



# ***WITH THE WORKFORCE***

Studying Solutions to Address Housing Needs in a Rapidly Growing Region

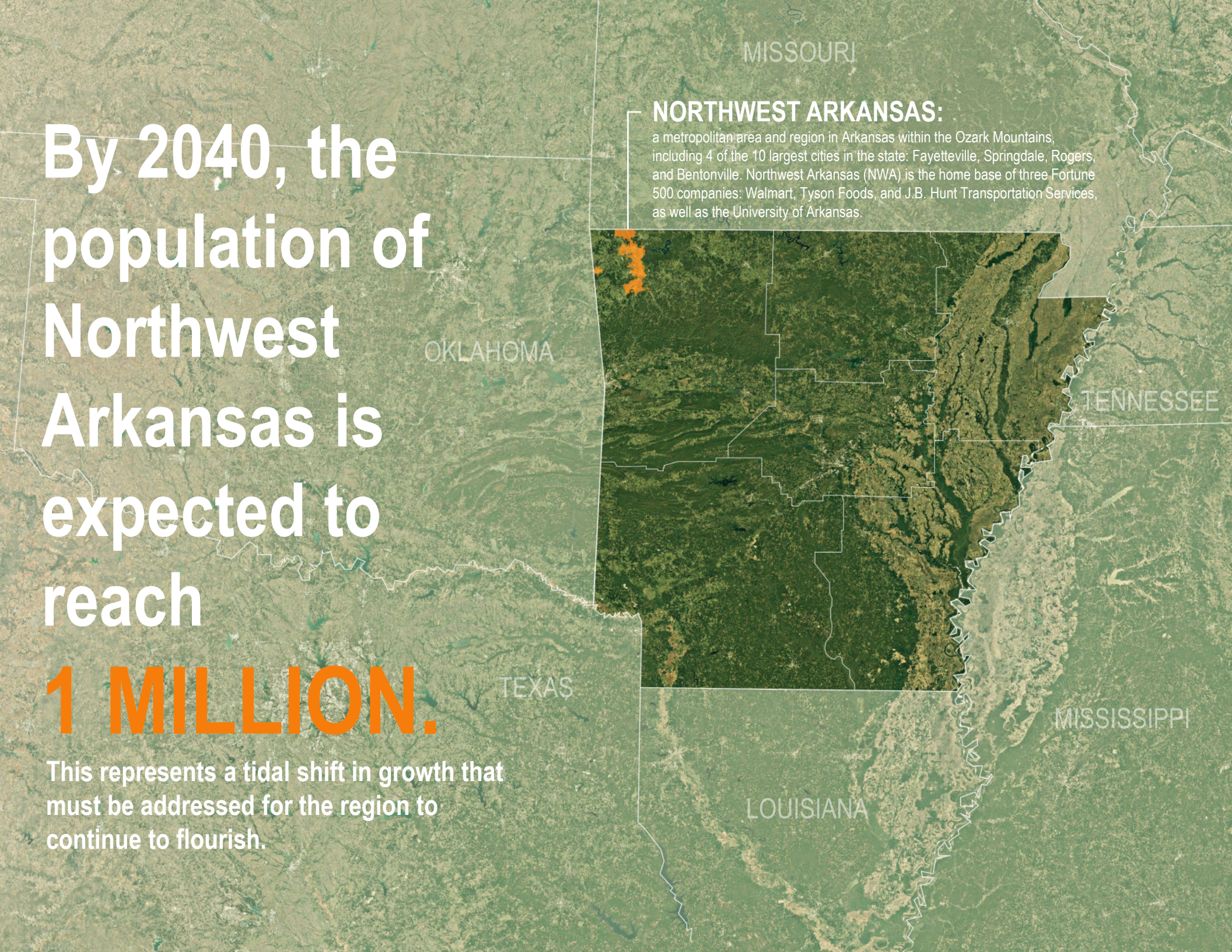
By 2040, the population of Northwest Arkansas is expected to reach

**1 MILLION.**

This represents a tidal shift in growth that must be addressed for the region to continue to flourish.

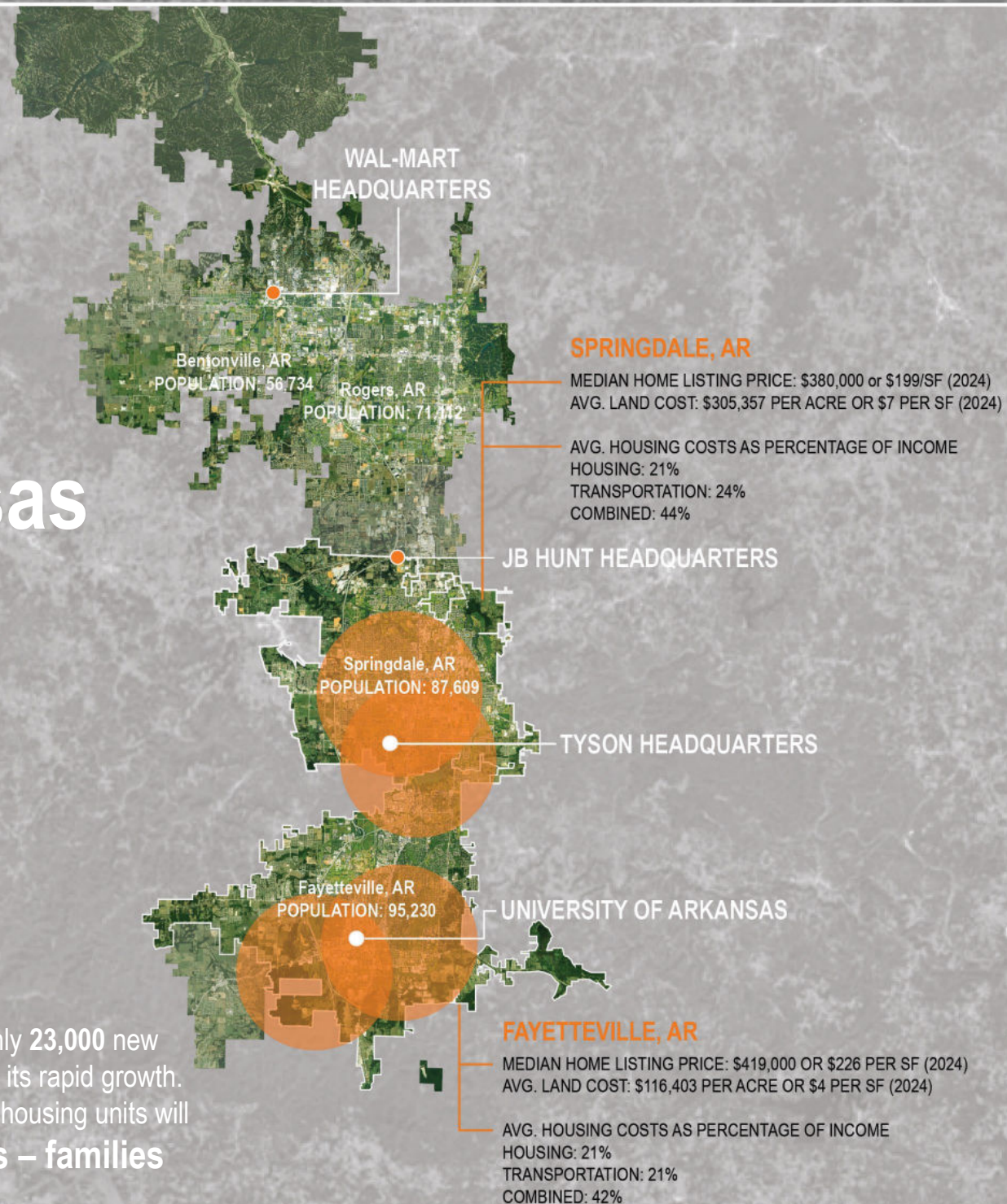
**NORTHWEST ARKANSAS:**

a metropolitan area and region in Arkansas within the Ozark Mountains, including 4 of the 10 largest cities in the state: Fayetteville, Springdale, Rogers, and Bentonville. Northwest Arkansas (NWA) is the home base of three Fortune 500 companies: Walmart, Tyson Foods, and J.B. Hunt Transportation Services, as well as the University of Arkansas.

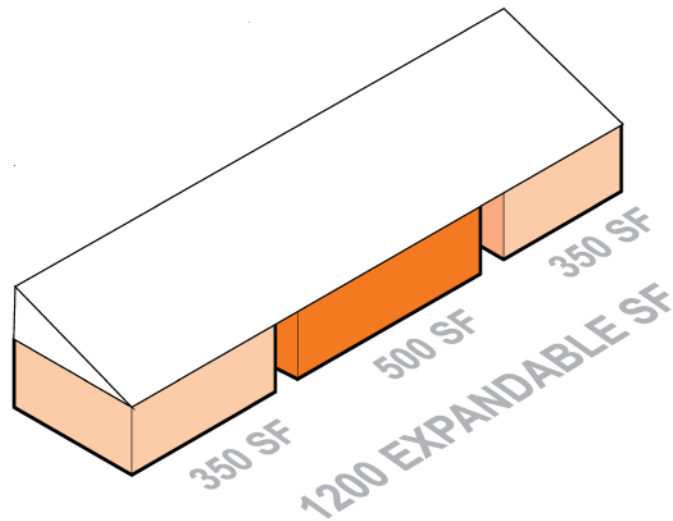


# Housing costs in the major metropolitan regions of Northwest Arkansas are rising an average of **30 - 40%** every two years.

Northwest Arkansas needs to generate housing for roughly **23,000** new residents per year for the next 20 years to accommodate its rapid growth. Analytical studies recommend that **at least half** of these housing units will need to be appropriate for **workforce households – families of four earning less than \$78,000 a year.**



# How can Northwest Arkansas house the workforce?



## ESSENTIAL WORKERS



**\$16**

AVERAGE WORKFORCE WAGE PER HOUR

**\$832**

MAX MORTGAGE @ 30% MONTHLY INCOME

### DESIGN TO INCOME MODEL:

\$115,000 SALE PRICE OF HOME (30-YEAR FIXED MORTGAGE, 7.61% INTEREST RATE, CURRENT AVG. IN ARKANSAS)

- \$ 11,500 DEVELOPERS FEES (10%)
  - \$ 6,900 TRANSACTION FEE (6%)
  - \$ 1,150 PERMITTING FEE (1%)
  - \$ 10,241 LAND COST (1 ACRE @ \$104,212/ACRE WASH CO)
- = \$85,029 CONSTRUCTION COSTS

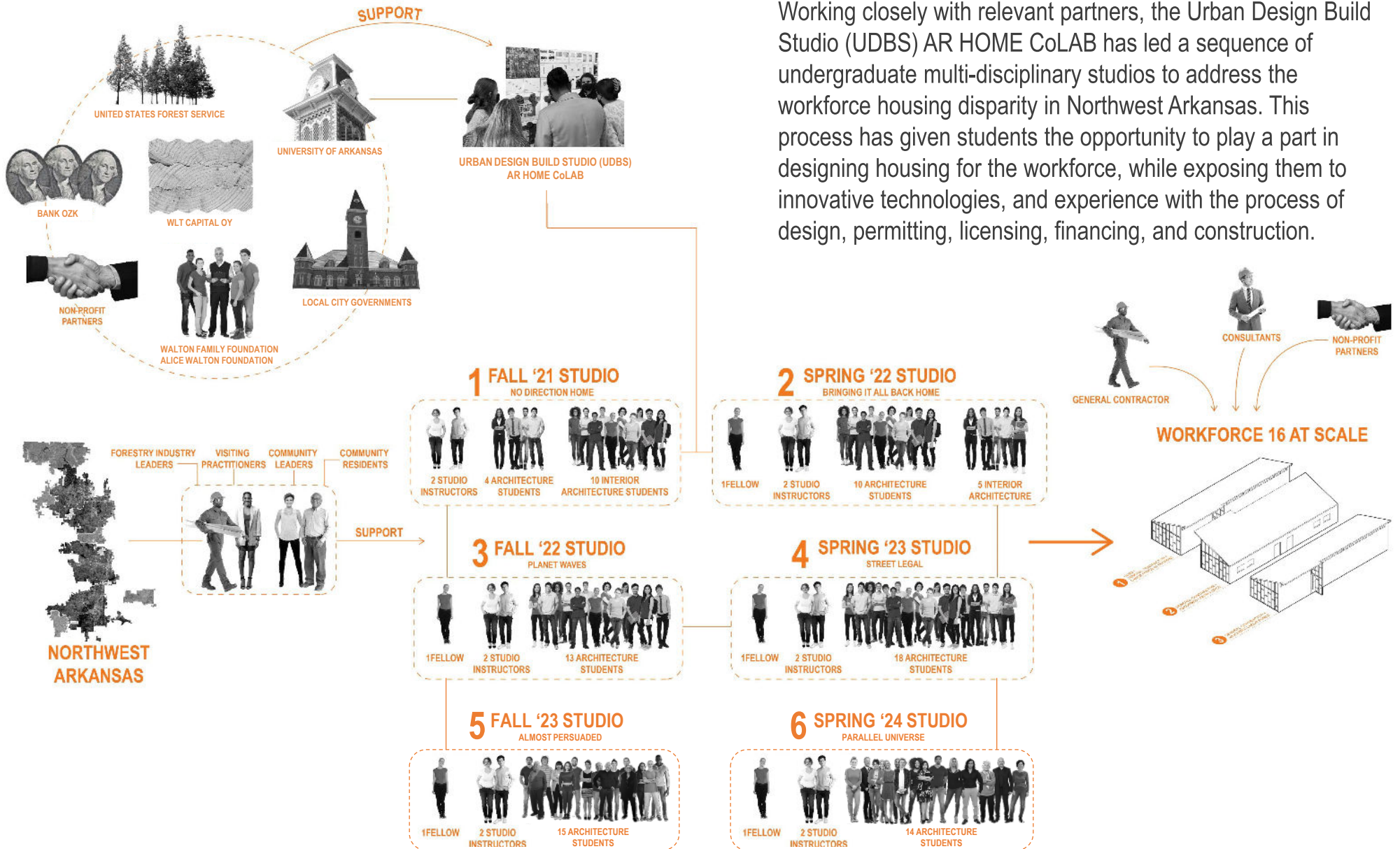
AVG. BUILDING COST OF \$175/SF

**500** SQ. FT MAX BUILDABLE AREA

The workforce in Northwest Arkansas is relying on hourly wages between \$15.00 and \$18.00 per hour without healthcare benefits. Using a **Design-to-Income** model, the buildable area of an affordable single-family home for the workforce can be determined based on an affordability index of 30% of monthly income and average costs of land, construction, and development fees. This results in a 500 sq. ft. maximum conditioned buildable area. This provides an avenue for the workforce to purchase and live in dignified dwellings while building equity and wealth for their future. As they do so, this model allows for expansion up to 1,200 sq. ft. while remaining under the threshold for subsidies in the U.S.

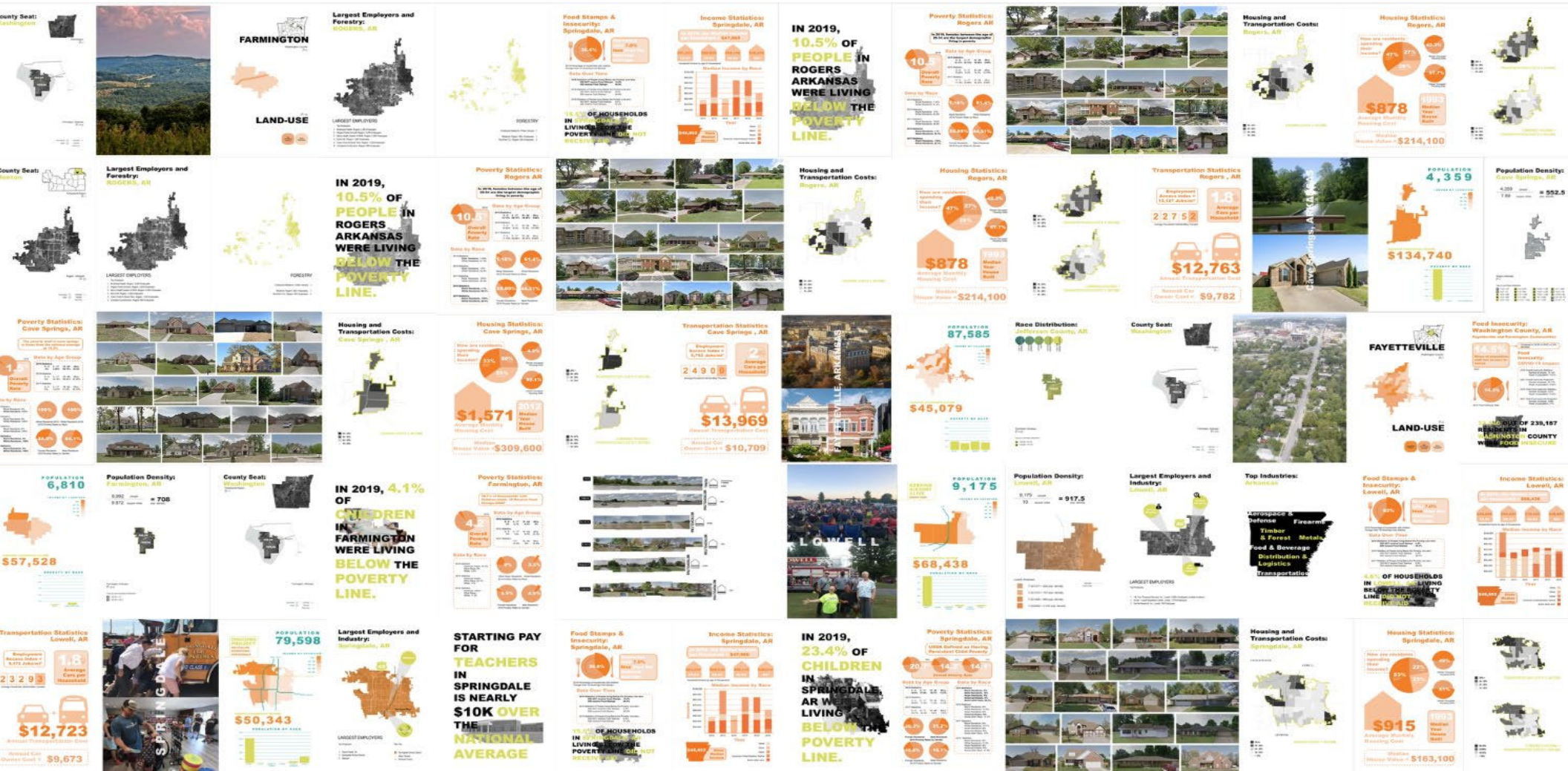
# Defining a path to a potential solution

promoted through collaboration with local, regional, and statewide entities.



Working closely with relevant partners, the Urban Design Build Studio (UDBS) AR HOME CoLAB has led a sequence of undergraduate multi-disciplinary studios to address the workforce housing disparity in Northwest Arkansas. This process has given students the opportunity to play a part in designing housing for the workforce, while exposing them to innovative technologies, and experience with the process of design, permitting, licensing, financing, and construction.

# Objective understanding of place, identity, and condition.

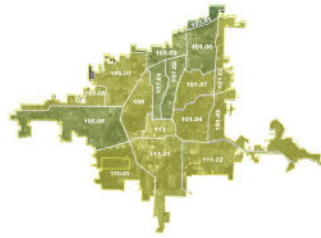


Examples of student work: mapping of demographic data compiled during quantitative research.

In the first 6 credit hour studio, students engaged in a comprehensive study of demographic data and mapping focused on populations, educational infrastructure, income trajectories, housing and transportation costs, employment opportunity, development strategies, home typologies, and access to services across the metropolitan area of Northwest Arkansas. The data was compiled into an atlas that relied on accessible modes of representation that could be utilized as part of community engagement and participatory design processes. This body of work empowered students with a foundational knowledge base for consideration in design.

# Objective understanding of place, identity, and condition.

## Race Distribution: Fayetteville, AR

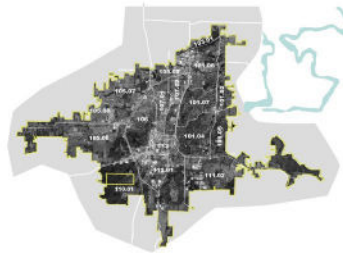


Fayetteville, Arkansas  
Population: 75,100

Tenth Level Race Distribution

White	131.02 - 87.7%	Black	153.01 - 46.43%	Asian	116.96 - 81%	Hispanic/Latino	111.01 - 81.2%
White	131.04 - 88.8%	Black	152.35%	Asian	116 - 74.7%	Hispanic/Latino	111.02 - 81.2%
White	131.08 - 78.1%	Black	135.03 - 73.4%	Asian	117.01 - 68.8%	Hispanic/Latino	113 - 79.8%
White	131.05 - 90.6%	Black	135.05 - 73.2%	Asian	117.02 - 76.1%	Hispanic/Latino	
White	131.07 - 95%	Black	135.07 - 66.2%	Asian	118.01 - 82.4%	Hispanic/Latino	

## County Seat: Washington



Washington, Arkansas  
Population: 15,000

Population Density

Population Density	110 - 100	Population Density	110 - 100
Population Density	110 - 100	Population Density	110 - 100

## Income Statistics: Fayetteville, AR

### Income by Year: Data by Race

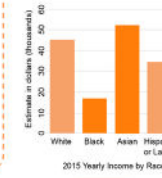
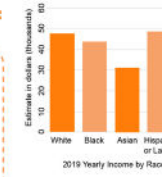
2019 Statistics  
Asian: \$31,000  
Black: \$43,715  
Hispanic/Latino: \$48,308  
White: \$47,347

2018 Statistics  
Asian: \$22,832  
Black: \$15,517  
Hispanic/Latino: \$34,827  
White: \$48,592

2017 Statistics  
Asian: \$31,692  
Black: \$31,819  
Hispanic/Latino: \$42,777  
White: \$48,497

2016 Statistics  
Asian: \$27,922  
Black: \$27,922  
Hispanic/Latino: \$41,177  
White: \$41,078

2015 Statistics  
Asian: \$51,859  
Black: \$18,415  
Hispanic/Latino: \$35,814  
White: \$45,230



\$65,712

National Yearly Income (2019)

\$48,952

State Yearly Income (2019)

## Poverty Statistics: Fayetteville, AR

58.5% of Households with Children Under 18 Receive Food Stamps/SNAP



### Data by Age Group

2019 Statistics  
0 - 5: 20.3%  
5 - 17: 15.6%  
18 - 64: 25.9%  
65+: 2.7%

2015 Statistics  
0 - 5: 20.6%  
5 - 17: 16.8%  
18 - 64: 27.1%  
65+: 8.1%

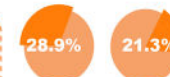
2012 Statistics  
<17: 18%  
18 - 64: 20.1%  
65+: 6.9%

### Data by Race

2019 Statistics  
Asian: 25.3%  
Black: 28.9%  
Hispanic/Latino: 28.9%  
White: 21.3%

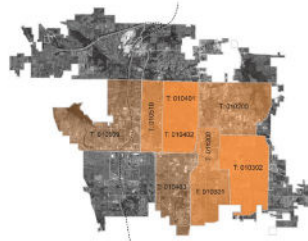
2015 Statistics  
Asian: 20.9%  
Black: 32.3%  
Hispanic/Latino: 21.4%  
White: 22.9%

2012 Statistics  
Asian: 29.7%  
Black: 29%  
Hispanic/Latino: 19.3%  
White: 22.9%



## Population Density: Springdale, AR

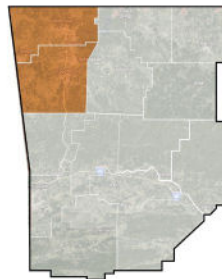
79,598 people / 47 square miles = 1,693.57 pcp. density



Springdale, Arkansas

Population density	900 - 1,700
Population density	1,700 - 2,500
Population density	2,500 - 3,300
Population density	3,300 - 4,100

## County Seat: Washington and Benton



TRANSPORTATION COSTS % INCOME

COMBINED HOUSING + TRANSPORTATION COSTS % INCOME

## Transportation Statistics Springdale, AR

Employment Access Index = 15,824 Jobs/mi<sup>2</sup>

1.7 Average Cars per Household

21815 Average Household Vehicle Miles Traveled



\$12,310 Annual Transportation Cost

Annual Car Owner Cost = \$9,435

# Experiential understanding of place, identity, and condition.



*Example of student work: an explorative model of a neighborhood in Springdale reflects experiential conditions - physical and visual boundaries, foot paths, traffic patterns, and the character of the place*



*Images of student work/derive models and students engaged in parlor games during generation of random experiential paths.*

To provide the studio with an experiential, qualitative understanding of place, students constructed Situationist Dérives. In groups of 3 or 4, students played parlor games to define randomly generated paths through Springdale and Fayetteville, Arkansas. The dérive's objectives included understanding of the physical terrain, socio-cultural condition (psychogeography), and emotional disorientation utilizing tactical, poetic, and sensory sensibilities of observation inherent to the dérive. Students then produced explorative engagement models that represented their experiential understanding of place. The multi-media models manipulated scale and relationship through static and motion based (edited video) components.

# Experiential understanding of place, identity, and condition.

To complement efforts through the *dérive*, students were required to take part in a simulation exercise. Again, in groups of 3 or 4, each was provided with a scripted scenario that required them to accomplish the daily objectives of an essential worker in Northwest Arkansas. The scenarios required them to care for themselves and their family in a constrained timeline on a specified budget. They were required to map the most efficient route to access schools, food, medical/pharmaceutical facilities, gas, cultural assets/public amenities, and places of work within specific time frames. Once the routes were mapped, the groups were required to travel the paths represented in the daily routines, making necessary stops and purchasing necessities. Students were required to create a film and digital journal illustrating the realities of what was experienced, understanding the realities of transportation costs and time. The objective of this exercise was to encourage empathy while chronicling qualitative aspects of life critical to the location of a home. The simulation exercise was called "Walk a Mile."




Example of student work: portion of a digital journal reflecting imagery and text from the Walk A Mile exercise.



Example of student work: still images representing a portion of a "Walk A Mile" video chronicle reflecting the experience of a young, single, working mom with two school-aged children – a typical workforce individual in Northwest Arkansas.


# Engagement tools foster communication and design thinking.

**13% OF YOUR NEIGHBORS IN NORTHWEST ARKANSAS HAVE TO CHOOSE WHICH TO PAY FOR EACH MONTH. DO YOU?**




HOUSING

**OR**

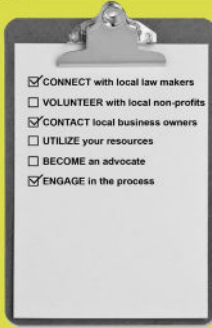


EDUCATION

**We can change that.**




**HOW CAN YOU HELP BUILD WEALTH FOR PEOPLE IN YOUR AREA?**




- CONNECT with local law makers
- VOLUNTEER with local non-profits
- CONTACT local business owners
- UTILIZE your resources
- BECOME an advocate
- ENGAGE in the process

**Join the team for affordable housing.**




**WHO IN FAYETTEVILLE CAN AFFORD AN AVERAGE COST HOME?**




**\$364,000**

**LESS THAN 20% OF HOUSEHOLDS IN NORTHWEST ARKANSAS COULD QUALIFY FOR A MORTGAGE ON THIS HOME.**

**What can you do to change that?**




**IS THIS THE ONLY AFFORDABLE HOUSING IN NORTHWEST ARKANSAS?**



**It does not have to be.**

You can make affordable housing a reality for everyone in your area.

**How will you use your power?**




Examples of student work: advocacy posters were developed to promote awareness of issues

Examples of student work: engagement tools were developed to for communication

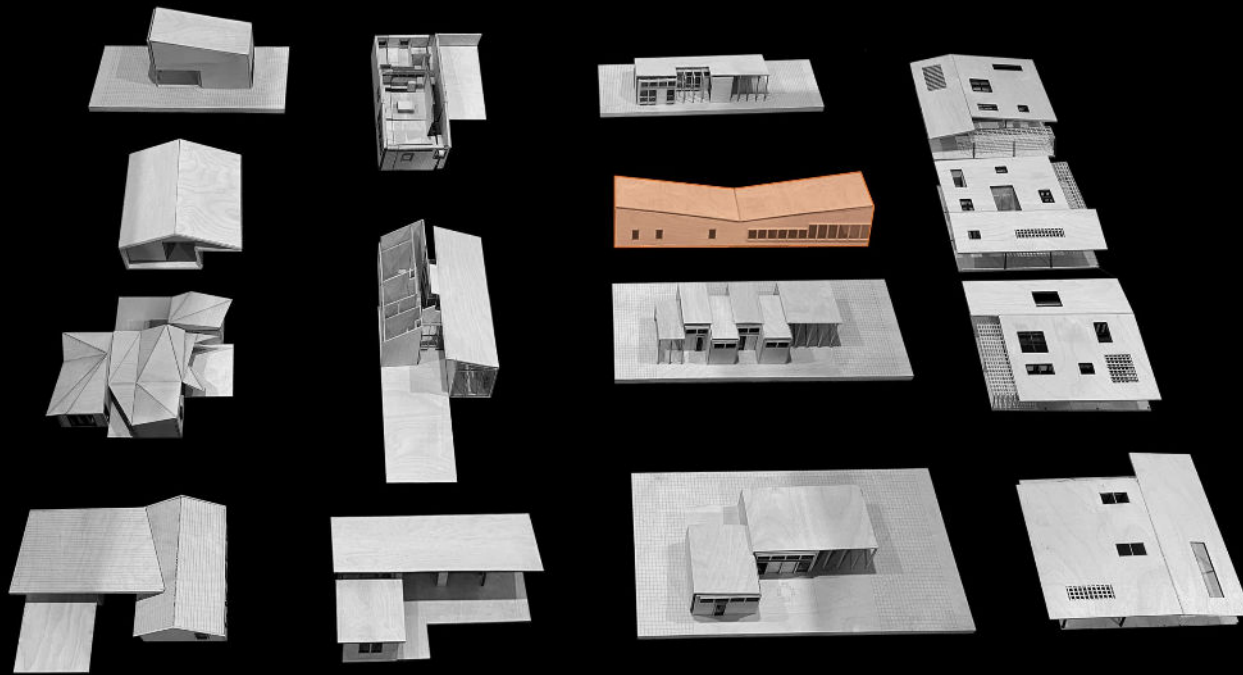
Building on objective and experiential understandings of place, students developed content to assist in communication with the community and relevant stakeholders throughout the design process. Students developed advocacy posters focused on raising public awareness of challenges the regional workforce faces in obtaining dignified housing. The advocacy campaigns also promoted the idea that an optimistic future is within grasp. The primary complementary component of advocacy work involved the design development and execution of engagement tools for use with potential residents and stakeholders required for successful implementation.

# BUILDING THE TEAM TO BUILD

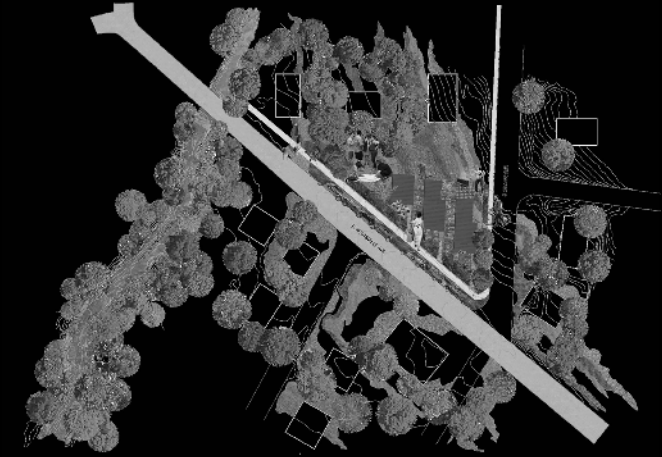


*Images of students using engagement tools to interface with visiting practitioners and stakeholders.*

The studio hosted a series of workshops, open-houses, and visits to engage with allied non-profit housing providers, local municipal agencies, community leaders, residents, real estate professionals, and sector design professionals who influenced the trajectory of planning and project scope. Research and engagement tools developed by students were instrumental in eliciting discourse about the value a university-affiliated 501c3 non-profit organization situated within a Carnegie Research 1 institution can bring to bear in promoting successful implementation of workforce housing. The sustained engagement proved instrumental in building a collaborative team for subsequent



Examples of student work: small scale physical models of workforce housing prototypes studied with the selected prototype concept highlighted.



Examples of student work: exploratory site plans of hypothetical site locations study contextual and environmental relationships.



Examples of student work: experiential renderings studying scale and spatial relationships.

## Consensus among collaborating parties oriented the studio's developmental work toward typological design and design strategy.

Infill lots that had been catalogued throughout Northwest Arkansas were reviewed for development potential in terms of market-driven cost, consistent siting factors, and constructability to determine characteristics suggestive of a typology that could address challenge at scale. Consideration of access explored through simulation exercises influenced the development of study areas in Springdale and Fayetteville, Arkansas. Beyond the physical, financial, and constructive dimensions of analysis, job-skill training, labor force development, and resource-based economic development emerged as primary areas requiring attention and exploration in addressing the housing challenge. The studio developed a number of replicable workforce home prototype proposals for characteristic sites, selecting one as a vehicle for a pilot project.

# Context and a vehicle for change.

The studio designed a hypothetical infill proposal for three workforce housing prototypes on a typical scatter-site infill development lot. The proposal considered replication, solar orientation, passive strategies, and economic viability. Critical to the UDBS AR HOME CoLAB's contribution in helping to address regional workforce housing challenges, the proposed design provided a vehicle for the studio to explore a new building technology that promises to enhance job-skill training, labor force development, and resource-based economic development.



*Rendering of the workforce housing pilot project which provided the vehicle for exploration of enhanced job-skill training, labor force development, and resource-based economic development that would prove unviable in the private sector, but that can be explored in the context of a Carnegie Research 1 at the Fay Jones School of Architecture and Design at the University of Arkansas.*

# Finding the right material technology

Assessing material supply chains and common design practices, the studio examined potential in altering the point at which material sourcing normally occurs in the execution of housing. Arkansas is in a timber-rich part of the United States, with over 19 million acres of forested land in the state. Promoting the use of local timber species like Southern Yellow Pine in construction benefits the economic development of the region and state. Mass timber construction is a logical choice in leveraging this renewable resource in addressing climate change, economic prosperity, and opportunity for living wages while addressing a crisis in housing. Mass timber technologies can prove prohibitive in attainable single-family home construction due to the expertise required in fabrication and construction. Associated equipment costs for deploying panelized mass timber further exacerbate viability. The studio investigated possibilities for stick-based, site-aggregated mass timber technologies through a \$250,000 grant focused on mass timber solutions for attainable single-family infill development. Wave Layered Timber, an adhesiveless, mass-timber building process that has never been used before in North America, was identified as a potential solution. Through an exclusive license agreement, the UDDBS AR HOME CoLAB and studio began exploring the potential of this technology.

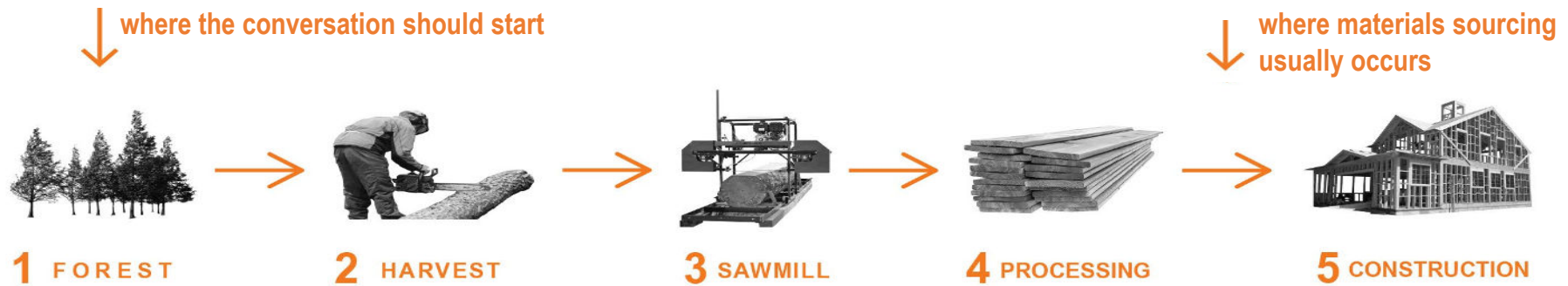
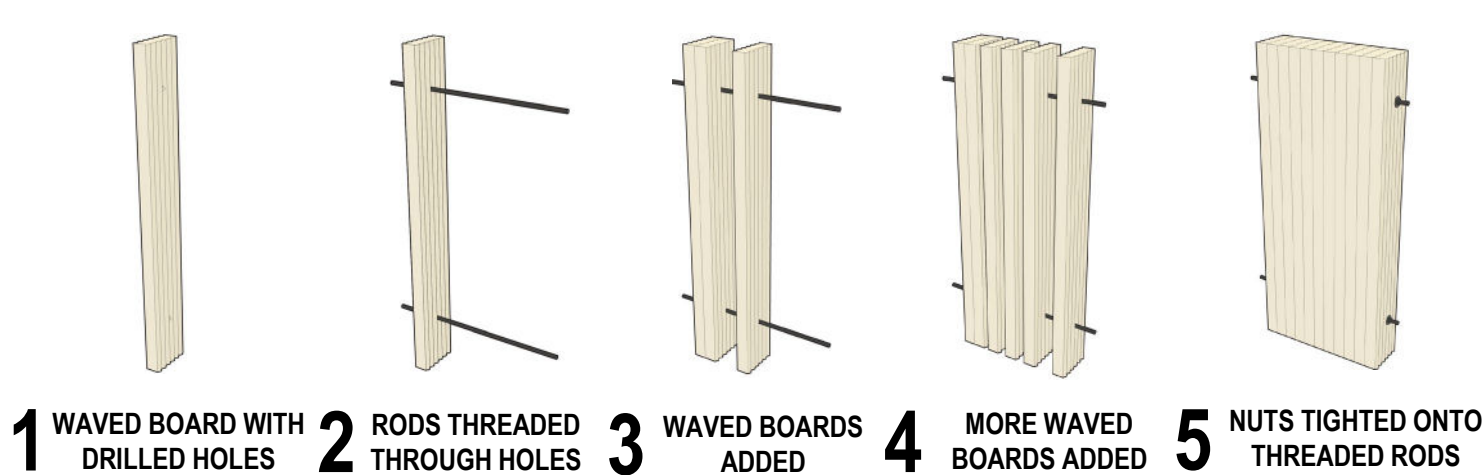


Diagram explaining the typical relationship between the steps toward construction of housing at scale and the opportunity for more cyclical communication made possible by WLT.



LEFT: diagram communicating the process of producing an assembly with Wave-Layered Timber members  
RIGHT: images of nominal lumber after being processed into Wave-Layered Timber

# Paths to scale

A significant component of work involved the design of productive networks and processes. Extensive diagramming proved instrumental in understanding and communicating the UDBS AR HOME CoLAB within the landscape of material production and housing development throughout Northwest Arkansas and the state. While the design of a home prototype remained a critical dimension of effort, focus shifted toward relationship building, tooling, and capacity building that could support the introduction of a new building technology promising effectiveness at a scale matching that of the challenge.

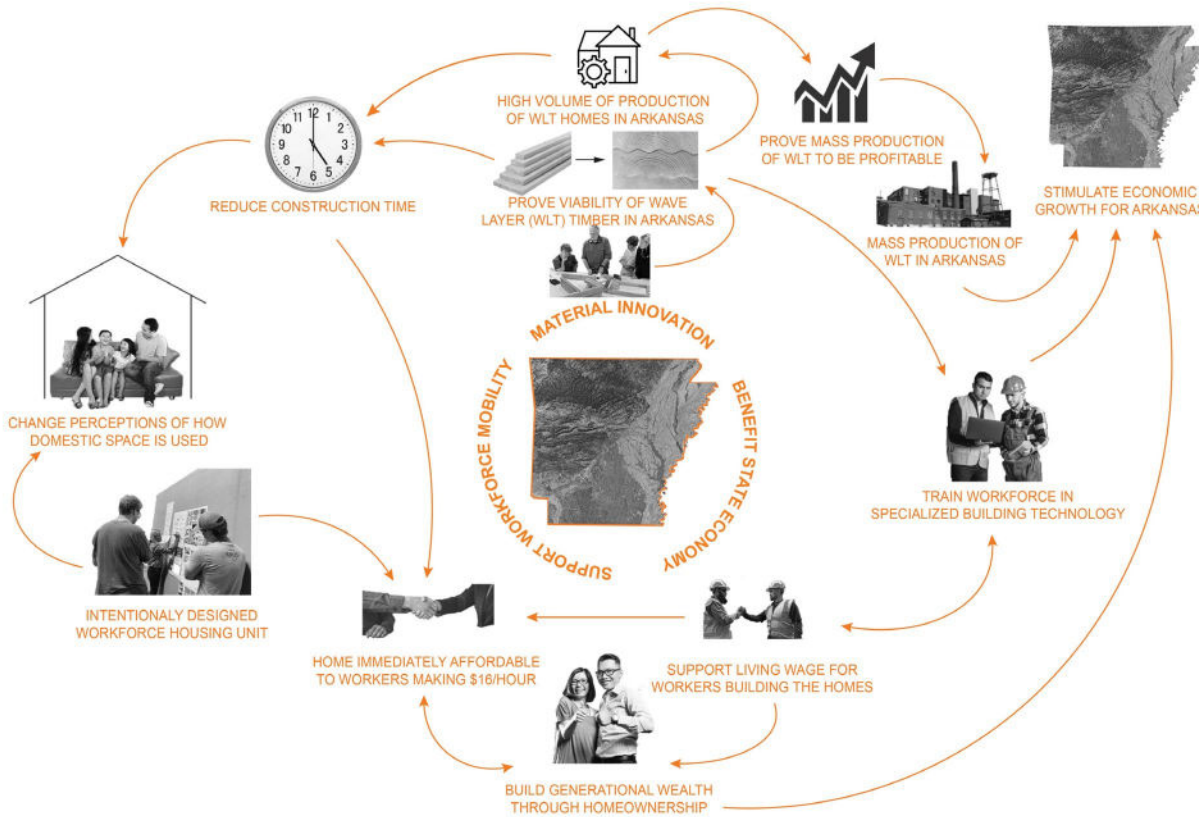


Diagram highlighting the potential benefits of the production and applied use of Wave-Layered Timber as a mass timber building technology for workforce housing in Arkansas. Relationships identified in the diagram remain essential to successful adoption and integration.

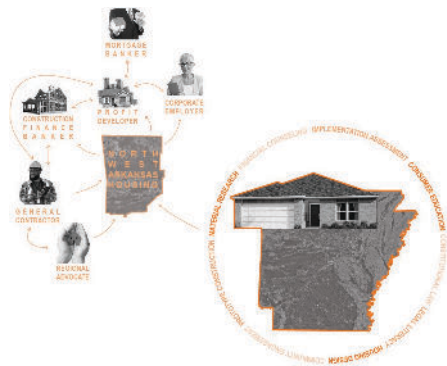


Diagram communicating the relationships between the stakeholders necessary to implement workforce housing in Northwest Arkansas. This diagram highlights complementary roles of the university and private sector in collaboration.

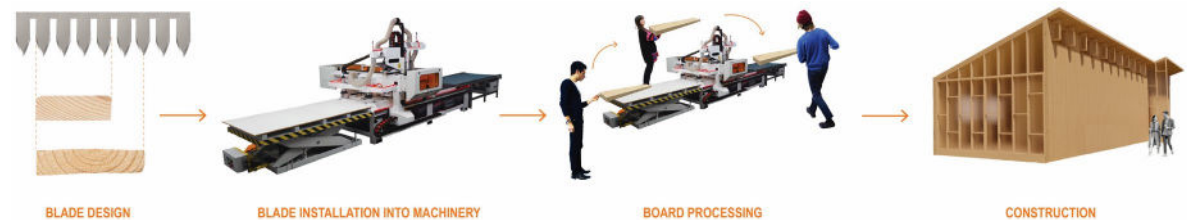
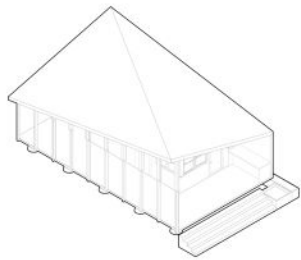
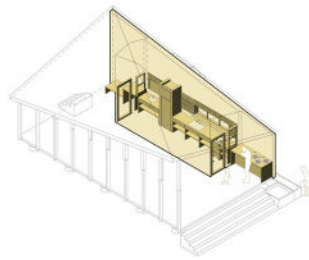


Diagram utilized to illustrate the process from production to product using Wave-Layered Timber as a mechanism for construction at scale.

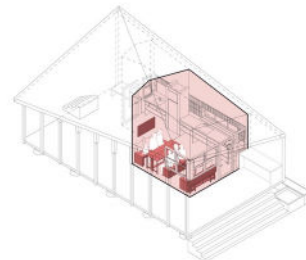
# An iterative design process informed the evolution of the workforce housing prototype.



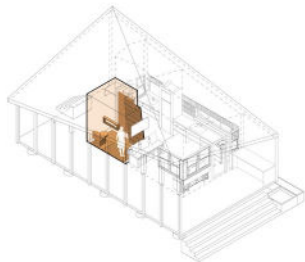
FORM



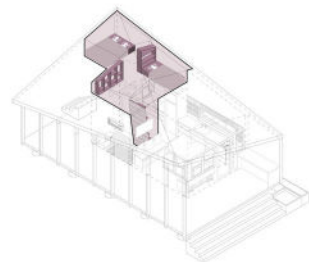
CIRCULATION BAR



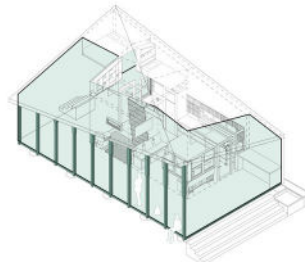
GATHERING SPACE



CLEANSING



SLEEPING

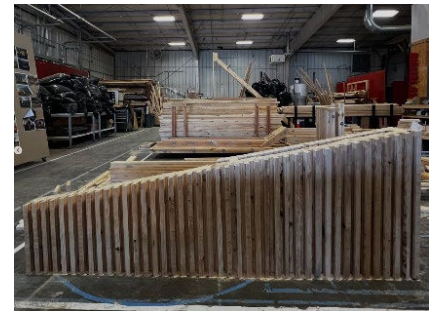
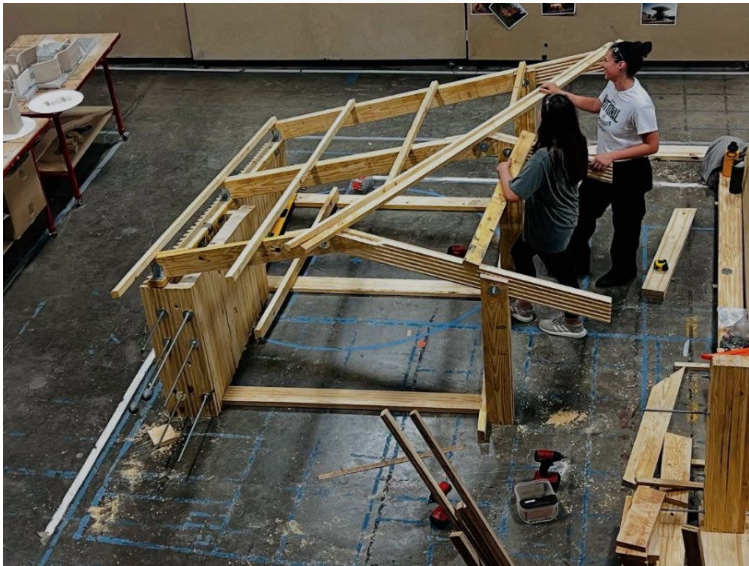
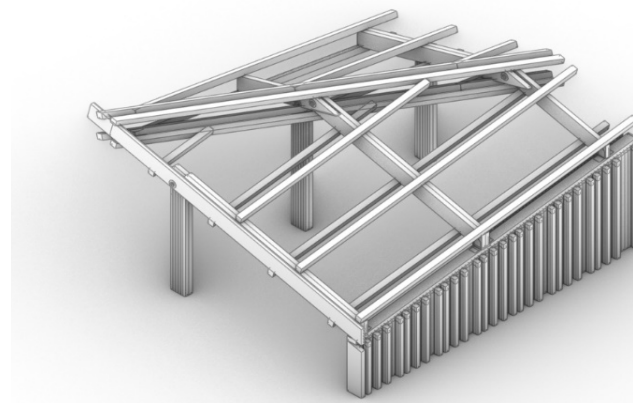
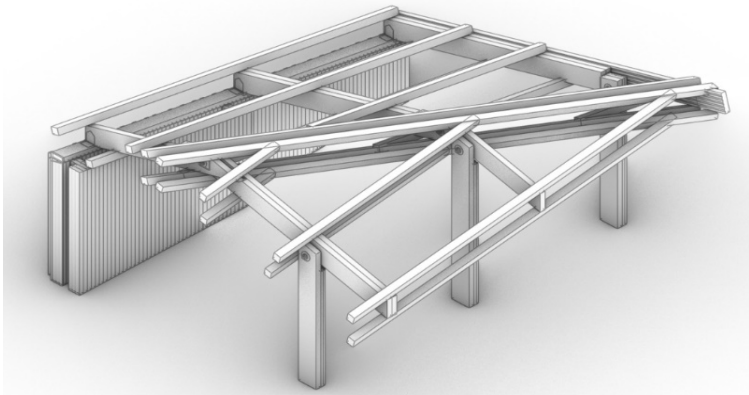


PORCH

*Example of student work: Diagrams illustrating how a single service bar, multipurpose space, cleansing area, and sleeping loft are deployed within a passively biased shell. RIGHT: Example of student work: Experiential renderings of the UNTITLED prototype.*

As work advanced in bringing the Wave-Layered Timber technology to the development community, the studio continued to develop the workforce home prototype. These images and drawings illustrate The 'UNTITLED' Workforce Home Prototype. 960 square feet of space are provided under a permitted shell constructed of Wave Layered Timber (WLT), a technology being employed by the Fay Jones School UDBS AR HOME CoLAB for the first time in North America. 410 square feet of the space is enclosed and conditioned, allowing residents to expand into the rest of the shell as resources become available.



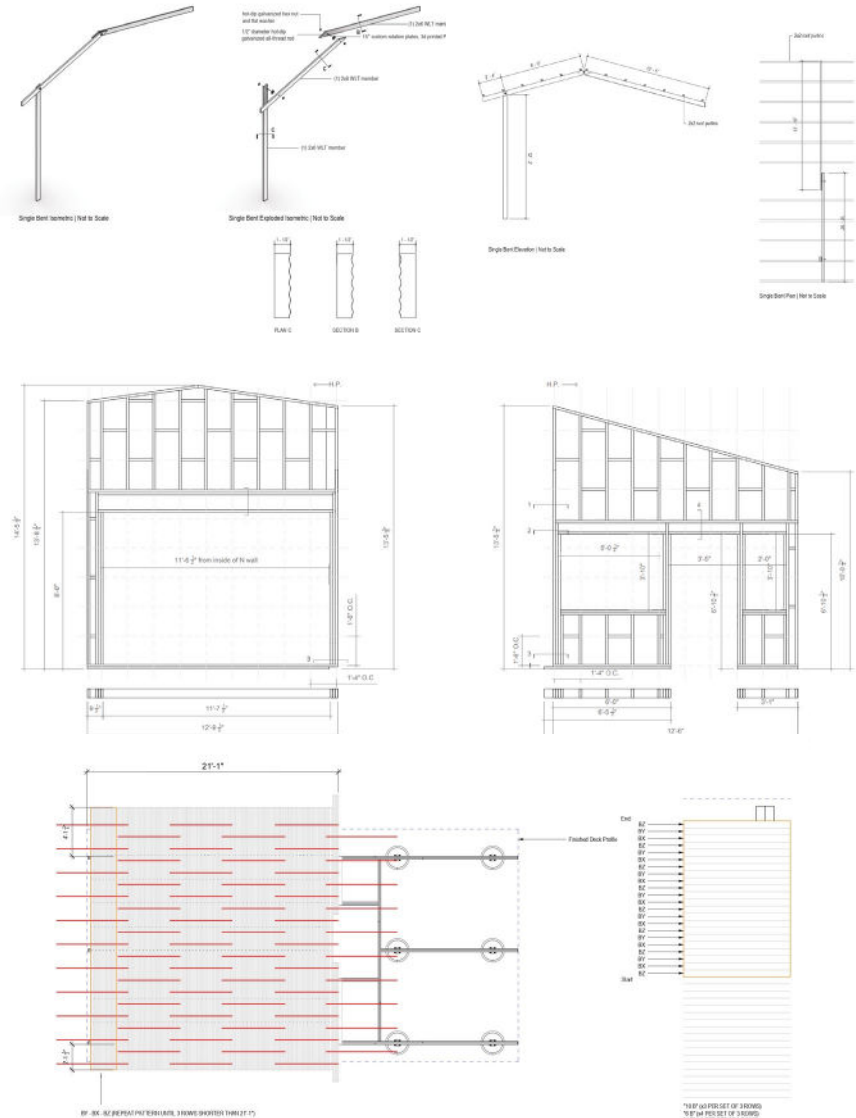


3D digital model views and construction images of a large-scale mockup of the UNTITLED Home prototype under assembly by students. The mockup includes key structural systems of the prototype, including the Wave-Layered Timber (WLT) cavity wall, laminated WLT columns, structural bents, and portions of the roof assembly constructed at full scale.

## Physical demonstrations on the path to scaled construction

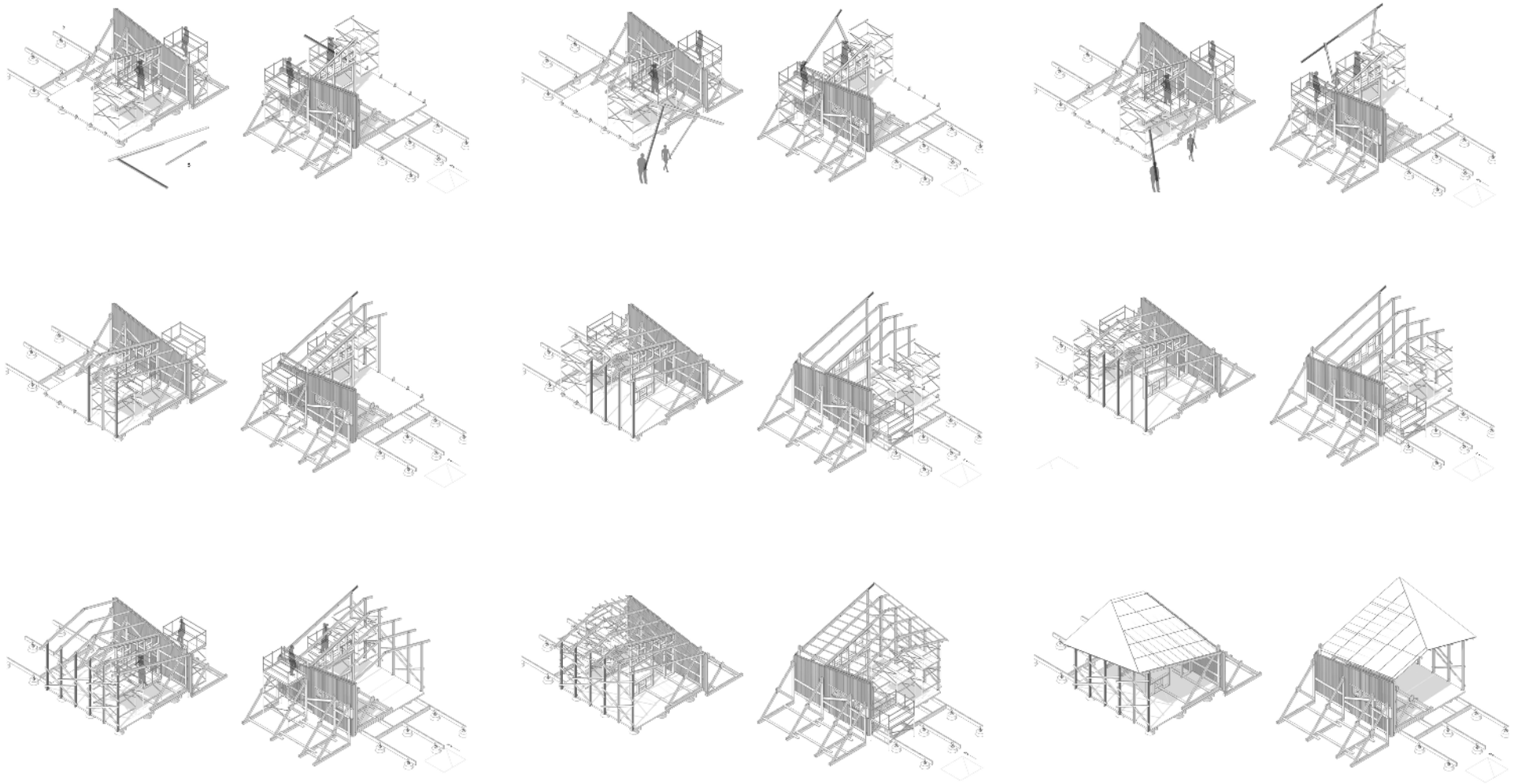
A physical demonstration of the technology's implementation proved critical to stakeholder confidence in application. Utilizing grant funding, the UDBS AR HOME CoLAB and studio invested in tooling for the production of WLT in North America for the first time. The studio also used the controlled environment of the school's build lab to iteratively construct segments of the home prototype. This process afforded the ability to tangibly understand the technology's potential with consideration for time, job-skill training, and economic parameters. Once the studio obtained an understanding of optimized construction methods through iterative prototyping, a plan was developed to produce a larger-scale mockup that could be deployed in the environmental context anticipated.

# Going public



LEFT: Images of UDBS AR HOME CoLAB students engaged in the construction of the public demonstration of the UNTITLED HOME v01 prototype. Activities shown include tilting up columns, installation of custom steel column connectors, and the continuous tightening of threaded tension elements through strategically placed port holes in the WLT deck assembly. The work provided hands-on job-skill training in precision timber fabrication, post-tensioning systems, finish detailing, and tool safety, offering students real-world experience in both innovative and conventional construction practices. RIGHT: Examples of student work: drawings to guide the construction of the WLT deck assembly, framed walls, and WLT bent members.

Construction of a full-scale building section prototype on a public demonstration site provided both immediate and ongoing learning opportunities. Construction allowed for further examination of construction detailing and assemblies, analysis and documentation opportunities for improvement, design of necessary adjustments, and work to execute them. Constructing it in the public realm allows for continued study of WLT as a viable, environmentally sensitive, and affordable mass timber construction material. Access to the public has also allowed for community engagement and conversations with partners to enhance the development and refinement of design and detailing. Faculty, staff, and students have continually monitored the mockup for material and system performance since the completion of construction.



*Example of student work: Selected diagrams from a construction sequencing set developed by students to support the assembly of the UNTITLED Home prototype. These drawings map the order of operations, material staging, tool organization, and trade coordination for efficient construction of WLT assemblies.*

The UNTITLED prototype constructed on the public demonstration site employs a mass timber shell constructed from Wave-Layered Timber (WLT). A mass timber floor deck was constructed over an optimized frame and post-tensioned incrementally before framed walls were constructed and erected. Developed through iterative analysis and informed by on-site experience, diagrams were developed to serve as both a planning tool and a training resource, building student understanding of workflow optimization, jobsite logistics, and the practical translation of design into construction.



**Project Title:** With the Workforce

**Month/Year Completed:** May 2024

**Role of Nominee in the Project:** Lead Faculty and Founding Director of the Urban Design Build Studio

**Collaborators and Funding Sources Expenses:** 65 Undergraduate Advanced Elective Studio Students; 4 Undergraduate Architecture Students and 10 Undergraduate Interior Architecture Students in Fall 2021; 11 Undergraduate Architecture (1 returning from Fall 2021) and 5 Undergraduate Interior Architecture Students (4 returning from Fall 2021) in Spring 2022; 13 Undergraduate Architecture Students in Fall 2022; 17 Undergraduate Architecture Students (1 returning from Spring 2022, 7 returning from Fall 2022) in Spring 2023; 14 Undergraduate Architecture Students (2 returning from Spring 2023) in Fall 2023; 14 Undergraduate Architecture Students (3 returning from Spring 2022, 4 returning from Fall 2023) in Spring 2024. 6 Credit Hours per Undergraduate Architecture Student in Each Semester, 5 Credit Hours per Undergraduate Interior Architecture Student in Each Semester; 2 Paid Student Summer Interns (2020), full time (\$14,400.00); 1 Paid Student Summer Intern (2022), full time (\$7,200.00); 1 Paid Student Summer Intern (2022) part time (\$3,600.00); One Compensated Non-Profit Organization Project Manager, part time Spring 2022-Spring 2024 (\$51,600.00); Funding obtained through grants provided by a federal wood innovations agency (\$250,000.00), natural resource proprietor (\$50,000.00), a personal philanthropy group (\$350,000.00), and a financial institute (\$50,000.00), collaborating partners include allied non-profit housing providers, local municipal agencies, community leaders, residents, real estate professionals, and sector design professionals.

**Student Compensation:** 2 Paid Student Summer Interns (2021), full time (\$14,400.00); 1 Paid Student Summer Intern (2022), full time (\$7,200.00); 1 Paid Student Summer Intern (2022) part time (\$3,600.00).