2017 LAF CSI PROGRAM LANDSCAPE PERFORMANCE SERIES:
Wayne Ferguson Plaza

Research Title: Landscape Performance Series – The University of Texas at Arlington Case Study Investigations 2017; Harvest Community, Argyle; Shops at Park Lane, Dallas and Wayne Ferguson Plaza, Lewisville[1]

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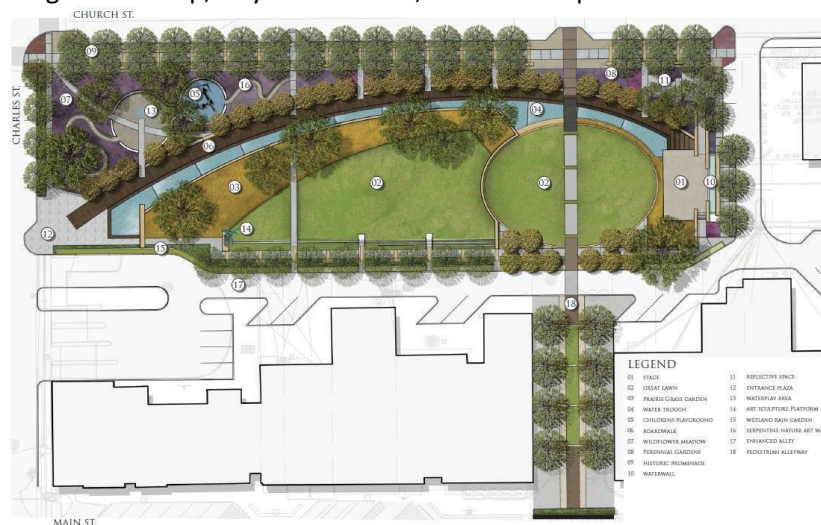Ravija Munshi, MLA Program

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Sponsor/Research Partner: Landscape Architecture Foundation (LAF)

(Source: Design Workshop, 2017))

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Overview of UT Arlington's Research Strategy for Case Studies

Introduction:
The purpose of this research is to investigate the landscape performance of three different North Texas landscape architectural projects: 1) Harvest Master Planned Community, Argyle, 2) Shops at Park Lane, Dallas 3) Wayne Ferguson Plaza, Lewisville Texas. This research is initiated as part of 2017 Case Study Investigation (CSI) program funded by Landscape Architecture Foundation (LAF). It is conducted in collaboration with the project landscape architecture firms: 1) Design Workshop & 2) TBG Partners.

The case study research tasks and reporting are outlined in advance by LAF to present project profile and overview, sustainable features, challenges/solutions, lessons learned, role of landscape architects, cost comparisons, and performance benefits. Within the LAF framework, the UT Arlington team, with its professional firm partners, collected, reviewed, and analyzed/synthesized project-related data for over 23 weeks between February – August, 2017 to prepare the case studies published online at LAF website.

The UT Arlington team developed its overall research design strategy in the 2013 & 2014 cycles as one of the recipients of the LAF's CSI grant/recognition (see Ozdil et. al., 2014). As a third term grant recipient in 2017, UT Arlington team continues to follow the strategy developed in the previous years with some revisions based on the lessons learned in the 2013 and 2014 funding periods. The research outlines its inquiry under the three sub-category headings-- environmental, economic, and social (including cultural and aesthetic)--to establish a comprehensive and systematic framework, ease the data collection and analysis process for multiple case studies, and to avoid losing sight of research goals while documenting a diverse set of findings. These subcategories are used primarily to identify and organize the performance benefits of landscape architecture projects in this collaborative effort.

The UT Arlington research combines quantitative and qualitative methods to document both landscape architectural projects, and to assess their performance benefits (Deming et. al., 2011; Murphy, 2005; Moughtin, 1999; Ozdil et. al., 2015 & 2014; Ozdil, 2016 & 2008). Methodological underpinnings of the research for the case studies are primarily derived from a systematic review of performance criteria and variables from: (1) the LAF's landscape performance series *Case Study Briefs* (LAF, 2017), (2) the case study methods that are developed for designers and planners in related literature (Francis, 1999; Gehl & Svarre, 2013; Gehl, 1988; Marcus et. al. 1998; Ozdil et. al., 2013; Preiser et. al., 1988), (3) the primary data collection methods through surveys (Dilman, 1978), site observations, behavior mapping, and assessment techniques (Gehl & Svarre, 2013; Marcus et. al. 1998; Whyte, 1980 & 1990), and finally (4) project-related secondary data collected from project firms, project stakeholders, public resources and databases. The data gathered from all the research instruments are further analyzed, synthesized and summarized as the performance benefits for the three case studies under investigation. The findings are organized within the LAF framework, as it is outlined earlier in this document for online publication. The research is designed to highlight the value and significance of these three landscape architecture projects by utilizing objective measures and by documenting and evaluating their performance to inform the design of future urban landscapes.

DATA COLLECTIONS METHODS:
The research plan involves collection of primary and secondary data through online surveys, systematic review of available secondary data and some site observations to document environmental, social, and economic performance benefits. As one of the critical step, the research team plans to acquire necessary permissions from Institutional Review Board at UT Arlington prior to primary data collection involving human subjects. The following section briefly reviews some of the major data collection strategies adopted in this research.

Survey: Survey instruments are being developed by the research team to collect primarily social performance data for all three sites. The survey measures use perception on topics such as: Quality of life; sense of identity; health, community, and educational benefits; safety and security; presence of arts; availability of informal and organized events as well as some other key variables listed below. The survey is informed by relevant literature, by other survey instruments prepared for parks and other landscape architecture projects, and by research team's previous work in grant 2013 and 2014 grant cycles. The survey instrument and the variables questioned within are kept similar in all three cases in order to develop a more homogenous measure with which to study varying sites. The survey simply asks the users (residents, visitors, employees etc.) of the sites for their perceptions and experiences of the case study landscapes. The survey is composed of three parts. The first part of the questionnaire documents user profiles as well as user perceptions and choices of activities available on the site by using multiple choice questions. The second part of the survey asks users to rate performance-related statements with Likert scale questions. The final portion of the survey asks for additional comments of respondents who want to share additional information with the research team. The survey is voluntary and the respondents were assured that identities would be kept confidential to ease privacy concerns. The survey is kept short (15 minutes to complete) and is being prepared for web/online platforms.

Archival and Secondary Data: This research benefits heavily from archival and secondary data obtained from project firms, project stakeholders, public resources, and private databases to measure social performance benefits. In accordance with LAF's mission, this research was a product of a partnership among academic research team, project firm, and LAF. Where and when data were available from the secondary sources, such as the landscape architecture firm, client(s), project partners, scholarly literature, and publicly available sources, the project team systematically plans to collect and organize the data, review its content, and assess its rigor and integrity.

Site Observations: Passive observation, photography, video recording, and/or site inventory and analysis techniques (such as use of street furniture counts/measurements, etc.), may also be utilized in 2017 case studies to capture social performance benefits. Observational methods utilized in this research will not involve any intrusive interaction with the subjects. Although photography or video recording is used, the identity of the subjects is blurred unless they allow researchers to use their images or the research partners provided photos with credentials. In all case studies, the research team plans to inform the stakeholders prior to site visits, and acquire necessary permissions.

RESEARCH DESIGN:
The UT Arlington team designed its research strategy under three focused thematic areas--environmental, economic, and social (including cultural and aesthetic)--for all three case studies. The performance benefits research strategy for all three cases this year uses variables and measures informed by relevant scientific literature, UTA's previous strategy proven to be effective in 2013 & 2014 grant cycles, and most importantly the new project typologies (Master Planned Community, Traditional Town Plaza, and Contemporary TOD Plaza with Shops) assigned in 2017 cycle. In the beginning of the investigation, the research team benefited from this strategy for conducting a systematic research that produces replicable performance criteria and methods for all sites. After the measurable criteria were identified and the possibilities exhausted, the UT Arlington team further refined its approach by customizing performance criteria and procedures to each case study site to better document and report the varied qualities of each site independently. While achieving a comparable set of performance benefits for all sites was the goal, and this strategy produces the greater framework for the research, customizing detailed performance criteria later in the process helped the research team to overcome

concerns about data availability, varying project typologies, project goals and outcomes. Given the strong variation in project typologies in 2017, separate research instrument (survey) is being created for each site.

The findings of the investigations in all cases focused first on performance benefits related to the site itself, then its immediate adjacencies, and finally on the project block group/neighborhood/district or zip code. For example, performance benefits that are most direct and telling about the project site itself are emphasized more in comparison to indirect performance benefits and findings about the project adjacencies or neighborhoods. This strategy is also used in the reporting of the findings to clarify the document and to ease the review.

In conclusion, the data collected through these strategies were systematically reviewed and appropriate methods for analysis of specific performance criteria are highlighted in the detailed methodology below. The following section presents research design specifics for Wayne Ferguson Plaza (WFP), a basic summary of the performance criteria under investigation, and the data sources and procedures involved in measuring that particular performance criteria.

Overview of Wayne Ferguson Plaza & UT Arlington's Research Strategy:

Figure.1 Before and After for Wayne Ferguson Plaza (Source: Design Workshop, 2017)

Overview:

Wayne Ferguson Plaza is the central gathering and open space for growing historic downtown Lewisville (also known as Old Town), located approximately 24 miles northwest of downtown Dallas, Texas. The vision for the design is to provide the opportunity to experience history, culture, art, and commerce with access to amenities and activities for the Lewisville community and its visitors. The design is rooted in human comfort and includes programming for multigenerational activity; flexibility for local and tourism-based events; a high level of design and art water features; and a connection to Lewisville's natural and cultural history. As a parking lot redevelopment, the new plaza reduces impervious coverage by replacing it with rain gardens, lawns and green spaces while introducing native grasses and wildflowers to treat, collect, and/or slow down stormwater. The broader design recommendations for the project aim to connect Main Street commerce, City Hall, and the Lewisville Center for the Creative Arts as one cohesive green space environment through additional streetscape, connectivity, and rear façade enhancements. Inspired by the sculptural manner in which water carves the landscape of the

North Texas Tall Grass Prairie, Wayne Ferguson Plaza embodies the center of community gathering, environmental stewardship, economic commerce, and dedication to the arts for the city of Lewisville.

Case Study Strategy: The research team followed the comprehensive investigation strategies outlined earlier in this document by concentrating on the social, environmental, and economic implications of the project. The team's approach to identifying performance benefits for WFP, Lewisville is mainly driven by detecting site and district-level challenges (see above) by reviewing its spatial organization to create people places, and by evaluating elements influencing its forms and functions to provide visitors with access to outdoor amenities that open opportunities to experience art, music, history and culture. Its status as a destination and its social and recreational qualities as an urban plaza in downtown district for urban dwellers and visitors encouraged the research team to investigate user perceptions. After reviewing the relevant literature, the project information, and the firm archives with Design Workshop the UT Arlington research team developed detailed procedures and performance measures which can be tied to project's initial challenges, goals and objectives (see figure.2 for research design).

The Wayne Ferguson Plaza Framework Plan:
Research Design Strategies and Performance Benefits

CHALLENGES	SOLUTIONS	FEATURES	METHODS	PERFORMANCE MEASURES
DESIGN CHALLENGES	DESIGN SOLUTIONS		1) National tree benefit calculator	• Carbon sequestration • Water interception
		ENVIRONMENTAL	2) Rational stormwater runoff method	• Reduces stormwater runoff
		SOCIAL	3) Before & after permeable surfaces	• Reduces urban heat island effect
			4) System review of archival data from Design Workshop	• Reduces surface runoff with LID
		ECONOMIC	5) Online survey	• Social benefit variables
		OTHERS	6) Calculations from review of secondary data	• Jobs created for construction period
			7) Systematic review of archival and secondary data	• Employment impact post construction conditions
			8) On-site observation	• Housing impact post construction conditions

LAF CSI 2017 Landscape Performance Series:
The University of Texas at Arlington and Design Workshop

Figure.2 Research Design

The research team followed the research design strategies outlined in the earlier portion of this document for the WFP case study (see figure 2 above). The team explored all social, economic and environmental performance measures. Given the district-level focus on culture, arts, commerce and history, the research team emphasized performance criteria that are more telling about the perceptions of the users, programmatic elements of the various components of the plaza, innovative construction practices, and cultural implications for visitors, as well as its economic impact to its immediate context. The plaza's diverse regional user base encouraged the research team to emphasize online surveys, in addition to some site observations done by the research team as effective data collection strategies.

After acquiring Institutional Review Board (IRB) permissions for human subjects from UT Arlington, the survey was distributed via e-mails, social media outlets, and/or professional network.

The research procedure also involved documenting the environmental and economic performance indicators for this case study. Various secondary data sources were reviewed to determine the project's environmental and economic influence, and numerous positive indicators were found representing the larger context of the project site. However, especially in the case of economics, the causality between the improvements and the economic changes in most instances were not direct and not specific enough to the project nor as informative as the researchers desired. Therefore, only a few selected economic performance measures are highlighted for the Wayne Ferguson Plaza case study. The next section outlines the specific performance benefits documented for this 1.5 acre urban park by illustrating data sources and procedures followed, as well as the limitations encountered measuring the particular performance criteria.

Performance Indicators:
The following bullet points explain and illustrate some of the more complex performance indicators summarized on the LAF CSI website. The performance indicators listed below are in their full form, and explained in detail to inform the reader about the calculations, procedures, limitations and/or significance of the research. These bullets are later formatted, summarized and/or further revised to comply with the online portal restrictions.

Environmental Performance Benefits:

Performance Indicator.1:

- Sequesters 7,326 lbs of atmospheric carbon annually in 113 newly-planted trees. The tree canopies also intercept 31,668 gallons of stormwater runoff annually.

Scientific name	Estimated Caliper (inches)*	CO2 sequestered by one tree (lbs)	Quantity of trees	Total CO2 sequestered (lbs)
*Quercus virginiana**	6	123	13	1599
*Quercus texana***	6	124	10	1240
*Lagerstromeia 'Natchez'**	5	34	10	340
*Quercus polymorpha***	4	59	28	1652
*Prunus mexicana**	4	22	10	220
*Gleditsia triacanthos***	3	40	7	280
*Cercis canadensis**	4	57	35	1995
Total			**113**	**7326**

* Due to limited caliper information in planting design document estimates are made through onsite observations.
** The caliper information is retrieved from planting design document.

Table.1: Tree's potential for carbon sequestration.

Methods: As illustrated in the table above the carbon sequestered is calculated with National Tree Benefit Calculator (http://www.treebenefits.com/calculator/).

For example: A single *Quercus virginiana* of 6" DBH sequesters 123 lbs of CO2. There are a total of 13 *Quercus virginiana* in the planting plan of The Wayne Ferguson. Thus, the total amount of CO2 sequestered by *Quercus virginiana* would be:
123 lbs*13 = 1599 lbs

One metric ton comprises of 2204 lbs. Thus, the total CO2 sequestered with the help of all the trees would be:
7326/2204 ~ **3.32 metric ton**

Limitations: This indicator relies on tools and estimations that are developed/ provided by third parties and may be subject to errors beyond the research team's control. Caliper information is captured from the Planting Design Construction Document. Due to data availability limitations caliper information is used as opposed to DBH. Although the Wayne Ferguson Plaza project was completed in October 2015, the plants are still not fully matured, thus plants will sequester additional carbon dioxide as they grow in size. The DBH for the plants is considered as 3" to 6" as per the caliper size information sourced from Design Workshop.

Scientific name	Caliper (inches)	Stormwater intercepted by one tree (gallons)	Quantity of trees	Total stormwater runoff intercepted (gallons)
Quercus virginiana	6	458	13	5954
Quercus texana	6	509	10	5090
Lagerstromeia 'Natchez'	5	190	10	1900
Quercus polymorpha	4	211	28	5908
Prunus mexicana	4	170	10	1700
Gleditsia triacanthos	3	148	7	1036
Cercis canadensis	4	288	35	10080
Total				**31668**

Table.3: Trees' potential for water interception.

Methods: As illustrated in the table above the stormwater intercepted is calculated with National Tree Benefit Calculator (http://www.treebenefits.com/calculator/).

For an example: A single *Quercus virginiana* of 6" DBH intercepts 604 gallons of stormwater runoff. There are a total of 9 *Quercus virginiana* in the planting plan of The Wayne Ferguson Plaza. Thus, the total amount of stormwater intercepted by the 9 *Quercus virginiana* would be:

458 gallons*13 = 5954 gallons

▪ Reduces the peak stormwater flow rate for a 2-inch rain event by 32.26% from 1.86 cfs to 1.26 cfs by reducing impervious surfaces by 34.6% or 0.17 acres.

Stormwater Runoff - pre-development					
Description	Area (sq. ft.)	i (inches/hour)	Area (Acres)	C (coefficient number)	Q=CiA (cu. ft./sec)
Asphalt paving	38700	2	0.88	0.9	1.584
Brick Paving	5200	2	0.12	0.65	0.143
Planting	10630	2	0.25	0.3	0.144
Total (raw numbers)			1.25		
Total (based on weighted-averages coefficient number for total area)	54530	2		0.744	1.86

Stormwater Runoff - post-development					
Description	Area (sq. ft.)	i (inches/hour)	Area (Acres)	C (coefficient number)	Q=CiA (cu. ft./sec)
Paving	18011	2	0.41	0.9	0.738
Planting	33611	2	0.77	0.3	0.462
Planting and Gravel	2908	2	0.06	0.65	0.0858
Total (raw numbers)			1.25		
Total (based on weighted-averages coefficient number for total area)	54530	2		0.504	1.26

Table.4: Stormwater runoff; pre and post-development comparison

Methods: As illustrated in the tables above the stormwater runoff is calculated with Rational Method (Q=CiA). The coefficient numbers for different materials are referenced from the LARE Reference Manual.

For example: A 5200 sq.ft. brick paving surface will create a 0.143 cu. ft. per second runoff in a single rain event of 2". (Please note that the area used in the following calculation is converted into acres. The area of an acre is equivalent to 43,560 sq.ft.):
CiA=Q
0.65*2 inches*0.11 acres =0.143 cu. ft./sec

As seen from the tables above the total stormwater runoff post-development is 1.26 cu. ft./sec and the

total stormwater runoff pre-development is 1.86 cu. ft./sec.

1.86cu. ft./sec - 1.26 cu. ft./sec =0.6cu. ft./sec
Thus, reducing the stormwater runoff post-development by 0.6 cu. ft./sec.
Considering the pre-development stormwater runoff as 100%, the post-development runoff is 67.74%
thus, reducing the stormwater runoff by 32.26%.

Finally, overall there are 0.6 cu. ft./sec reductions in the stormwater runoff which is a 34.70% reduction for the whole site.

Limitations: All calculations were derived from aerial photos and images converted to AutoCAD files and calculated which slightly hinder the accuracy of the exact square footage. Furthermore, the Rational Method (Q=CiA) is a mathematical formula developed to estimate stormwater runoff amount. It has mathematical limitations in terms of how accurately to round any and all decimal outcomes.

Performance Indicator.3:

- Intercepts 31,668 million gallons of stormwater through tree canopies provided reducing and/or directing runoff to tree wells, rain gardens, and planter areas.

Methods: As illustrated in the table above the stormwater intercepted is calculated with National Tree Benefit Calculator (http://www.treebenefits.com/calculator/).

Limitations: This indicator relies on tools and estimations that are developed/provided by third parties and may subject to errors beyond the research team's control. Since the project is recently completed in October 2015, the plants are still not fully matured. The DBH for the plants is considered as 5" and 6" as per the information sourced from Design Workshop.

Performance Indicator.4:

- Provides 40.1% shade over the summer months through an increased tree canopy, compared to 6.1% shade pre-development.

Shade Comparison - post-development			
Season	Daily Morning Average (~sq. ft)	Daily Afternoon Average (~sq. ft)	Seasonal Average (~sq. ft)
Summer	26750	25698	26224

Shaded area post-development:
Seasonal average shaded area= 26224 sq. ft.
Total area of site = 65340 sq. ft.
Percentage of area covered by shade = 40.1%

Shade Comparison - pre-development

Season	Daily Morning Average (~sq. ft)	Daily Afternoon Average (~sq. ft)	Seasonal Average (~sq. ft)
Summer	4086	3916	4001

Table. 5: Shade Area; pre and post-development comparison

Shaded area pre-development:
Seasonal average shaded area= 4001 sq. ft.
Total area of site = 65340 sq. ft.
Percentage of area covered by shade = 6.1%

Method: A Google SketchUp model was built to simulate summer season for both pre-development and post-development conditions, shown below (Pre and Post-Development example). The shade area is calculated by finding the square footage of shaded areas for twice a day and for one day in every month of the summer season.
For example: For each month of the summer season (3), simulated images were taken for 2 different times of the day; Morning and Afternoon. Those images were of both Pre-Development and Post-Development conditions.
For each image, the area of the shaded zones were mapped and calculated. Post and Pre-Development conditions are shown below (Please note that the shaded area is depicted in Red):
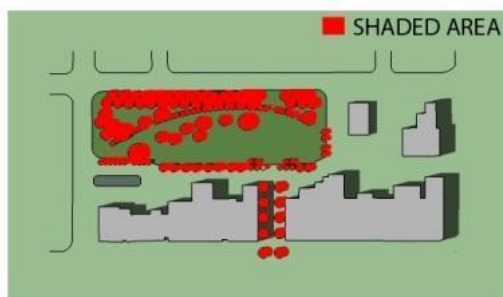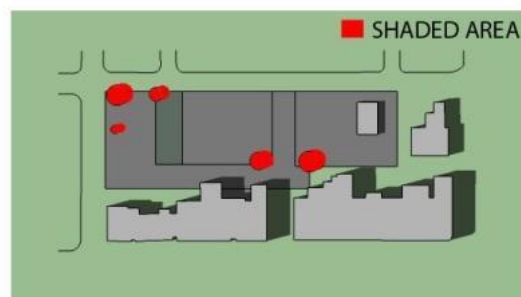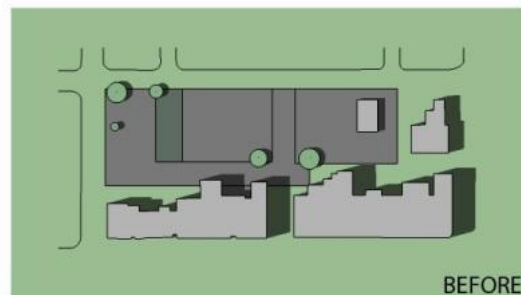

Figure.3: Shaded Area Before and After; Post- and Pre-Development

Limitations: This study was conducted in a simulated computer environment and did not take into account every day of the year (365) individually, which would allow more sample images for more accurate calculations. The times of day taken were 9:00AM for the morning samples and 5:00PM for the Afternoon samples in order to simulate the most impactful environments for shade. To gather more efficient results, ideally every hour would be measured, showing the constant shifting of the shaded

areas. In addition, the models built for the study were not shaped exactly as the structures/buildings are in reality, hindering the potential for even more precise area measurements. Due to canopy data availability, the model was built as per measurements provided in construction document. Tree canopy sizes are simulated based on schematic plan drawings.

Social Performance Benefits:

Performance Indicators:

According to the Wayne Ferguson Plaza Survey conducted by the UT Arlington research team, respondents ***agree or strongly agree with the statement*** *that Wayne Ferguson Plaza (N: 121):*

- Promotes **scheduled/organized events** for **98.3%** (72% strongly agree) of the survey respondents primarily through *Music Concerts, Festivals, and Market Days*.
- Improves **perception of the Downtown Lewisville** for **95.8%** of the survey respondents.
- Is perceived **favorably by 94.9%** of the respondents.
- Improves **perception of the City of Lewisville** for **94%** of the survey respondents.
- Creates **a sense of identity** for **91.5%** of the survey respondents.
- Promotes a **safe & secure environment** for **89.8%** of the survey respondents primarily through *Lighting, Visibility, Presence of Others, and Planting Scheme*.
- Improves the **quality of life** for **88.9%** of the survey respondents primarily through *A Place for Community, A Place to Be Outdoors, and Reduce Mental Stress*.
- Promotes **art and artistic activities** for **84.8%** of the survey respondents primarily through *Fountains and Water Features, Garden Design, and Performing Arts.*
- Encourages **multigenerational interaction** for **83.9%** of the survey respondents.
- Promotes **healthy living** for **84.8%** of the survey respondents primarily through *Passive Activity, Relaxing, and Fountain Play*.
- Provides **access for all (American Disability Act-ADA)** for **83.1%** of the survey respondents.
- Promotes **history & heritage of Lewisville** for **75%** of the survey respondents.
- Increases **participation in outdoors** for **80.5%** of the survey respondents primarily through *Food Consumption, People Watching, and A Place to Take a Walk*.
- Improves understanding of **landscape architectural practice** for **71.2%** of the survey respondents.
- Promotes a **better understanding of sustainability** for **66.9%** of the survey respondents primarily through *Native Planting, Urban Greenery, and Walkability.*
- Promotes **educational activities** for **59.4%** (31.4% neutral) of the survey respondents.
- Encourages people **to live within walking distance** for **32.2%** (23.7% disagree) of the survey respondents.

Survey notes: 121 Wayne Ferguson Plaza users were surveyed between June and July, 2017 by UT Arlington research team. **60.2%** of the plaza users surveyed noted themselves as '**resident'** while **30.5%** as **'employee'** and only **5.9%** as '**visitor'.** Survey findings also illustrated that only **0.8%** of the users were visiting the plaza **first time and 5.1% daily** while **92.4%** visits the park **at least one time per month**. Additionally, nearly **84.2%** of the respondents arrives Plaza by using a **personal vehicle** while **10.8%** arrives Plaza **on foot.** Median respondents' travel **3.48** miles (**5.47** miles average respondent) to get to Wayne Ferguson Plaza**.**

Method: Online Survey. Please see the data collection methods at the beginning of the paper.

Limitations: This survey is conducted only on an online platform due to resource, time, and permissions limitations. An online survey recruitment letter was circulated among various e-mail lists and social media groups throughout Lewisville. It was realized that an online survey may produce more targeted results depending on where the survey can be circulated in a short amount of time. However, it may not always assure a high response rate. Another potential limitation is that the Los Angeles (LAX)recruitment strategies used in this instance do not assure randomized sampling which may have influenced the results.
Not all of the survey results/findings are reported in their entirety due to LAF's online formatting restrictions for their website, therefore the list only includes a sample of the survey findings. For further information, contact the UTA research team for this case study: Dr. Taner R. Ozdil, ASLA, tozdil@uta.edu.

Performance Indicator.2:

▪ Contributed to an increase in the downtown block group population by 9.4% between 2010 and 2017 by providing a new amenity for Lewisville community.

Methods: The US Census data was organized with the ESRI Business Analyst software to compare the current 2010 US Census data with projected 2017. Demographic data from 2010 (latest US Census data) and 2017 (projected US Census data by ESRI Business Analyst) is used for the analysis.

Limitations: Secondary data was attainable for US Census block group only which is considerably larger area than the park and its adjacencies. Thus the park can only be looked at as an indirect catalyst for the population change.

Performance Indicator.3:

▪ Dedicate a minimum 1% of the construction budget for public art while incorporating art from local or national artists to a minimum of four key locations within the design to build on energy associated with the Center for Creative Arts.

Methods: Secondary data from public and/or private sources

Limitations: Given that the data was collected from secondary sources there may be inherent errors and/or omissions to such data beyond the researchers' control.

Performance Indicator.4:

▪ Hosts 21 large and small events on average between March and July, including Old Town celebrations/festivals, concerts, farmers market, yoga, worship, and more, totaling over 2,800 online RSVPs.

Methods: Secondary data is used from social media sources. The total number is estimated from Facebook (Wayne Ferguson Plaza page) event reservation.

Limitations: Although total number of attendants is anecdotally higher there is no attendance count available. Therefore, Facebook page RSVP is considered for the total count.

Economic Performance Benefits:

Performance Indicator.1:

▪ Contributed to a 56.6 % increase in the total assessed value of adjacent parcels in its urban block between 2012 and 2017. Property value increase was nearly 33.9% more than another randomly selected downtown block.

Methods: Data sourced from a systematic review of archival data and literature from the Denton Central Appraisal District, 2017. The first data was collected for 15 parcels adjacent to Wayne Ferguson Plaza Block (See the image and the table below). Through random sampling another block (see Figure.5) was chosen to see the comparative advantage or disadvantage of WFP's block.

Figure.4: WFP Block adjacent parcel lots numbered, Source: Denton Central Appraisal District.
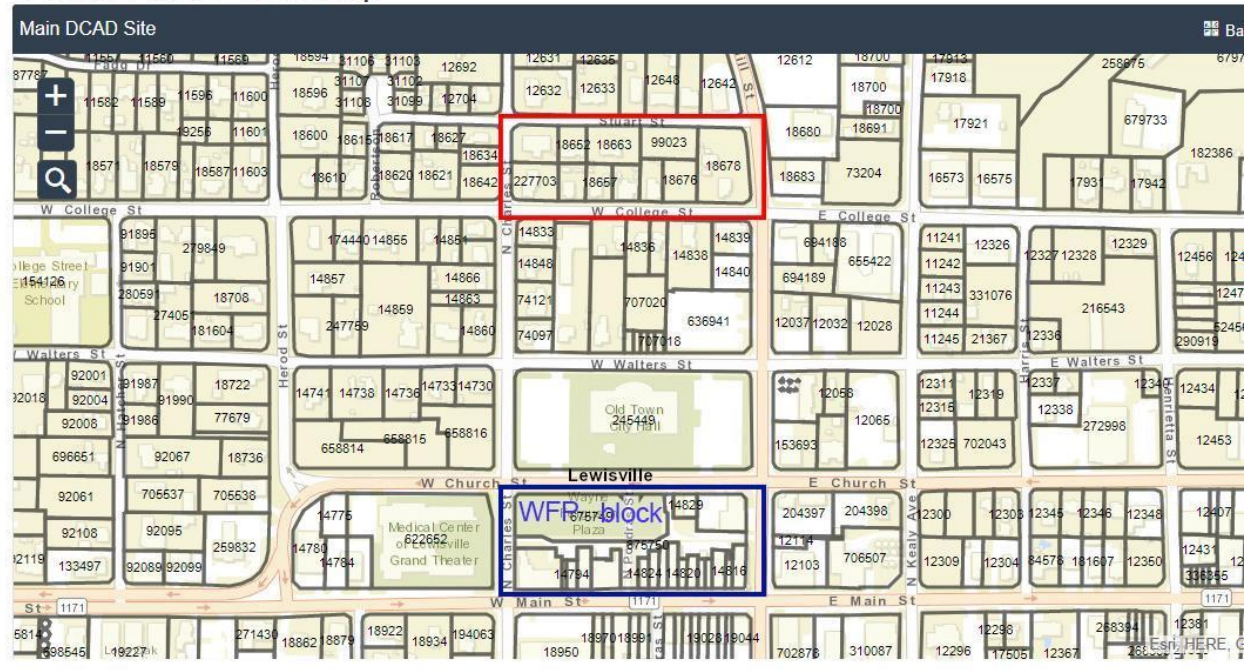
Figure.5: Blue outline indicate WFP block whereas red shape outlines comparable block for Property Market Value comparison, Source: Denton Central Appraisal District.

COMPARISON BLOCK				
Market value (Property Parcel Value in $)				
Property/Year	2010	2012	2015	2017
227704	123259	111382	128217	154373
18652	55846	61112	68866	80494
18663	77891	82111	90093	102366
99023	46652	46652	46652	46652
18678	81469	81469	81469	81469
18676	42690	42690	42690	42690
18671	54567	58476	65934	77102
18660	64490	73713	81108	94230
18657	53841	60030	65613	75407
18655	48244	51693	57814	67031
Total	648949	669328	728456	821814
Percentage increase/ decrease in property value	2010-12	2012-15	2015-17	2012-17
	3.14%	8.83%	12.82%	22.78%

WFP BLOCK				
Market value (Property Parcel Value in $)				
Property/Year	2010	2012	2015	2017
14829	169850	170000	263383	346546
64901				
14814	345679	323258	550000	525764
14816	164825	153731	192000	212167
73315	159000	169287	300000	465000
14817	110000	91147	150000	236676
14818	162661	160000	216000	207274
14819	276376	242968	351000	355764
14820	205450	175408	260000	268142
14821	208747	234319	323676	350000
14822				
14823	401245	410232	538600	540000
14824	174000	150297	291600	300000
14796	918890	831968	970000	1096039
14795	349283	500000	578776	719000
14794	227939	200777	270000	325000
14793	93644	80606	150000	151679
675751				
Total	264506	259600	360336	406603
Percentage increase/ decrease in property value	2010-12	2012-15	2015-17	2012-17
	-1.85%	38.80%	12.84%	56.63%

Table.6: Blue outline indicates the WFP block whereas the red shape outlines a comparable block for Property Market Value comparison by parcel numbers, Source: Denton Central Appraisal District.

Limitations: Data was collected from secondary sources; there may be errors and/or omissions inherent to such data beyond the researchers' control. Data is a summation of property values of each parcel adjacent to Wayne Ferguson Plaza as well as for a comparison block which was randomly selected. The comparison block may not be representative of downtown property values. Also, the reader should be aware that developing an understanding of the economic impact of a project like Wayne Ferguson Plaza in an urban environment is a complex task. Although this bullet takes into account promising real estate activity within the adjacent properties, it cannot fully take into account some of the larger complex economic trends within the greater district and city. Thus, it must be viewed as indirect. These numbers are not inflation-adjusted.

Performance Indicator.2:

▪ Since its inception, WFP generated minimum of 22 major ticketed events/rentals for more than 129,000 visitors.

Methods: Raw data was acquired from The City of Lewisville.

Limitations: Given that the data was collected from secondary public sources there may be inherent errors and/or omissions to such data beyond the researchers' control. Visitor numbers are also estimates provided by the City. Ticket/rental prices for events were not available.

Performance Indicator.3:

▪ Helps decrease housing vacancy by 6.6% between 2010 and 2017 in its U.S. Census block group by creating a desirable destination and attracting economic development.

Methods: The data was organized with the ESRI Business Analyst software to compare the current 2010 U.S. Census data with projected 2017 and 2022 data. Block group data was used.
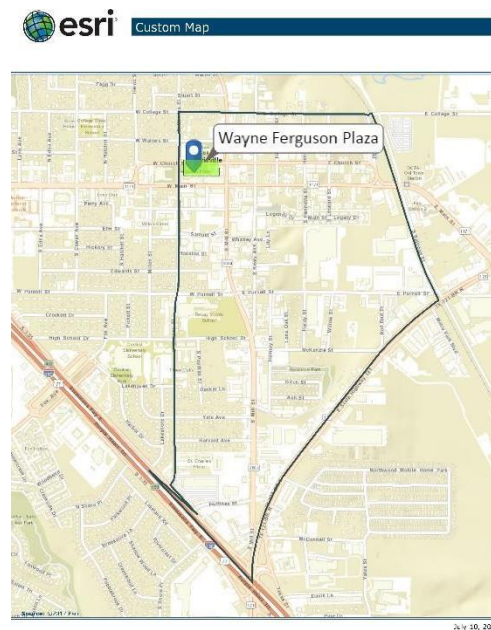

Figure.5: Downtown Block group, Source: ESRI Business Analyst**.**

Limitations: The main limitation is that the data is based on projections, but due to the Wayne Ferguson Plaza's opening in 2015, there is currently no census data available. A secondary limitation is the use of block groups. The park can only be looked at as an indirect catalyst for the housing market change. From 2010 (latest US Census data) to 2017 (projected US Census data by ESRI Business Analyst).

Cost Comparison Calculations:

During the design development phase of Wayne Ferguson Plaza, as part of a weeklong design charrette, the Lewisville community was presented with three design alternatives by the design team with an estimated price tags of: $1.9, $2.1 and $2.5 million (2009 prices). Design alternatives emphasized curvilinear, angular, or organic design elements, forms, and/or features with slightly different programmatic elements based on earlier community input. According to designer records, the community overwhelmingly chose a curvilinear design alternative by highlighting their interest in a linear promenade and water feature with a children's adventure playground, which carried a price tag of an estimated $2.1 million. Although the chosen design had already included water features and over 50 canopy trees it was further improved with additional features (such as water features, interactive pop-jet fountains, 50% more canopy trees and public arts and sculpture) based on the comments provided by the stakeholders for the other two design alternatives. As a result of such design improvements as well as the added infrastructure the final plaza's estimated price tag increased to $3.7 million (in 2009 prices) The final design provides an ample amount of design features for multigenerational outdoor activities in a tough North Texas climate. The ultimate cost of the project is estimated to be $5.2 million (in 2015 prices).

Limitations: These calculations were made based on the master planning document created in the earlier phases of the project. They are early conceptual 'best guesses' that clearly evolved and increased throughout the design process over time. More accurate estimating occurs during the design phases and the cost estimates from the CD and bidding phases tell a more complete story than master planning early assumptions.

Sustainable Feature 1:

▪ Provides habitat for 17 primarily Texas native plant species out 34 planted. This makes up 50% of the overall plant species (trees, shrubs, perennials and ground covers, water plants, and bulbs) and 85% of the tree species planted in WFP.

Method: University of Texas at Arlington's research team observation from Design Workshop documents. The plant data from the firm is evaluated with the Texas Native plant database from the Lady Bird Johnson website.

Limitations: Relies on data pertaining to the whole state of Texas and not specific to the microclimate of Lewisville.

Sustainable Feature 2:

▪ Provides opportunities for Main Street businesses to benefit from the plaza by opening the back façade of their buildings.

Method: Secondary data

REFERENCES:

American Forests. (2013). *Carbon Footprint Calculator.* Retrieved from http://www.americanforests.org/discover-forests/carbon-calculator/

ArcGIS Business Analyst(2017). *Business analyst*. Retrieved from http://www.esri.com/software/businessanalyst/data-and-reports

Casey Trees and Davey Tree Expert Co. (2013). *National Tree Benefit Calculator.* Retrieved from http://treebenefits.com/calculator/

Central Park Conservancy. (2011). *Report on the Public Use in Central Park.* New York: Central Park Conservancy.

City of Dallas Parks and Recreation. (2012). *How Do We Rate?* Dallas: City of Dallas.

Design Workshop, NDM Civil Engineering & DTA Inc. (2010). *Master Plan Booklet. City of Lewisville Old Town Plaza.* City of Lewisville.

Deming, M. E., & Swaffield, S. R. (2011). *Landscape architecture research: Inquiry, strategy, design*. Hoboken, N.J: Wiley.

Denton Central Appraisal District (2017). *Denton CAD webmap. Retrieved from: https://www.dentoncad.com/gis/*

Dilman, D. A. (1978). Mail and telephone surveys. New York: John Wiley & Sons.

Francis, M. (1999). A case study method for landscape architecture. Landscape Architecture Foundation, Washington, D.C. (Last Accessed http://www.lafoundation.org/research/case-study-method/)

Gehl, J. & Svarre, B. (2013). *How to Study Public Live*. Washington: Island Press.

Gehl, J. (1996). *Life between buildings: Using public space*. New York: Van Nostrand Reinhold.

Lady Bird Johnson Wildflower Center (2017). *Native Plant Database. Retrieved from: https://www.wildflower.org/plants/*

LAF-Landscape Architecture Foundation (2017). *Landscape Performance series: Case study briefs. Retrieved from:* https://landscapeperformance.org/

LAF-Landscape Architecture Foundation (2013). *Case Study Briefs*. http://www.lafoundation.org/research/landscape-performance-series/case-studies/ (Last Accessed, June 15, 2014)

Marcus, C. C., & Francis, C. (1998). *Peoples place: Design guidelines for urban open space.* London: Van Nostrand Reinhold.

Moughtin, C. (1999). Urban design: Methods and techniques. Boston, MA: Architectural Press.

Murphy, M. D. (2005). *Landscape architecture theory: An evolving body of thought*. Long Grove, Ill: Waveland Press Inc.

Ozdil, Taner R. (May, 2016) "Social Value of Urban Landscapes: Performance Study Lessons from Two Iconic Texas Projects" *Landscape Architecture Frontiers – LAF*, 4(2): p12-29.

Ozdil, Taner R., & Stewart, D. (February, 2015). "Assessing Economic Performance of Landscape Architecture Projects: Lessons Learned from Texas Case Studies" *Landscape Architecture Journal* hosted by Beijing Forestry University, China. Special Issue, p70-86.

Özdil, Taner R. (2008). *Economic Value of Urban Design*. VDM Verlag Dr. Muller, Munich

Ozdil, Taner R., & Modi, S., & Stewart, D. (March, 2014).'Texas Three-Step' Landscape Performance Research" *Council of Educators in Landscape Architecture (CELA-2014)*. Baltimore, Maryland. Abstract is in proceedings.

Ozdil, Taner R., & Modi, S., & Stewart, D. (December, 2013). "Case Study Investigation 2013: Klyde Warren Park". OJB. *Landscape Performance Series.* Landscape Architecture Foundation, Washington D.C.

http://www.lafoundation.org/research/landscape-performance-series/case-studies/case-study/612/

Preiser, W. F.E., Rabinowitz, H. Z., & White E. T. (1988). *Post occupancy evaluation*. New York: Van Nostrand Reinhold.

Sherer, P. (2006). *The Benefits of Parks: Why America Needs More City Parks and Open Space*. San Francisco: The Trust for Public Land.

SimplyMap, Geographic Research, Inc. (2013). *SimplyMap*. Retrieved July 2013, from Geographic Research, Inc.: http://geographicresearch.com/simplymap/

US Census Bureau. (2014). Retrieved July 2014, from United States Census Bureau: http://www.census.gov/

U.S Department of Transportation, F. H. A. (March 2013). *Highway Statistics 2011*. from http://www.fhwa.dot.gov/policyinformation/statistics/2011/vm1.cfm

U.S. Environmental Protection Agency (2012). *Water Trivia Facts*. from http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm

Wayne Ferguson Plaza. (2016). Retrieved from http://www.ecodevlewisville.com/wayne-ferguson-plaza

Wayne Ferguson Plaza. (2017, January 05). Retrieved from http://www.cityoflewisville.com/about-us/city-departments/parks-leisure-services/park-listings/wayne-ferguson-plaza#ad-image-1

Wayne Ferguson Plaza Dedication Ceremony. (2015, October 02). Retrieved from http://www.cityoflewisville.com/Home/Components/News/News/1638/33?seldept=19&npage=3&arch=1

Wayne Ferguson Plaza Update. (2015, July 31). Retrieved from https://www.youtube.com/watch?v=BexDponf5Z0

Whyte, H. W. (1980). *The social life of small urban space.* Washington, D.C.: The Conservation Foundation.

Whyte, H. W. (Writer/Director). (1990). *The social life of small urban spaces* [Video Recording]. New York: Municipal Art Society.