$ 2,343,594	--	n/a**	n/a**
2002	\$ 2,716,161	\$ 3,941,076	n/a**	n/a**
2003	\$ 2,885,365	\$ 4,126,781	n/a**	n/a**
2004	\$ 2,993,212	\$ 4,321,237	n/a**	n/a**
2005	\$ 3,233,183	\$ 4,524,856	n/a**	n/a**
2006	\$ 3,608,971	\$ 4,738,069	n/a**	n/a**
2007	\$ 4,368,915	\$ 4,961,328	n/a**	n/a**
2008	\$ 4,756,454	\$ 5,195,108	n/a**	n/a**
2009	\$ 4,675,849	\$ 5,439,904	n/a**	n/a**
2010	\$ 5,275,685	\$ 5,696,235	\$ 156,656	\$ 223,349
2011	\$ 6,681,184	\$ 5,964,644	\$ 161,355	\$ 234,517
2012	\$ 7,228,322	\$ 6,245,700	\$ 169,423	\$ 281,420
2013	\$ 7,734,305	\$ 6,540,000	\$ 1,282,051	\$ 877,592
2014	\$ 8,353,049	\$ 6,834,300	\$ 1,366,239	\$ 873,647

* Location 2 added in 2002
** Not available as of date of model completion
Source: CDOT

Table 17: Chicago Riverwalk tour boat revenue 1993-2014. Source: City of Chicago

Location One: Mercury Skyline Cruiseline-Chicago's First Lady

Chicago Riverwalk Tour Boats Concessions Mercury Skyline Cruiseline - Chicago First Lady F/Y 2018											
Fiscal Year	Total Revenues	Deductions	Gross Sales	Percent	Actual Percent Fee	Projected Percentage Fee	Difference	Annual License Fee	Actual Percent Fee	Total Annual and Percent Fee	
2013			\$ 11,641,018.60	5.0%	\$ 582,050.93	\$ 536,695.00	45,355.93	\$ 700,000.00	\$ 582,050.93	\$ 1,282,050.93	
2014	\$ 22,003,313.00	\$ 9,028,781.85	\$ 12,974,531.15	5.0%	\$ 648,726.56	\$ 579,630.00	69,096.56	\$ 721,000.00	\$ 648,726.56	\$ 1,369,726.56	
2015	\$ 26,443,390.13	\$ 10,385,583.11	\$ 16,057,807.02	5.0%	\$ 802,890.35	\$ 648,726.56	154,163.79	\$ 742,630.00	\$ 802,890.35	\$ 1,545,520.35	
2016	\$ 29,222,004.75	\$ 11,641,646.39	\$ 17,580,358.36	5.0%	\$ 879,017.92	\$ 769,981.00	109,036.92	\$ 764,909.00	\$ 879,017.92	\$ 1,643,926.92	
2017	\$ 29,737,540.62	\$ 11,877,468.19	\$ 17,860,072.43	5.0%	\$ 893,003.62	\$ 831,579.00	61,424.62	\$ 787,856.00	\$ 893,003.62	\$ 1,680,859.62	
2018	\$ 29,830,327.65	\$ 11,239,623.69	\$ 18,590,703.96	5.0%	\$ 929,535.20	\$ 898,106.00	31,429.20	\$ 811,492.00	\$ 929,535.20	\$ 1,741,027.20	
TOTAL	\$ 137,236,576.15	\$ 54,173,103.23	\$ 83,063,472.92		\$ 4,153,173.65		\$470,507.02	\$ 3,827,887.00	\$ 4,153,173.65	\$ 7,981,060.65	

Location Two: Wendella Sightseeing Boats

Chicago Riverwalk Tour Boats Concessions Wendella Sightseeing Company F/Y 2018											
Fiscal Year	Total Revenues	Deductions	Gross Sales	Percent	Actual Percent Fee	Projected Percentage Fee	Difference	Annual License Fee	Actual Percent Fee	Total Annual and Percent Fee	
2013	\$ 6,538,066.66		\$ 6,538,066.66	3.0%	\$ 196,142.00	\$ 196,200.00	(58.00)	\$ 681,450.00	\$ 196,142.00	\$ 877,592.00	
2014	\$ 5,668,324.00	\$ -	\$ 5,668,324.00	3.0%	\$ 170,049.72	\$ 205,029.00	(34,979.28)	\$ 703,597.13	\$ 170,049.72	\$ 873,646.85	
2015	\$ 5,212,515.00	\$ -	\$ 5,212,515.00	3.0%	\$ 156,375.45	\$ 214,255.31	(57,879.86)	\$ 726,464.04	\$ 156,375.45	\$ 882,839.49	
2016	\$ 5,823,340.00	\$ -	\$ 5,823,340.00	3.0%	\$ 174,700.20	\$ 223,896.79	(49,196.59)	\$ 750,074.11	\$ 174,700.20	\$ 924,774.31	
2017	\$ 5,674,137.00	\$ -	\$ 5,674,137.00	3.0%	\$ 170,224.11	\$ 233,972.15	(63,748.04)	\$ 744,451.52	\$ 170,224.11	\$ 914,675.63	
2018	\$ 5,094,096.00	\$ -	\$ 5,094,096.00	3.0%	\$ 152,822.88	\$ 244,500.90	(91,678.02)	\$ 799,621.20	\$ 152,822.88	\$ 952,444.08	
TOTAL	\$ 27,472,412.00	\$ -	\$ 27,472,412.00		\$ 824,172.36		\$ (297,481.79)	\$ 3,724,208.00	\$ 824,172.36	\$ 4,548,380.36	

Table 18: Chicago Riverwalk tour boat revenue 2013-2018. Source: City of Chicago

Year	Concessionaires	Tour boats	TOTAL
2014	\$1,246,780.00	\$17,427,235.00	\$18,674,015.00
2018	\$14,395,184.40	\$34,924,560.65	\$49,319,745.05
		Dollar Increase	\$30,645,730.05
		Percent Increase	164.11%

Table 19: Increase in Chicago Riverwalk Business Revenue calculated from Tables 16-19.

Source: City of Chicago

5. Before or after visiting the Riverwalk, do you ever patronize businesses in the area not along the Riverwalk? If so, which type?(i.e. restaurants, bars, recreation) (Please select all that apply)		
Restaurant	32	64%
Bar	25	50%
Recreation	13	26%
Retail	12	24%
I do not spend money at any of the businesses in the area when visiting the Riverwalk.	5	10%
	50/50	

Table 20: Spending habits in the vicinity of the Chicago Riverwalk as self-reported on July 4 and 8, 2019.

Source: LAF Research Team User Survey

Sources:

Callone, Matt. Chicago Riverwalk Vendor Survey. July 2019. Raw data. Chicago Riverwalk, Chicago.

Chicago Riverwalk Financial Plan as of December 31, 2017. PDF. Chicago: City of Chicago, March 30, 2018.

Chicago Riverwalk Financial Plan as of December 31, 2018. PDF. Chicago: City of Chicago, March 29, 2019.

Limitations: The City of Chicago cannot confirm the accuracy of data sourced by the Chicago Parks District.

- Catalyzed over \$12 million in funding for the redevelopment of earlier phases of the Riverwalk including the creation of a Master Plan for older portions of the Riverwalk and over \$240,000 for the construction of a Community Marketplace.***

As a result of the economic success of the concessions program, the City of Chicago decided not to pursue hiring a Master Developer and instead maintains the Chicago Department of Fleet and Facility Management (2FM) as the property manager and the Chicago Department of Cultural Affairs and Events (DCASE) for program oversight. Beyond keeping property management as an in-house expenditure, the success of Chicago Riverwalk concessions programming provides an impetus for redevelopment of older portions of the Riverwalk. The Community Marketplace is expected to be completed in the summer of 2018. The Master Plan for redevelopment of the pre-Phase 1 area includes a new path, additional landscaping, lighting, and public seating.

Methods: The 2018 Chicago Riverwalk Financial Plan details the identification of funding for the redevelopment of the pre-Phase 1 portion of the Chicago Riverwalk between Michigan Avenue and Lake Shore Drive.

Calculations:

The 2018 Chicago Riverwalk Financial Plan identifies that \$242,136.50 was allocated for the creation of a new Marketplace, and \$12 million was allocated for Riverwalk improvements in 2019.

Sources:

Chicago Riverwalk Financial Plan as of December 31, 2018. PDF. Chicago: City of Chicago, March 29, 2019.

Limitations: Catalyzation of the redevelopment of pre-Phase 1 cannot be definitively attributed to the success of Phases 2 and 3, but it is highly likely that Phases 2 and 3 played a direct role.

- ***Generated approximately \$16 million from 2013 to 2018 toward the repayment of a \$99 million federal loan used for project construction. Revenues designated for loan repayment generated from Riverwalk concessions were an average of 29% higher than projected.***

A federal Transportation Infrastructure Finance and Innovation program loan (TIFIA) was used for construction of the Riverwalk. Repayment was scheduled to occur through city revenues generated primarily from concessions on the Riverwalk including license fees, advertising, and sponsorships. The Riverwalk has exceeded revenue projections, putting the City ahead of schedule for TIFIA loan repayment.

Methods: Data was collected from Figure 3b of the 2018 Chicago Riverwalk Financial Plan's listed metrics of project revenue collected since 2013 from concessions along the riverfront, consisting of tour boats and vendors. Pledged revenues primarily collected through license fees generated from 2013 to 2018 were summated to determine total repayment as of the end of the 2018 fiscal year. The average percent differences from the expected revenues between 2014 and 2018 were calculated (Table 21). On average, this amount exceeded projected revenue for the repayment schedule by 29%.

Calculations:

Year	Likely	Actual	Difference from Likely	Percent Difference
2014	\$1,381,450.00	\$2,220,192.93	\$838,742.93	60.71%
2015	\$2,164,128.19	\$2,724,708.25	\$560,580.06	25.90%
2016	\$2,657,898.09	\$3,362,459.88	\$704,561.79	26.51%
2017	\$3,269,726.04	\$3,819,952.33	\$550,226.29	16.83%
2018	\$3,401,569.28	\$3,905,009.66	\$503,440.38	14.80%
	Amount Repaid	\$16,032,323.05	Percent in Excess of Expectations	28.95%

Table 21: Annual Riverwalk Revenue Calculations. Source: City of Chicago

Sources:

Chicago Riverwalk Financial Plan as of December 31, 2017. PDF. Chicago: City of Chicago, March 30, 2018.

Chicago Riverwalk Financial Plan as of December 31, 2018. PDF. Chicago: City of Chicago, March 29, 2019.

Limitations: The TIFIA loan accrues interest. The amount repaid must be compared to the outstanding balance including interest to understand the proportion of debt paid to date.

- Supports investment in public art, with over \$460,000 designated for programming and public art in 2018 and over \$2 million designated for an international art competition in 2019.***

The Chicago Department of Cultural Affairs and Events (DCASE) oversees Riverwalk Programming and a Public Art campaign on the Chicago Riverwalk. The Department of Fleet and Facility Management (2FM) and DCASE work alongside one another to provide events that are culturally relevant for Chicago citizens and tourists alike. In 2017 and 2018, \$462,080 was provided for programming and public art expenditures. In 2019, DCASE launched an international call to artists for a public art design competition, providing \$40,000 for finalists' development proposals and \$2 million for the design and construction of the selected piece.

Methods: The 2018 Chicago Riverwalk Financial Plan provided programming and public art expenditures for 2017 and 2018, as well as the money allocation in 2019 for the public art piece to be displayed as part of the Riverwalk East Gateway Project (Table 22)

Calculations:

Year	Contract Property Management	Facility Operations Work Orders	Capital Projects	Public Art & Programming	Special Projects	Total
2015	\$ 663,503.05	\$ -				
2016	\$ 1,004,756.28	\$ -				
2017	\$ 2,284,419.85	\$ 305,158.95	\$ 160,064.56	\$ 130,158.95		\$2,879,802.31
2018	\$ 2,071,325.60	\$ 250,370.00	\$ 494,314.41	\$ 331,920.00	\$ 23,889.56	\$3,171,819.57

Table 22: Expenditures dedicated to public art and programming. Source: Chicago Riverwalk Financial Plan.

Sources:

Chicago Riverwalk Financial Plan as of December 31, 2018. PDF. Chicago: City of Chicago, March 29, 2019.

Limitations: Not all investments in public art are quantified in the 2017 and 2018 Chicago Riverwalk Financial Plans, such as the Arts in the Dark Halloween Parade, or Art on the MART’s permanent projection system (which displays art on the 2.5 acre Merchandise Mart river facade for five nights a week, 10 months of the year).

Inconclusive Benefits

- ***Increased the availability of quality aquatic habitat as demonstrated by 15 species of fish identified along the Chicago Riverwalk.***

Whereas approximately 40 years ago only seven fish were identified in the Chicago River, today the Friends of the Chicago River has identified around 70 different species of fish, including the first recorded sighting of the American Eel in the Chicago River in 2014. This rebound in aquatic life is the result of decades of improvements in water quality and the reestablishment of habitat. Inspired by the Friends of the Chicago River’s floating garden that functioned as a “fish hotel” on the Riverwalk site in 2005, the floating wetlands contain fish habitat structures including fish lunkers for resting areas and protection and limnetic caisson curtains that encourage algae formation on the nylon strands, which serve as a food source for fish. Plantings in the stainless steel floating gardens are both native emergent and submergent species that provide habitats for invertebrates that in turn are used as food for fish, amphibians, ducks, and other wildlife (Figure 8). The floating wetland plays a role in the larger ecology of the Chicago River by supporting aquatic populations moving through the main branch of the River; the wetlands greatest contribution is its use as an observation grounds for how to provide opportunities to better support these populations.

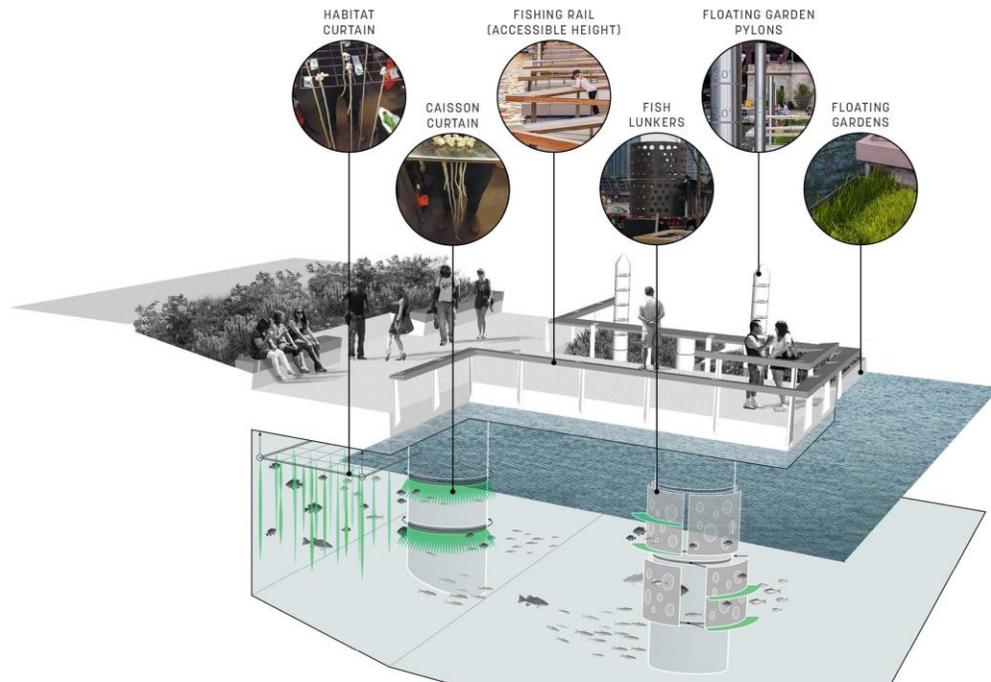


Figure 8: Section diagram of The Jetty room floating wetland

Method:

On October 20, 2017, a University of Michigan (UM) research team installed an underwater camera within the main branch of the Chicago River along where the Chicago Riverwalk is located to observe fish around and below the floating wetlands at “The Jetty” room of the Riverwalk. In addition, onsite surveys taken by UM students at the Riverwalk from August 17-21, 2017 asked surveyees if they fish and which species they typically catch. Photographed recordings and self-reported surveyees identified carp, catfish, bluegill, yellow perch, white perch, bullheads, largemouth, smallmouth and European bass, pinfish, invasive goby, bluegill, bream, crappie, and sunfish. A select number of species of plants found in the floating wetlands listed on construction documents were cross-referenced to determine specific benefits to aquatic life (Table 23).

Calculations:

Of the six surveyees out of 346 surveyed by UM students that responded “Yes” to “Do you fish here [the Riverwalk]” three fished almost every day, two respondents fished one to three times per month and one respondent fished four to six times per month. The answers to the open-ended question, “What do you typically catch?” were “carp,” “catfish,” “bluegill,” “yellow perch,” “white perch,” “bullheads,” “largemouth bass,” “bass,” “pinfish,” “invasive goby,” “European bass.” Desirable species observed in this section of the Chicago Riverwalk, as reported by the UM report, are largemouth and smallmouth bass, bluegill bream, crappie, and sunfish. Fishermen observations and UM reported observations total 15 species of fish identified along the Chicago Riverwalk.

Habitat Benefits of Select Species Found in Floating Wetlands		
Species	Scientific Name	Habitat Benefit
white water lily	<i>Nymphaea odorata</i>	attract invertebrate (i.e. fish food)
lizards tail	<i>Saururus cernuus</i>	attract invertebrate (i.e. fish food)
palm sedge	<i>Carex muskingumensis</i>	fish protection
sweet flag	<i>Acorus calamus</i>	spawning habitat
common water plantain	<i>Alisma subcordatum</i>	shade

Table 23: Habitat benefits of select species found in floating wetlands. Source: Various

Sources:

“Help Friends Continue to Improve the Chicago River.” Fish - River Ecology and Wildlife - About the River - Friends of the Chicago River. Accessed June 29, 2019.
<https://www.chicagoriver.org/about-the-river/river-ecology-and-wildlife/fishes>.

Hsieh, Ho, Xuehan Li, Shui Wang, and Yifei Wu. “Post-Occupancy Evaluation of the Chicago Riverwalk.” Master’s thesis, University of Michigan, 2018. April 2018. Accessed May 29, 2018. <http://hdl.handle.net/2027.42/143161>.

“Young Angler Catches Rare American Eel at Chicago River Fishing Event.” WTTW News. October 17, 2017. Accessed June 29, 2019.
<https://news.wttw.com/2017/10/17/young-angler-catches-rare-american-eel-chicago-river-fishing-event>.

Limitations: Though species of fish have been identified within the main branch of the Chicago River and the “Jetty” room in particular, University of Michigan (UM) sediment toxicity tests revealed sediment chemically contaminated higher than tolerable to benthic species. The risk of suspended sediment may discourage aquatic life from establishing permanent habitat in the main branch of the river. On October 20, 2017, a UM research team, with the assistance of the Metropolitan Water Reclamation District, collected one-liter sediment samples from the Chicago River at four Ambient Water Quality Monitoring (AWQM) stations, one in the vicinity of the Chicago Riverwalk (station 100), using a Petite Ponar Peterson. Sediment toxicity (*Hyalella azteca* 7 day survival test) and physiochemical (trace metals) analyses were conducted in the Burton Ecotoxicology Research Laboratory at the School for Environment and Sustainability at the University of Michigan. These analyses revealed sediment heavy metal toxicity and reduced survival rates of *Hyalella azteca*. Such results suggest that the floating wetlands are not an ideal site for permanent aquatic habitat and support reports by Chicago Fleet and Facilities Management (2FM) of pulling dead fish out of the water. (Though dead fish cannot be solely contributed to potential sediment toxicity, as other urban conditions such as significant boat traffic, water pollution, fishing and other human activities characteristic of a highly urban environment have a large impact on fish populations as well.) Further in-depth studies are

necessary to have a greater understanding of the impacts of sediment toxicity on aquatic life. As such, this benefit is inconclusive.

- **Provides approximately 93% of the River Theater room’s irrigation needs in the month of July via a 2,000-gallon cistern.**

In the River Theater, a 2,000-gallon cistern housed below grade serves as a water reserve to further supplement the room’s irrigation needs in drier times. The cistern alone can store approximately 93% of the River Theater room’s irrigation needs, and is set up to fill with city water when rainwater reserves are low.

Methods: The 2,000-gallon cistern in the River Theater is filled through a pump from catch basins at the base of the room’s bottom landing, which drain the area below the planters via a slot drain. CNT equation inputs for bioretention and infiltration were utilized to determine the amount of rainwater that falls onto the River Theater cistern drainage area; the drainage factor equation input for the cistern drainage area was equal to the percentage of the room’s surface area that drains to the cistern. The River Theater itself requires an estimated 2,100 gallons in the month of July - the 2000-gallon cistern alone could meet approximately 93% of those watering needs.

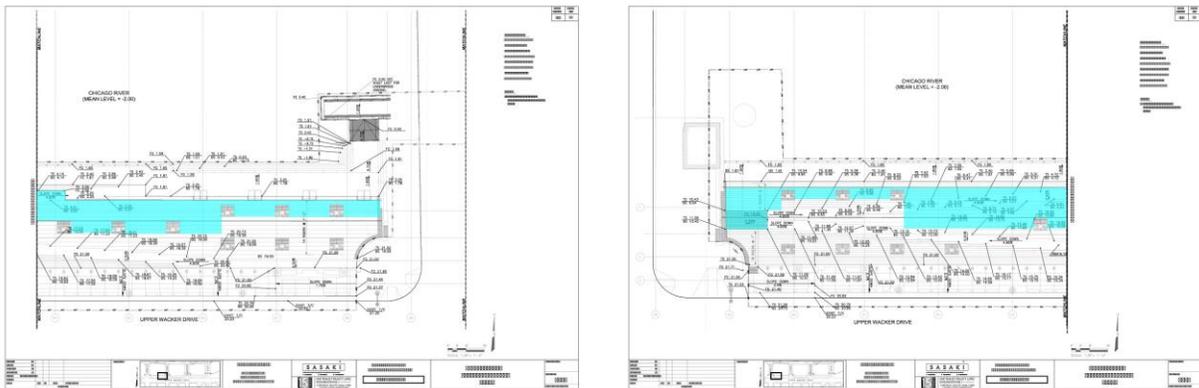


Figure 9: Diagram of River Theater drainage area to cistern

Calculations:

<p>Cistern Capture: [July precipitation (in) * (cistern drainage area (sf)) * % of rainfall captured] * 144 sq inches/SF * 0.00433 gal/cubic inch = total runoff reduction (gal)</p>						
RUNOFF DRAINED TO 2000 GALLON CISTERN	July Precipitation	Drainage Area	Detention Factor*	Area Conversion Factor	Gallon Conversion Factor	= Site Runoff (gal)
River Theater East	3.70	6,632.00	0.50	144.00	0.00	1,766,764.80

River Theater West	3.70	8,023.00	0.40	144.00	0.00	1,709,861.76
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INFILTRATION STRATEGIES AND WATERING REQUIREMENT TOTALS	Watering Requirements	Runoff Captured by Cistern (Max 2000 gallons)	Percentage of Water Requirements Met by Cistern Alone
Marina Plaza	6,900.68	N/A	
River Theater	2,131.82	2000	93.82%
TOTAL	9,032.50		

Table 24: Infiltration and Water Requirement Calculations. Source: LAF Research Team

*the drainage factor equation input for the River Theater is equal to the percentage of the room's surface area that drains to the cistern

Sources:

American Rivers, Center for Neighborhood Technology. 2011. *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Social and Environmental Benefits*. <http://www.cnt.org/repository/gi-values-guide.pdf>

Illinois Monthly Evaporation Data. Accessed June 26, 2019. <https://www.isws.illinois.edu/statecli/Pan-Evap/panevapx.htm>.

Sasaki Associates, Inc., Ross Barney Architects, Alfred Benesch and Co., Infrastructure Engineering, Rubino and Mesia, Delta Engineering, Jacobs/Ryan Associates, Schuler Shook, Dynasty Group, and Geo Services. *Chicago Riverwalk State Street to LaSalle Street Bid Drawings*. PDF. Chicago: City of Chicago Dept. of Transportation Div. of Engineering, July 22, 2013.

US Department of Commerce, and NOAA. "July Precipitation Amounts for Chicago, IL." National Weather Service. January 04, 2019. Accessed June 30, 2019. https://www.weather.gov/lot/July_Precip_Rankings_Chicago.

Limitations: Though the cistern is turned off and on to irrigate, and switched to fill with potable water as necessary, this data was not available to determine a more exact metric for the actual use of the cistern. This is assuming normal precipitation for the month of July and that the cistern is not ever full of municipal water as it catches all of its water from its drainage area. It is known anecdotally from 2FM, however, that the cistern does need to be filled with municipal water at times. As such, this benefit is inconclusive.

Cost Comparison

Seventeen 4.5-caliper trees were installed to provide more immediate shade for visitors and higher initial aesthetic value, accommodated by expanded tree pits in the River Theater. The cost to install custom tree grates was \$201,380, as compared to standard street tree grates which would have cost \$43,350. Investing an additional \$158,030 for custom tree grates allowed for the installation of trees with a more mature canopy and with a higher probability of living longer and growing larger. The lifespan of urban honey locust is estimated to be 65 years under adequate growing space and proper soil conditions, approximately 4-9 times longer than the 7-15 years of a typical urban street tree in conventional tree pits with poor soil conditions. This would save an estimated \$87,600 in replacement tree costs over time. Additionally, the appraised value of these trees in good soil conditions once mature is estimated to be nearly 18 times greater at \$334,900 than mature trees in poor soil conditions at \$18,700.

Methods: The Chicago Landscape Ordinance Manual requires that trees planted in the Greater Downtown area, of which the Chicago Riverwalk falls within, have a minimum 4 inch caliper upon installation. As such, the project team opted for 4.5 inch caliper trees to provide more canopy cover, be hardier, and have a stronger visual impact upon installation. The team designed custom tree grates that integrated into the River Theater's steps to provide large tree pits to ensure adequate soil volume, reduce soil compaction, and provide proper drainage. These were a significant investment, but the value becomes evident when compared to the cost of tree replacements every 7 to 15 years, which is typical for street trees in poor conditions according to the journal Urban Forestry and Urban Greening. The average lifespan of urban honey locust trees is 60 to 70 years according to Northern State University's The Natural Source online resource. The average of 65 years was used for the cost comparison. Additionally, the appraised value of mature trees in good and poor soil conditions were looked at to further quantify the value of the additional tree grate expense. The values used were based on James Urban's table in *Up By Roots*. The Willow oak was chosen for comparison because its canopy and size most closely resemble the honey locusts planted in the River Theater.

Calculations:

Tree and tree grate costs*

River Theater - 17 Gleditsia triacanthos - 4.5" caliper - \$793 each x 17 = **\$15,067**

River Theater stepped tree grate, type A - \$9,340.02 each x 7 = **\$65,380.14***

River Theater stepped tree grate, type B - \$13,600 each x 10 = **\$136,000***

$\$65,380.14 + \$136,000 = \mathbf{\$201,380.14}$ total expense for custom tree grates

Typical 5' x 5' Chicago Tree Grate - \$2,550 x 17 = **\$43,350** total expense for standard tree grates

$\$201,380.14 - \$43,350 = \mathbf{\$158,030.14}$ total extra expense for custom tree grates

*Costs for trees and tree grates do not include transportation/installation expenses

Urban Honey Locust Trees in Good Soil Conditions

Expected lifespan of urban honey locust = 60 to 70 years

Average lifespan of urban honey locust = $60 + 70 = 130 / 2 = \mathbf{65 \text{ years}}$

Average lifespan of street tree in typical conditions = 7 to 15 years
65 years / 7 years = 9.3 times replacement required
65 years / 15 years = 4.3 times replacement required

Tree Only Replacement Costs (poor soil conditions)*

Gleditsia triacanthos - 4.5" caliper price = **\$793**

\$793 x 4 times requiring replacement = **\$3,172**

\$793 x 9 times requiring replacement = **\$7,137**

Average replacement for tree only cost per tree = \$3,172 + \$7,137 = \$10,309 / 2 = **\$5,155**

Estimated Lifetime Replacement Costs for Trees in River Theater = \$5,155 x 17 trees = **\$87,635**

*Costs for trees do not include transportation/installation expenses

Value of Mature Tree in Different Soil Conditions

Willow oak, 10-inch dbh, in poor soil; street tree in a commercial district \$1,100*

Willow oak, 30-inch dbh, in good soil; street tree in a commercial district \$19,700

*slower growth rate assumed due to poor soil conditions in stressed environment

**data based on table in James Urban's *Up By Roots*, 2008

\$19,700 / \$1,100 = **17.9** times greater value in good soil condition

\$19,700 x 17 trees = **\$334,900** value of trees in good soil condition

\$1,100 x 17 trees = **\$18,700** value of trees in poor soil condition

Sources: Chicago Riverwalk Project Bid Documents.

Urban, James. *Up by Roots Healthy Soils and Trees in the Built Environment*. Champaign, IL: International Society of Arboriculture, 2008.

Roman, Lara A., and Frederick N. Scatena. "Street Tree Survival Rates: Meta-analysis of Previous Studies and Application to a Field Survey in Philadelphia, PA, USA." *Urban Forestry & Urban Greening* 10, no. 4 (2011): 269-74. <http://www.actrees.org/wp-content/uploads/2012/08/roman-scatena-2011-street-tree-mortality.pdf>.

Lara A. Roman, John J. Battles, and Joe R. McBride. "Urban Tree Mortality: a Primer on Demographic Approaches." United States Department of Agriculture, 2016. https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs158.pdf

The Natural Source, Northern State University, "*Honeylocust*," accessed 26 July 2019. <https://www3.northern.edu/natsource/TREESA1/Honeyl1.htm>.

Limitations: Due to limited information, estimated life expectancy for honey locust trees in urban conditions may not be fully accurate. Only costs for transported trees was considered in these calculations, additional costs for soil replacement and maintenance were not considered. Estimated value of the planted honey locusts was based on a different species of tree.

Appendix A:

Full Report - Floristic Quality Assessment for Chicago Riverwalk Phases 2 and 3

Chicago Riverwalk Phases 2 and 3						
Chicago Riverwalk						
Chicago						
Cook						
Illinois						
United States						
FQA DB Region:	Chicago Region USACE					
FQA DB Publication Year:	2017					
FQA DB Description:	https://www.lrc.usace.army.mil/Missions/Regulatory/FQA.aspx					
Practitioner:	Matt Callone					
Latitude:	41.88708					
Longitude:	-87.631898					
Private/Public:	Public					
Conservatism-Based Metrics:						
Total Mean C:	5.4					
Native Mean C:	6.3					
Total FQI:	38.2					
Native FQI:	41.3					
Adjusted FQI:	58.4					
% C value 0:	14					
% C value 1-3:	14					
% C value 4-6:	26					
% C value 7-10:	46					
Native Tree Mean C:	3.7					
Native Shrub Mean C:	9					
Native Herbaceous Mean C:	6.3					
Species Richness:						
Total Species:	50					

Native Species:	43	86%					
Non-native Species:	7	14%					
Species Wetness:							
Mean Wetness:	-0.4						
Native Mean Wetness:	-0.5						
Physiognomy Metrics:							
Tree:	6	12%					
Shrub:	2	4%					
Vine:	0	0%					
Forb:	32	64%					
Grass:	5	10%					
Sedge:	3	6%					
Rush:	0	0%					
Fern:	2	4%					
Bryophyte:	0	0%					
Duration Metrics:							
Annual:	1	2%					
Perennial:	49	98%					
Biennial:	0	0%					
Native Annual:	1	2%					
Native Perennial:	42	84%					
Native Biennial:	0	0%					
Species:							
Scientific Name	Family	Native?	C	W	Physio gnomy	Duration	Common Name
Acer rubrum	Aceraceae	native	5	0	tree	perennial	red maple
Acorus calamus	Acoraceae	non-native	0	-2	forb	perennial	single-vein sweetflag
Alisma subcordatum	Alismataceae	native	3	-2	forb	perennial	american water-plantain
Allium canadense	Liliaceae	native	3	1	forb	perennial	meadow garlic
Allium cernuum	Liliaceae	native	7	1	forb	perennial	nodding onion
Ammophila breviligulata	Poaceae	native	6	2	grass	perennial	beach grass
Asarum canadense	Aristolochiaceae	native	1 0	1	forb	perennial	canadian wild ginger

<i>Asclepias incarnata</i>	Asclepiadaceae	native	3	-2	forb	perennial	swamp milkweed
<i>Asclepias tuberosa</i>	Asclepiadaceae	native	8	2	forb	perennial	butterfly-weed
<i>Betula nigra</i>	Betulaceae	native	5	-1	tree	perennial	river birch
<i>Caltha palustris</i>	Ranunculaceae	native	8	-2	forb	perennial	yellow marsh-marigold
<i>Camassia scilloides</i>	Liliaceae	native	7	0	forb	perennial	atlantic camas
<i>Carex muskingumensis</i>	Cyperaceae	native	9	-2	sedge	perennial	muskingum sedge
<i>Carex stipata</i>	Cyperaceae	native	4	-2	sedge	perennial	stalk-grain sedge
<i>Chasmanthium latifolium</i>	Poaceae	native	7	-1	grass	perennial	indian wood-oats
<i>Chelone glabra</i>	Scrophulariaceae	native	8	-2	forb	perennial	white turtlehead
<i>Chionodoxa luciliae</i>	Hyacinthaceae	non-native	0	2	forb	perennial	luciles glory of the snow
<i>Cornus mas</i>	Cornaceae	non-native	0	2	tree	perennial	cornelian cherry
<i>Deschampsia cespitosa</i>	Poaceae	native	1 0	-1	grass	perennial	tufted hair grass
<i>Diervilla lonicera</i>	Caprifoliaceae	native	1 0	2	shrub	perennial	dwarf honeysuckle
<i>Eupatorium perfoliatum</i>	Asteraceae	native	4	-2	forb	perennial	common boneset
<i>Geranium bicknellii</i>	Geraniaceae	native	4	2	forb	annual	northern cranesbill
<i>Gleditsia triacanthos</i>	Fabaceae	native	1	1	tree	perennial	honey-locust
<i>Hamamelis virginiana</i>	Hamamelidaceae	native	8	1	shrub	perennial	american witch-hazel
<i>Hepatica acutiloba</i>	Ranunculaceae	native	8	2	forb	perennial	sharp-lobe hepatica
<i>Hibiscus moscheutos</i>	Malvaceae	native	7	-2	forb	perennial	crimson-eyed rose-mallow
<i>Hosta lancifolia</i>	Liliaceae	non-native	0	2	forb	perennial	plantain lily
<i>Iris virginica</i> var. <i>shrevei</i>	Iridaceae	native	5	-2	forb	perennial	virginia blueflag
<i>Jeffersonia diphylla</i>	Berberidaceae	native	1 0	2	forb	perennial	twin-leaf
<i>Liatris aspera</i>	Asteraceae	native	8	2	forb	perennial	rough gayfeather
<i>Lobelia cardinalis</i>	Campanulaceae	native	7	-2	forb	perennial	cardinal-flower
<i>Lobelia siphilitica</i>	Campanulaceae	native	4	-2	forb	perennial	great blue lobelia
<i>Mimulus ringens</i>	Scrophulariaceae	native	4	-2	forb	perennial	allegheny monkey-flower
<i>Nymphaea odorata</i>	Nymphaeaceae	native	5	-2	forb	perennial	american white water-lily
<i>Osmunda cinnamomea</i>	Osmundaceae	native	8	-1	fern	perennial	cinnamon fern
<i>Panicum virgatum</i>	Poaceae	native	3	0	grass	perennial	wand panic grass

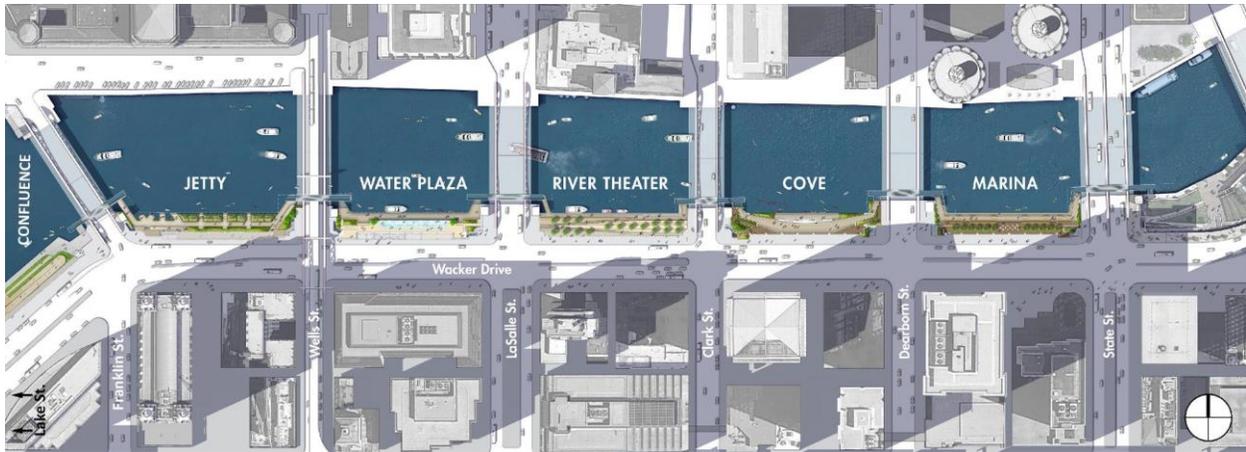
Peltandra virginica	Araceae	native	1 0	-2	forb	perennial	green arrow-arum
Physostegia virginiana	Lamiaceae	native	4	-1	forb	perennial	obedient-plant
Polystichum acrostichoides	Dryopteridaceae	native	8	2	fern	perennial	christmas fern
Pontederia cordata	Pontederiaceae	native	9	-2	forb	perennial	pickerelweed
Quercus robur	Fagaceae	non-native	0	2	tree	perennial	english oak
Rudbeckia fulgida	Asteraceae	non-native	0	-2	forb	perennial	orange coneflower
Sagittaria latifolia	Alismataceae	native	3	-2	forb	perennial	duck-potato
Saururus cernuus	Saururaceae	native	7	-2	forb	perennial	lizards-tail
Schizachyrium scoparium	Poaceae	native	5	1	grass	perennial	little false bluestem
Scirpus pendulus	Cyperaceae	native	2	-2	sedge	perennial	rufous bulrush
Silphium perfoliatum	Asteraceae	native	5	-1	forb	perennial	cup-plant
Solidago patula	Asteraceae	native	9	-2	forb	perennial	round-leaf goldenrod
Taxodium distichum	Taxodiaceae	non-native	0	-2	tree	perennial	southern bald-cypress
Trillium grandiflorum	Liliaceae	native	9	2	forb	perennial	large white trillium

Appendix B

Chicago Riverwalk User Survey Performed on July 4 and 8, 2019.

Chicago Riverwalk Visitor Survey

The Chicago Riverwalk underwent Phases 2 and 3 of its reconstruction between State Street and Lake Street, this redevelopment opening in October 2016. This survey is being taken to measure the social, environmental and economic impacts of this redevelopment. Please respond as best as possible to the following questions. This survey should take 10-15 minutes to complete.



1. When visiting the Riverwalk, generally how much time do you spend here? *(Please circle one)*
 - a. This is my first visit
 - b. 10 minutes or less
 - c. 11 minutes to 30 minutes
 - d. 31 minutes to 60 minutes
 - e. 1 hour to 2 hours
 - f. 2 hours to 3 hours
 - g. More than 3 hours

2. Do you live in Chicagoland? *(Please circle one)*
 - a. Yes
 - b. No

3. Please rank your reasons for visiting the Riverwalk today *(Please list your primary reason as 1 and 6 as lowest reason)*
 - ___ For physical exercise/recreation - biking, running, kayaking, fishing, walking
 - ___ For social reasons - Dining, meeting friends
 - ___ For educational reasons - school trip, tour
 - ___ For mental restoration - to “take a break” or meditative reasons
 - ___ For lunch/a meal
 - ___ Other, please describe:

4. When visiting the Riverwalk, do you patronize any of the businesses along the Riverwalk? If so, which type? (i.e. restaurants, bars, recreation) *(Please select all that apply)*
 - a. Restaurant
 - b. Bar
 - c. Recreation
 - d. Retail

- e. I do not spend money at any of the businesses along the Riverwalk.
5. Before or after visiting the Riverwalk, do you ever patronize businesses in the area not along the Riverwalk? If so, which type?(i.e. restaurants, bars, recreation) (*Please select all that apply*)
- a. Restaurant
 - b. Bar
 - c. Recreation
 - d. Retail
 - e. I do not spend money at any of the businesses in the area when visiting the Riverwalk.
6. How would you rate your satisfaction with the Riverwalk in its current state compared with its previous state prior to its reconstruction in October 2016? (*Please circle one*)
- a. More satisfied
 - b. Less satisfied
 - c. Feel the same
 - d. Neutral
 - e. I am not familiar with the site prior to its reconstruction
7. Do you find the Chicago Riverwalk to have improved in the quality of any of the following categories? (Please select all that apply)
- a. Aesthetic
 - b. Environmental
 - c. Cultural
 - d. Accessibility
 - e. I am not familiar with the site prior to its reconstruction
8. Do you find that it is easier for you to get closer to the water than it was before? (*Please circle one*)
- a. Yes
 - b. No
 - c. The same
 - d. I am not familiar with the site prior to its reconstruction
9. Have you taken a tour of the Chicago Riverwalk today or before? (*Please circle one*)
- a. Yes
 - b. No
10. By visiting the Chicago Riverwalk today, do you have a better understanding of the river's water level and aquatic life, such as fish, within the river? (*Please circle one*)
- c. I better understand the river's water level and aquatic life.
 - d. I do not better understand the river's water level and aquatic life.
 - e. I have the same understanding of the river's water level and aquatic life.

11. If you have a better understanding, which elements of the Chicago Riverwalk give you a greater understanding of the river's hydrology and aquatic life? (*Please select all that apply*)
- a. Floating wetlands
 - b. Posts with water levels etched onto the surface
 - c. Observation along the Riverwalk
 - d. Physical recreation in the river such as kayaking, boating
 - e. Educational tour
 - f. Other, please list: _____
12. Did you use the Riverwalk as part of your regular commute prior to its reconstruction in 2016? (*Please circle one*)
- a. Yes
 - b. No
13. If you currently use the Riverwalk as part of your commute, what is/are your mode(s) of transportation to arrive at your final destination? (*Please select all that apply*)
- a. Walking
 - b. Biking
 - c. Scooter/skateboard/hoverboard
 - d. Train to Riverwalk
 - e. Bus to Riverwalk
 - f. Water taxi
 - g. Other
 - h. The Riverwalk is not part of my regular commute
14. If you currently use the Riverwalk as part of your commute, why do you choose to use it? (*Please list your primary reason as 1 and your lowest reason as 5*)
- ___ Scenic route
 - ___ Shorter distance or time
 - ___ Environmental concern
 - ___ Economic reasons
 - ___ Other, please specify: _____
 - ___ The Riverwalk is not part of my regular commute
15. Do you choose to use the Riverwalk as part of your commute even if it is not the shortest distance/time route? (*Please circle one*)
- a. Yes, please explain why: _____
 - b. No
 - c. The Riverwalk is not part of my regular commute
16. Have you observed any conflicts with bicycles on the Riverwalk?
- a. Very often
 - b. Somewhat often

- c. Seldom
- d. Never

17. Have you observed any conflicts with Riverwalk guests drinking alcohol in public seating areas?

- a. Yes, please explain _____
- b. No

18. Do you believe allowing alcohol sold by Riverwalk vendors in the public seating areas makes the Riverwalk visit more enjoyable or less enjoyable?

- a. More enjoyable
- b. Less enjoyable
- c. No opinion

19. Have you used the Riverwalk wayfinding maps? If so, which one(s).

- a. Franklin wayfinding map
- b. Wabash wayfinding map

20. What Riverwalk locations have you visited? Check all that apply.

CHICAGO RIVERWALK



- _____ Confluence (Lake to Franklin)
- _____ The Jetty (Franklin to Wells)
- _____ Water Plaza (Wells to LaSalle)
- _____ Sweet Home Gelato
- _____ River Theater (LaSalle to Clark)
- _____ Tiny Tapp and Café
- _____ City Winery
- _____ Vietnam Veteran Memorial
- _____ Chicago Brew House
- _____ O'Brien's Riverwalk Café
- _____ McCormick Bridgehouse and
Chicago River Museum
- _____ Chicago First Lady Cruises
- _____ Chicago Architecture Center
- _____ The Northman on the River
- _____ Island Party Hut and Boat
- _____ Urban Kayaks
- _____ US Submarine Memorial

Appendix C:

Full Survey Results of Chicago Riverwalk Vendor Survey, collected in July 2019

Chicago Riverwalk Vendor Survey

QUESTIONS

RESPONSES 10

10 responses



- SUMMARY
- INDIVIDUAL

Accepting responses

Who has responded?

Emails REDACTED

Name of Business

10 responses

Beat kitchen

Chicago Duffy, LLC

Tiny Tapp & Cafe

O'Briens Riverwalk Cafe

Chicago Brewhouse

City Winery

The Northman Beer & Cider Garden

Island Party

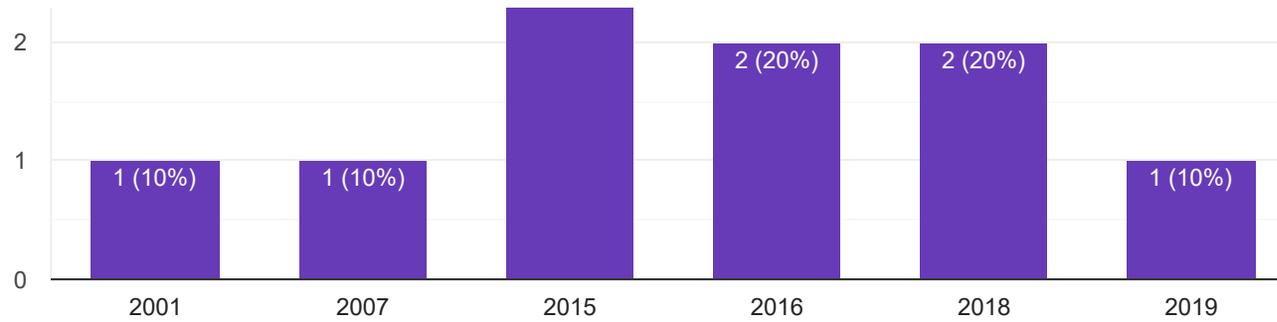
Chicago Riverwalk Ventures LLC

Chicago's First Lady

1. What year did you open your business at this location?

10 responses





2. Why did you choose this location for your business?

10 responses

To reach a different group of (and greater # of) customers, since Beat Kitchen's original location is in Roscoe Village.

It is right across from our current office on the river and we knew the Riverwalk was going to be a big hit!

We were excited to be a part of the re-imagined riverwalk, and help to make the river a viable recreational amenity

The City asked us to locate the cafe at this location to establish the Riverwalk as a destination stop and help in the efforts to establish federal funding to redevelop the area

Located on Riverwalk - which has quickly become one of top tourist destinations in the City

Location

Unique Waterfront Seating Opportunity

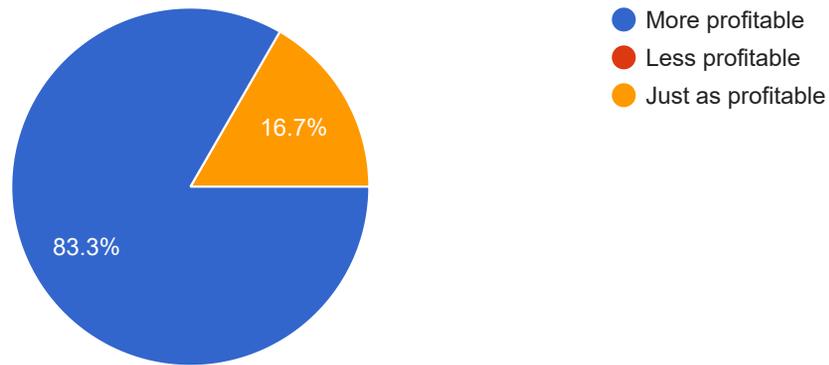
We wanted the open area in the park feel. Not a concrete jungle.

We thought adding a non-alcohol establishment would be a big seller since the diversity of the Riverwalk patrons was more than just 21+. There are a lot of visitors as well.

Wacker Drive reconstruction project

3. If your business was here prior to the reconstruction of the Chicago Riverwalk Phases 2 and 3, how has the reconstruction affected the profitability of your business?

6 responses



4. Approximately how many patrons did you serve at your Chicago Riverwalk location in 2018?

7 responses

13082

147000

96727

55000

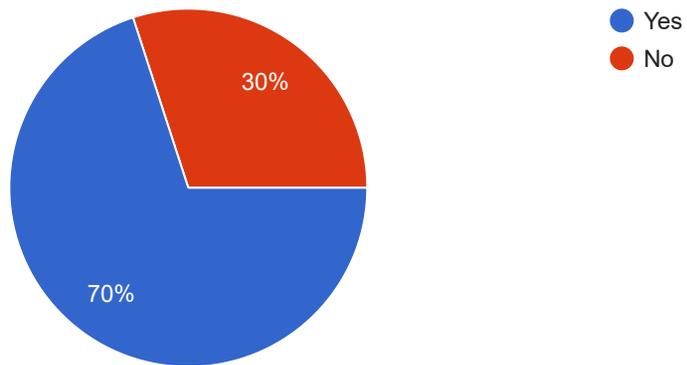
5000

40000

11339

5. Do you have another chain location elsewhere?

10 responses

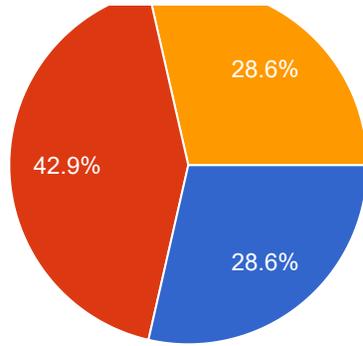


6. If so, how does the Chicago Riverwalk location's profitability compare to the other location?

7 responses



Chicago Riverwalk is more profitable



- Chicago Riverwalk is less profitable
- Chicago Riverwalk is just as profitable

7. How many seasonal, part-time and full-time permanent positions have you added to this location since 2016, if any? (Please specify if positions added were seasonal, part-time or full-time, i.e. "10 part-time").

9 responses

35-part time 35-full time

Approximately 140. Ninety of which are seasonal

10 part-time - 1 full time - seasonal

Currently - 60 full time seasonal and 20 part time - same last year

1 full time and 25 part time

30

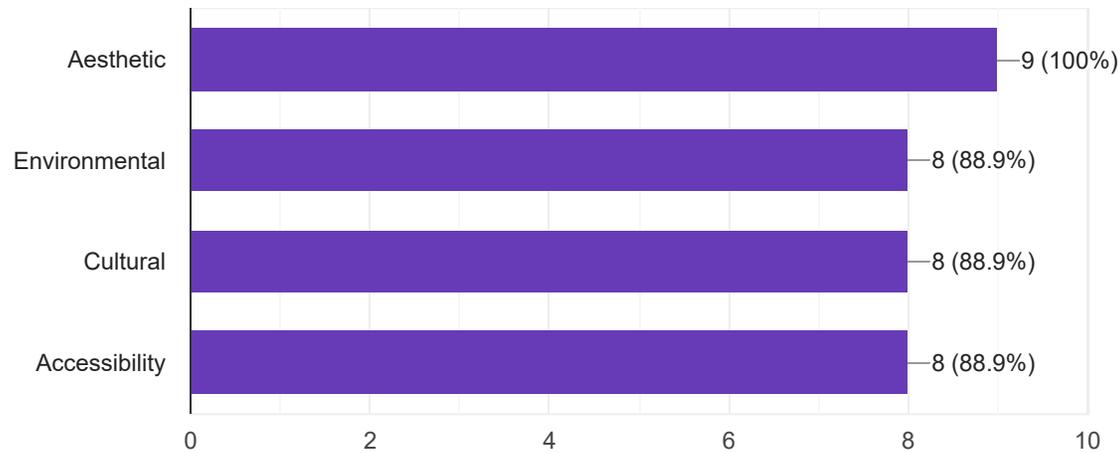
2 full time, 20 full time seasonal

35 - part time; 30 full time

Negligible changes

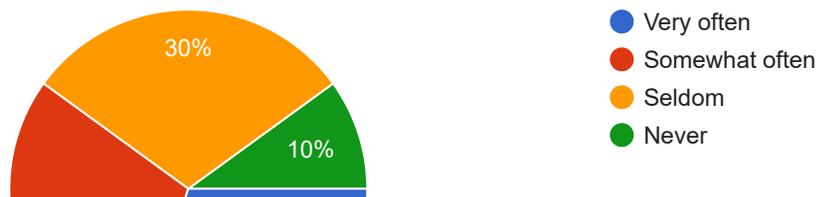
8. Do you find the Chicago Riverwalk to have improved in the quality of any of the following categories? (Please select all that apply)

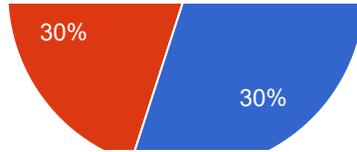
9 responses



9. Have you observed any conflicts with bicycles on the Riverwalk?

10 responses





10. Have you observed any conflicts with Riverwalk guests drinking alcohol in public seating areas? If yes, please explain.

9 responses

No

No, nothing terrible

Not in our area, we a self-contained cafe

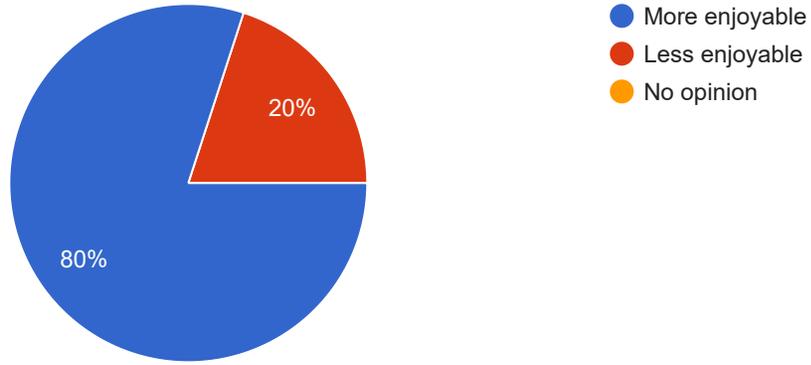
Many guests believe you can have alcohol anywhere on Riverwalk - we have to explain to them we cant sell to go and they get frustrated - they want to walk entire stretch of Riverwalk drink in hand

Only alcohol brought in from off the Riverwalk

Not really

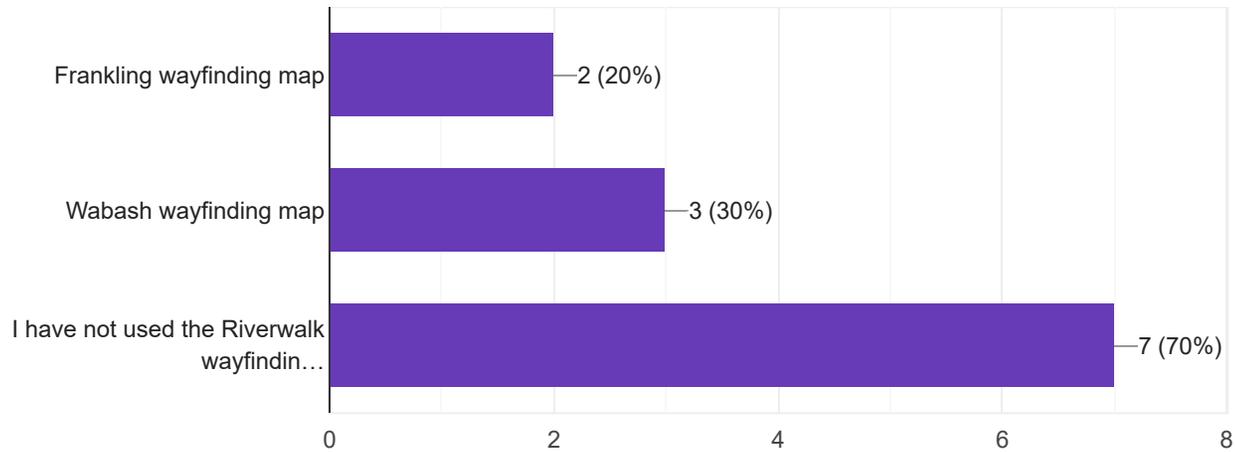
11. Do you believe allowing alcohol sold by Riverwalk vendors in the public seating areas makes the Riverwalk visit more enjoyable or less enjoyable?

10 responses



12. Have you used the Riverwalk wayfinding maps? If so, which one(s)

10 responses



13. What Riverwalk locations have you visited? Check all that apply. (Map below)

10 responses

