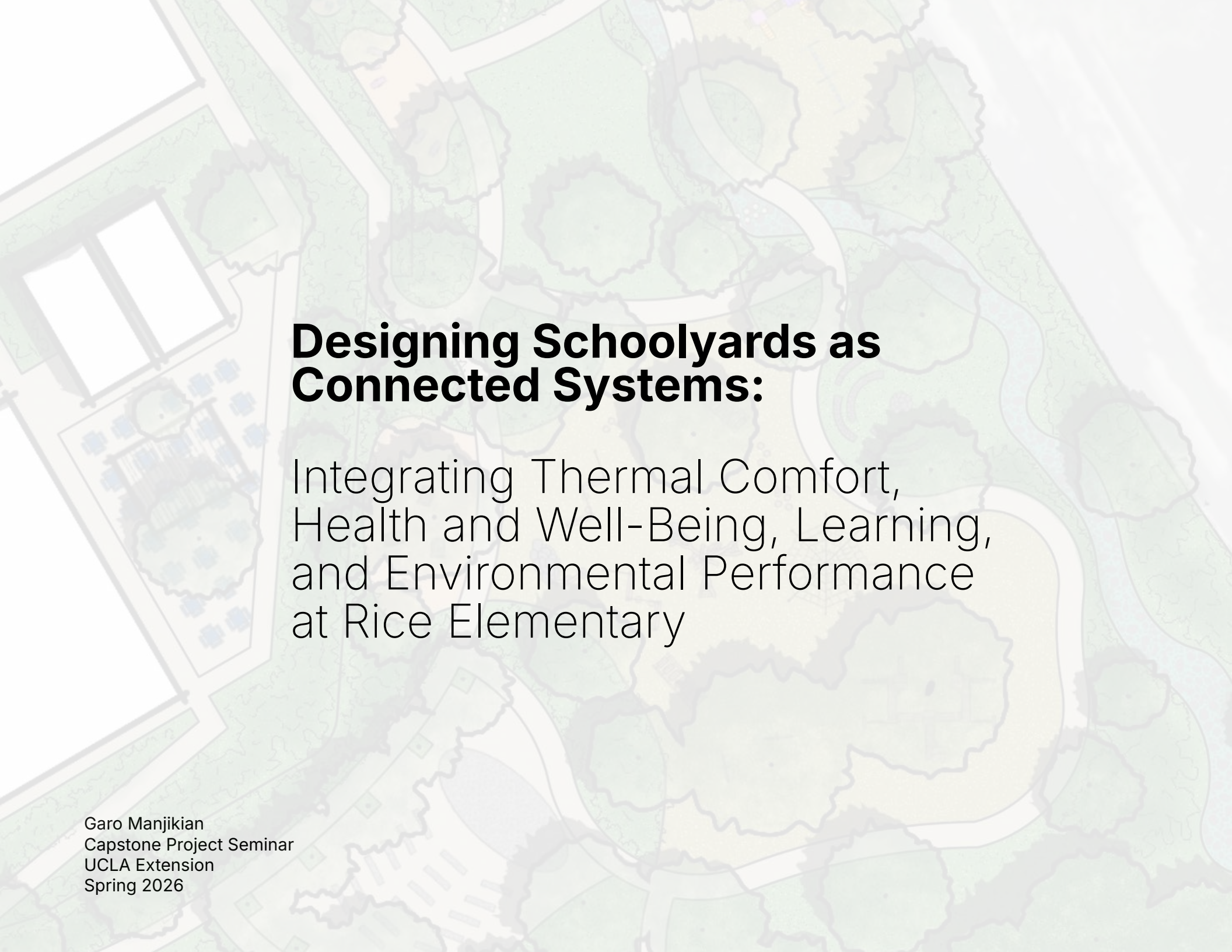


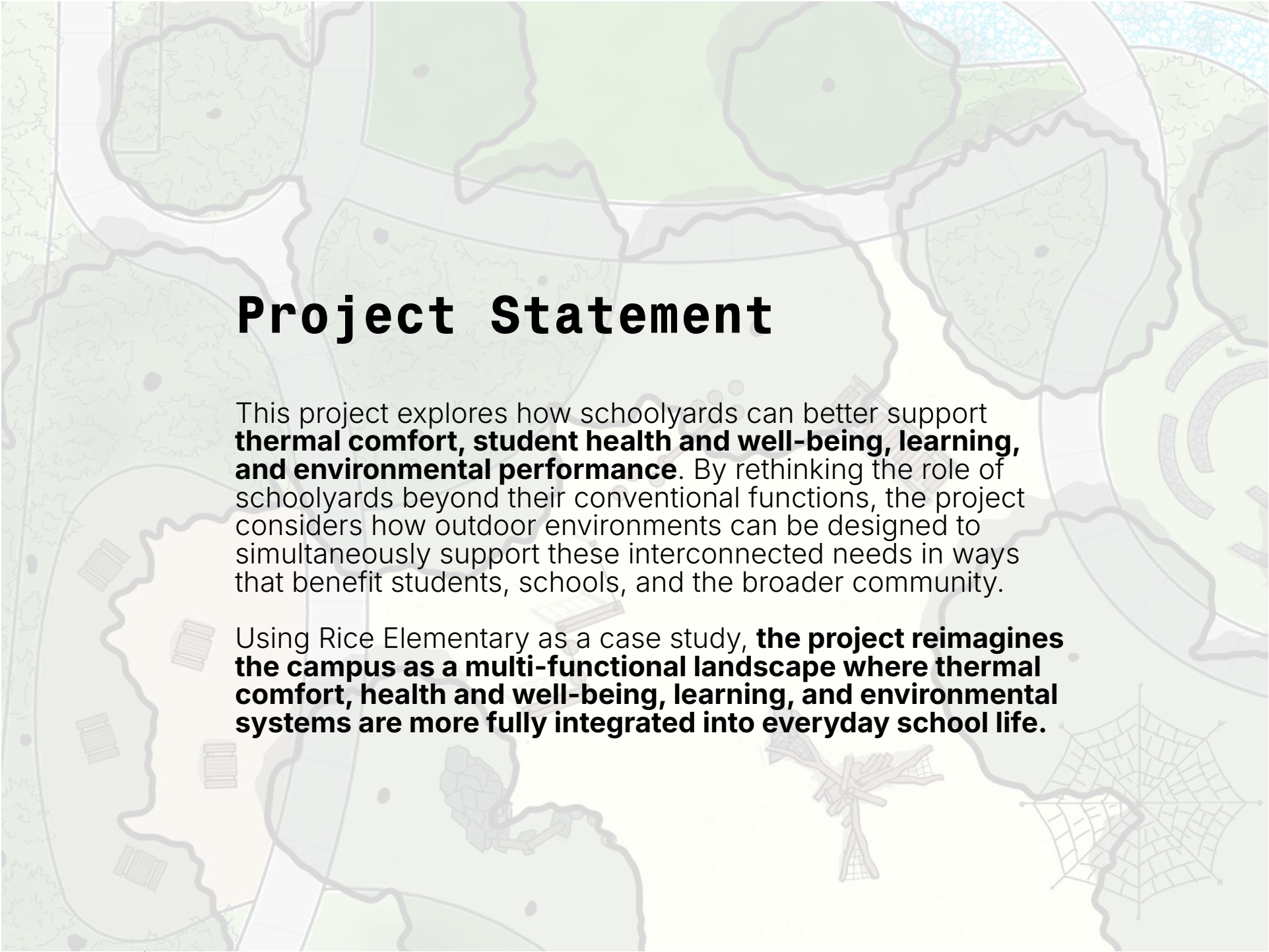
The background of the slide is a detailed landscape design plan. It features a network of winding paths in light gray, interspersed with various green spaces of different shades, representing lawns and planted areas. There are several circular and irregular shapes that likely represent trees or specific garden beds. On the left side, there are some rectangular outlines that suggest building footprints or paved areas. The overall style is technical and artistic, typical of a landscape architect's site plan.

Designing Schoolyards as Connected Systems:

Integrating Thermal Comfort,
Health and Well-Being, Learning,
and Environmental Performance
at Rice Elementary

Table of Contents

Project Statement.....	3
Justification.....	4
Site Information	
Location.....	6
Size.....	7
Agency Jurisdiction.....	8
Context.....	9
Primary Users.....	11
Current Use.....	12
Site Photos.....	13
Site Inventory.....	15
Goals and Objectives.....	16
Methodology.....	17
Program.....	18
Precedents.....	19
Site Analysis.....	22
Constraints and Opportunities.....	24
Concept Development.....	25
Design Solution	
Preliminary Site Plan.....	30
Plant and Hardscape Materials.....	31
Design Development.....	32
Illustrative Site Plan.....	34
Enlargement.....	35
Section Elevations.....	36
Before and After Sketches.....	38
Performance Analyses.....	41
Conclusion.....	43
Acknowledgment.....	44

The background of the slide is a light green map of the United States. Overlaid on the map is a faint, stylized design of a schoolyard. This design includes various green spaces, paths, and structures. In the bottom right corner, there is a detailed drawing of a spiderweb. The text is centered on the map.

Project Statement

This project explores how schoolyards can better support **thermal comfort, student health and well-being, learning, and environmental performance**. By rethinking the role of schoolyards beyond their conventional functions, the project considers how outdoor environments can be designed to simultaneously support these interconnected needs in ways that benefit students, schools, and the broader community.

Using Rice Elementary as a case study, **the project reimagines the campus as a multi-functional landscape where thermal comfort, health and well-being, learning, and environmental systems are more fully integrated into everyday school life.**

Justification

Heat Impacts Student Health and Learning

Many K–12 schools in Southern California are **dominated by asphalt and provide limited shade within high-use outdoor** areas such as playgrounds, paved play spaces, and fields, increasing heat exposure during recess, lunch, physical education, and after-school activities.

Research shows that **excessive heat negatively impacts student health, comfort, attention, and learning, with hotter school years linked to measurable declines in academic performance**, particularly among low-income and minority students. Increases in temperature lead to fewer opportunities and less time for outdoor activity that is essential for physical and mental health and child development.

Improving thermal comfort may be one of the most direct ways school districts can support student well-being, as students are more likely to remain active outdoors, utilize outdoor environments more comfortably, and access shade and respite throughout the school day.

Conventional Schoolyards and Play Equipment Don't Fully Support Student Health and Well-Being

Conventional schoolyards are often designed around standardized and single-purpose outdoor environments such as asphalt play areas, fixed play structures, and traditional sports courts. While these spaces support recreation and physical activity, **they provide a more limited range of movement, sensory engagement, creative play, quiet reflection, or interaction with natural systems.**

Research on child-centered and nature-based play environments suggests that more **varied outdoor spaces—including natural play areas, sensory landscapes, and flexible environments—may support a broader range of physical activity, creativity, social interaction, mental well-being, and diverse forms of movement and exploration** while also providing lower-cost and more adaptable alternatives to conventional playground infrastructure.

Sources:

Park, R. Jisung, Joshua Goodman, Michael Hurwitz, and Jonathan Smith, "Heat and Learning," *American Economic Journal: Economic Policy*
Park, R. Jisung, Joshua Goodman, and A. Patrick Behrer, "Learning is Inhibited by Heat Exposure, Both Internationally and Within the United States," *Nature Human Behaviour*
UCLA Luskin Center for Innovation, *Protecting Californians with Heat-Resilient Schools*, University of California
Claire Latané, *Schools That Heal: Design with Mental Health in Mind*, W.W. Norton & Company.
Dyment, Janet E. and Ronald Bell, "Grounds for Movement: Green School Grounds as Sites for Promoting Physical Activity," *Health Education Research*
Fjørtoft, Ingunn, "The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children," *Early Childhood Education*
Herrington, Susan and Lesley Brunelle, "An Exploration of the Influence of School Ground Design on the Physical Activity of Children," *Children, Youth and Environments*, Vol. 21, No. 1.
Simon Nicholson, "How NOT to Cheat Children: The Theory of Loose Parts," *Landscape Architecture Quarterly*, Vol. 62, No. 1.
Edward O. Wilson, *Biophilia*, Harvard University Press.

Gibson, James J., *The Ecological Approach to Visual Perception*, Houghton Mifflin.

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153 degree surface temperature measured on 90 degree day at Sierra Madre Elementary



Typical one dimensional play structure (<https://proplaygrounds.com/markets/schools-education/>)

Justification

Outdoor Learning Opportunities are Limited

Many school campuses provide **limited opportunities for both child-directed interaction with nature and teacher-directed outdoor learning**, and often lack the basic infrastructure needed to support outdoor activities such as seating, work surfaces, shade, educational planting, and flexible gathering spaces.

Outdoor classrooms provide alternative learning settings that help break up the routine and spatial limitations of traditional classroom environments. Additionally, research on experiential (learning through direct experience and hands-on engagement) and project-based learning (learning through extended, real-world projects and problem solving) suggests that **outdoor environments can help support engagement, creativity, observation, and hands-on learning experiences.**

Integrating habitat areas, regenerative planting for food production and craft harvesting, and other ecological features throughout the campus may help make these diverse learning experiences and hands-on activities more implementable while also encouraging everyday interaction with the outdoor environment.

Poor Environmental Performance

Many school campuses function as highly impervious environments with limited ecological function, stormwater infiltration, habitat value, or climate-responsive landscape systems. Large expanses of asphalt and compacted surfaces may contribute to increased heat exposure, runoff, and reduced environmental performance within the campus environment.

At the same time, school campuses represent opportunities to incorporate tree canopy, planting systems, soil improvements, and stormwater strategies that may contribute to heat mitigation, habitat value, water management, and long-term climate resilience. **Environmental systems integrated within schoolyards may also support outdoor learning, environmental literacy, and student interaction with natural processes while helping students, families, and the broader school community better understand climate resilience and environmental stewardship through everyday experience.** These environments may also contribute to more multi-functional outdoor spaces that strengthen campus identity and sense of community.



Rice Elementary outdoor space next to classroom



(<https://newsroom.ucla.edu/releases/california-k-12-schools-often-lack-shade-natural-surfaces>)

Sources:

Park, R. Jisung, Joshua Goodman, Michael Hurwitz, and Jonathan Smith, "Heat and Learning," *American Economic Journal: Economic Policy*

David A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development*, Prentice Hall.

Buck Institute for Education, *Project Based Learning Handbook*, Buck Institute for Education.

Kuo, Ming, Michael Barnes, and Catherine Jordan, "Do Experiences with Nature Promote Learning? Converging Evidence of a Cause-and-Effect Relationship," *Frontiers in Psychology*

Rice Elementary School

Eldridge Rice Elementary
2150 N Angelus Avenue
Rosemead, CA 91770
Garvey School District



Site Info

Rice Elementary School

Size:

453,000 sq ft/10.4 Acres

Zoning:

M-1 Light Industrial

Parcel Info:

AIN 5283032901
Use Type Government
Use Description Government Parcel
Lot Size Sq Ft 91,985.66
Acres 2.1117

AIN 5283032900
Use Type Government
Use Description Government Parcel
Lot Size Sq Ft 150,876.04
Acres 3.4636

AIN 5283031901
Use Type Government
Use Description Government Parcel
Lot Size Sq Ft 210,484.90
Acres 4.8321



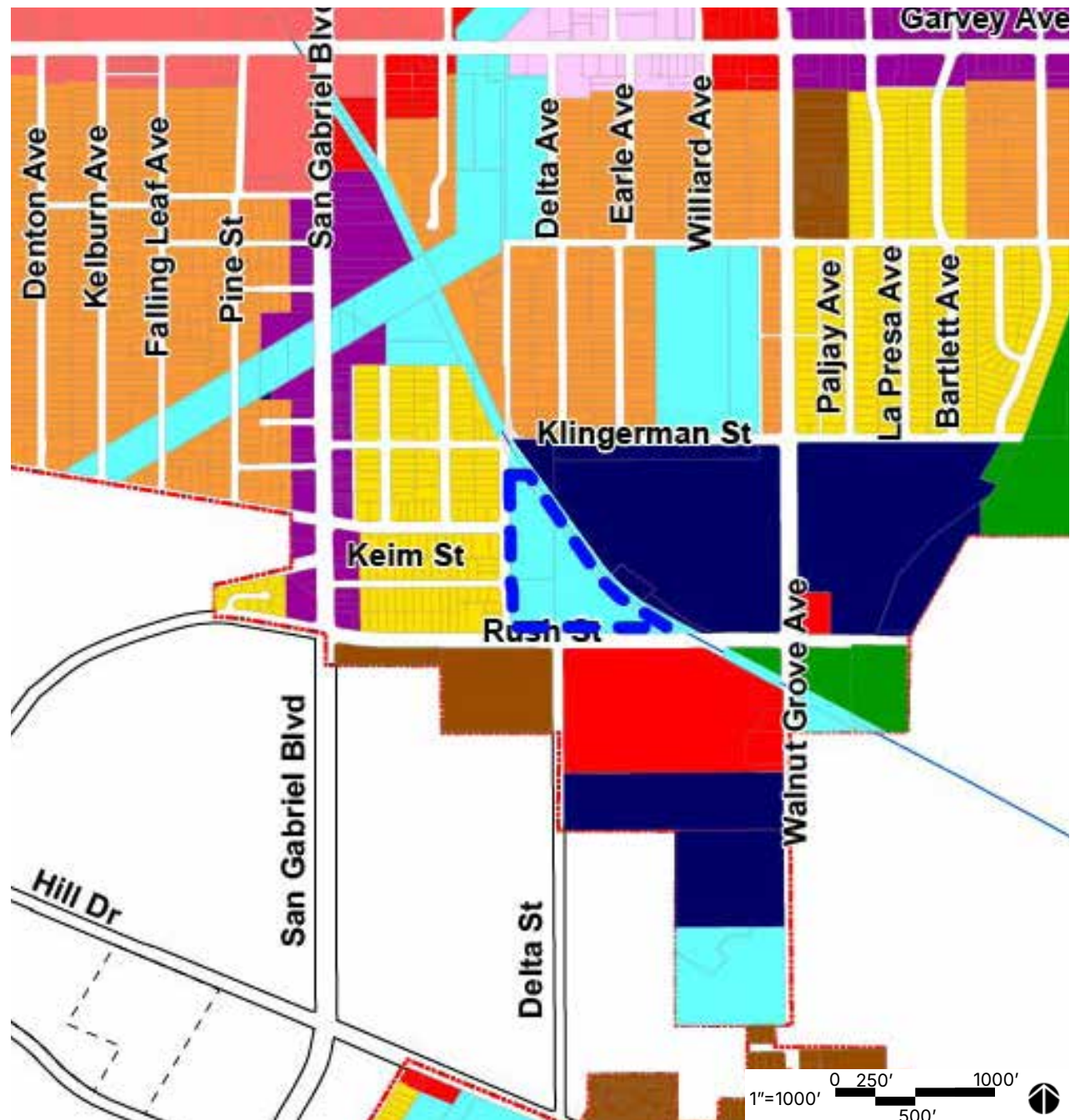
Site Info

Agency Jurisdiction



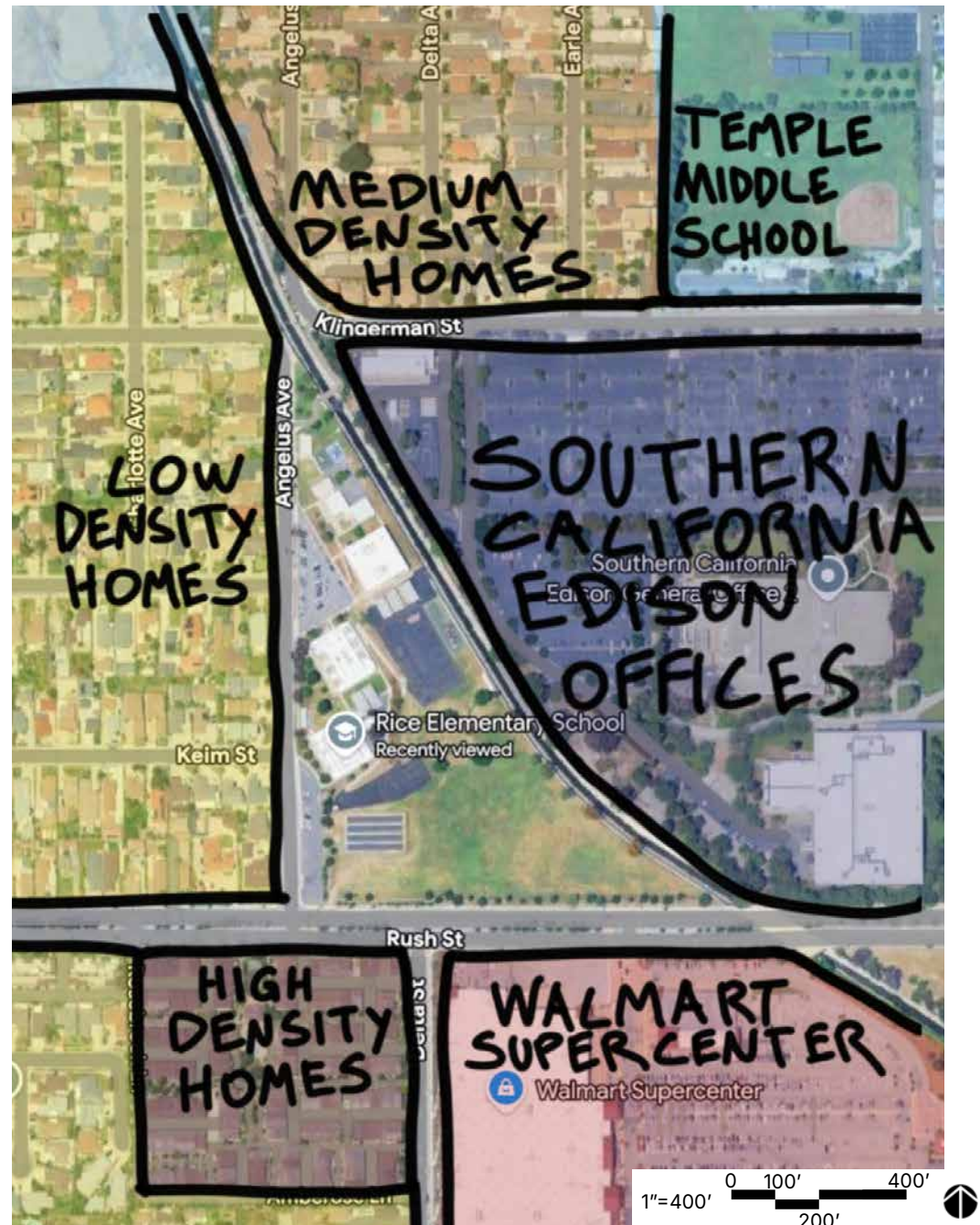
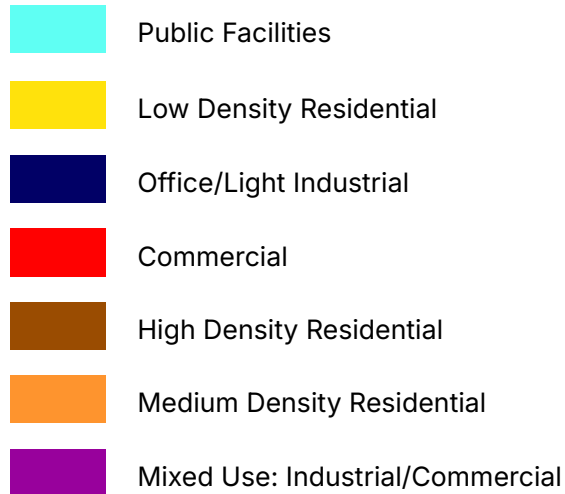
Context

Land Use



Context

Adjacencies



Primary Users

Students:

- 339 Students, TK-6th grade
- 54.3% Asian and 42.5% Hispanic/Latino students
- 39% English Learners
- 85% Classified as socioeconomically disadvantaged
- 90% Attend After school program (**5pm average pick up time**)

School Staff:

- 44 Total staff
- 14 Full-time grade teachers (two per grade)
- 9 Administrative and office staff (including principal, office staff, health office, and coordinators)
- 6 Academic support staff (counselors, therapists, and specialized support services)
- 6 instructional and student support aides (including instructional aides, behavior intervention aides, and personal care assistants)
- 2 Headstart staff
- 5 Cafeteria staff
- 2 Custodians

Parents and Guardians

- 90% Drive to drop-off, 10% walk
- 3.5 average household size (for immediate surrounding area, not specifically Rice Elementary)
- \$73,000 household income (for immediate surrounding area, not specifically Rice Elementary)

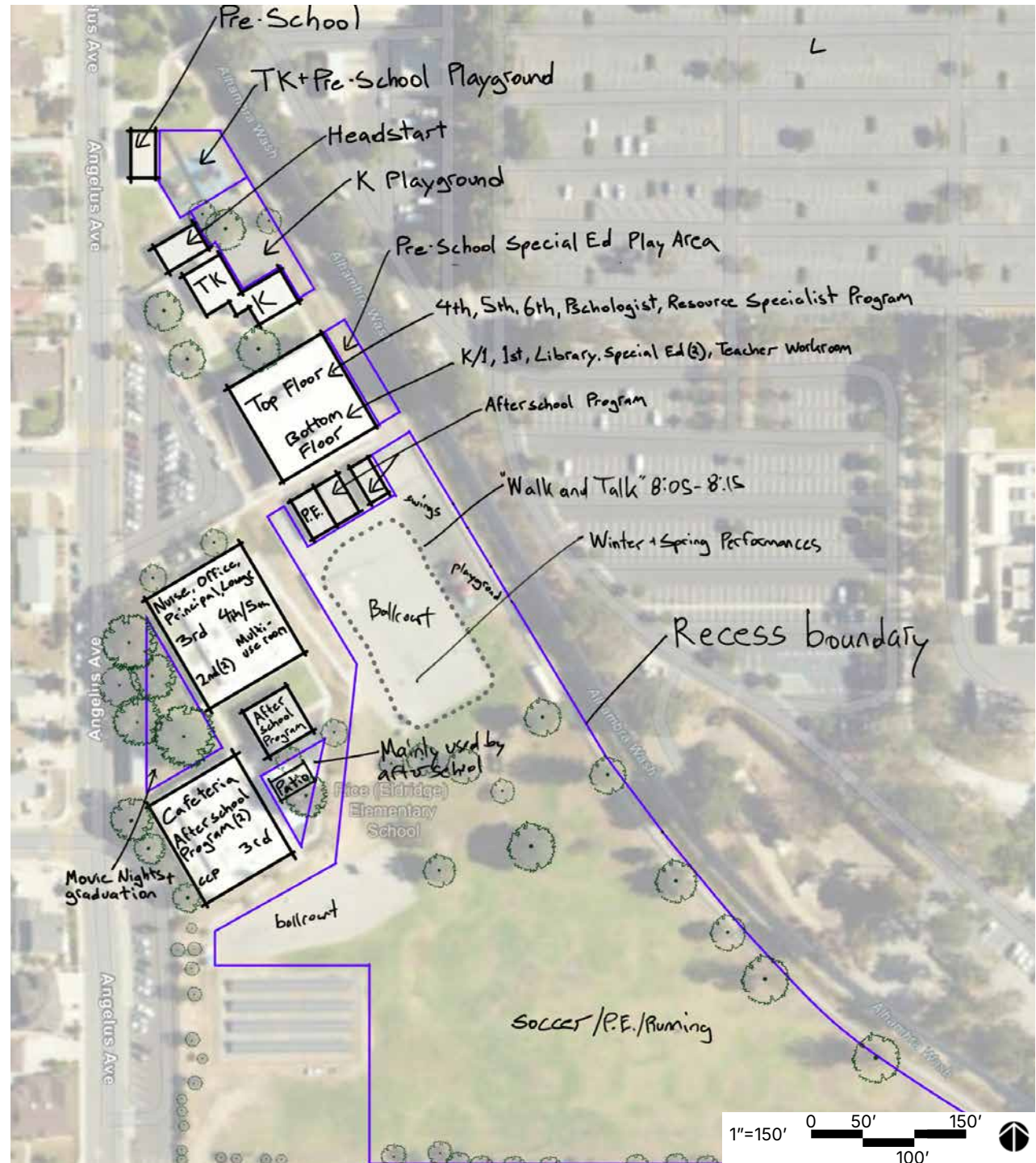


<https://rice.garvey.k12.ca.us/apps/video/watch.jsp?v=185680>



<https://rice.garvey.k12.ca.us/apps/video/watch.jsp?v=150180>

Current Use



Site Photos Recess Area



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1st-6th grade blacktop recess area



TK - K1 grade play structures (rubber surface)



1st-6th grade grassy field recess area



TK - K1 grade blacktop recess area



1st-6th grade play structure and swings (rubber surface)



TK-K1 play area trees

Site Photos Recess Area



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2nd-6th grade classrooms near school entrance



K-1st classrooms 2nd floor



2nd-6th grade classrooms



TK - K1 classrooms on left with K1-1st grade classroom on right

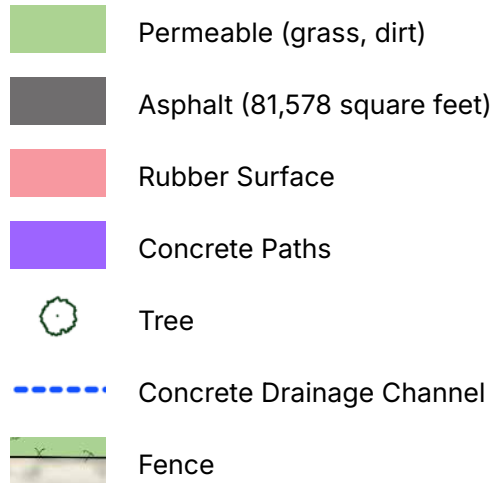


2nd-6th grade back side classrooms near path to recess area



TK-K1 classrooms

Site Inventory



BUILDING LEGEND:

A Pre-School	E P.E. Equipment
B Headstart	F After school Program
C TK	
D Top Floor: 4th-6th, Psychologist, Resource Specialist	G Principal, Nurse, 2nd-5th, Multi-Use Room
Bottom Floor: 1st, Library, Special Ed, Teacher Workroom	H After school Program
	I Bathroom
	J Cafeteria, 3rd, After School Program



Goals and Objectives

Increase Shade and Thermal Comfort

- Increase shade and improve thermal comfort within the outdoor spaces students use most frequently throughout the school day
- Reduce heat exposure through canopy expansion, material selection, surface treatments, and spatial organization

Support Student Health and Well-Being

- Support a broader range of movement, exploration, and age-appropriate physical activities through more varied outdoor play environments
- Create spaces that support social interaction, creativity, quiet reflection, and mental well-being
- Encourage sensory engagement and everyday interaction with natural systems through planting, water, and nature-based play environments

Support Learning Through Outdoor Environments

- Develop outdoor classrooms and hands-on learning environments that support diverse learning methods, teaching approaches, and student engagement throughout the school day
- Integrate habitat areas, regenerative planting for food production and craft harvesting, and other ecological features into learning environments and shared campus spaces
- Incorporate educational planting and environmental systems that support observation, creativity, and hands-on interaction with natural processes

Strengthen Environmental Performance and Environmental Education

- Incorporate planting, soil, and stormwater systems that support water management, heat mitigation, habitat value, and long-term environmental performance
- Integrate environmental systems in ways that support environmental literacy, environmental stewardship, and greater awareness of climate resilience within the broader school community

Create a More Multi-Functional and Connected School Environment

- Develop outdoor environments that support overlapping educational, recreational, environmental, and social functions simultaneously
- Improve relationships between classrooms, play spaces, outdoor learning environments, circulation, gathering spaces, and natural systems throughout the campus



<https://tenstrands.org/a-vision-for-green-schoolyards-across-california/>



<https://tenstrands.org/a-vision-for-green-schoolyards-across-california/>

Project Methodology

Thermal Comfort

Design is informed by microclimate design and urban heat mitigation strategies, including schoolyard shade and heat research by Green Schoolyards America and Trust for Public Land. These approaches emphasize improving thermal comfort in high-use school environments through increased tree canopy, material selection, and spatial organization.



<https://www.greenschoolyards.org/ca-schoolyard-forests>

Health and Well-Being

Design is informed by child-centered, nature-based play, and trauma-informed design research. These approaches support physical and mental well-being through movement, exploration, sensory engagement, social interaction, creativity, varied terrain, and opportunities for both active play and quiet reflection.



<https://www.landplanla.com.au/st-gerard-majella-school.html>

Learning in Outdoor Environments

Design is informed by experiential learning and outdoor education principles, emphasizing direct experience, observation, and interaction with the environment. These approaches support learning through outdoor classrooms, educational gardens, ecological landscapes, and flexible spaces that encourage exploration and hands-on engagement.



https://www.howweelearn.com/loose-parts-play-ideas/?utm_source=Pinterest&utm_medium=organic

Environmental Performance

Design is informed by Low Impact Development, regenerative landscape approaches, and ecological planting principles. These approaches support stormwater management, habitat creation, and climate resilience while creating productive landscapes that provide food, materials, shade, habitat, and other ecological benefits.



<https://www.meristemdesign.co.uk/case-study/hounslow-school-rain-gardens/>

Project Program

Thermal Comfort and Shade Systems

Increase shade within high-use areas from approximately 6.5% to at least 30%, requiring roughly 51,000 additional square feet (1.18 acres) of new shade coverage. This may include expanded tree canopy, shade structures, and shaded gathering areas integrated within play, learning, and circulation environments.

Nature-Based Play and Well-Being Areas

Provide a range of outdoor environments that support diverse forms of movement, exploration, creativity, sensory engagement, and social interaction. Elements may include natural play features, landforms, balancing elements, loose materials, sensory planting, and restorative spaces that support both physical and mental well-being.

Restorative and Social Spaces

Provide 6–10 small restorative spaces, approximately 50–100 square feet each, for quiet seating, reflection, small group gathering, or social connection. These spaces should be integrated with shade, planting, and other landscape features that support student well-being.

Learning Through Outdoor Environments

Provide approximately 3–5 flexible outdoor learning areas near existing classrooms, with each area approximately 500 square feet. Learning opportunities may also be integrated throughout circulation routes, play environments, planting systems, and other shared campus spaces to support experiential and project-based learning.

Harvest Landscapes and Learning Gardens

Provide approximately 3,000–6,000 square feet of distributed harvest landscapes and environmental learning areas featuring edible native plants, medicinal species, craft-harvest materials, habitat planting, and regenerative landscape systems. These areas may also incorporate stormwater management, habitat creation, and environmental education opportunities.

Circulation and Connection Systems

Circulation systems should support both movement and everyday interaction with the landscape.



<https://www.greenschoolyards.org/>



<https://www.markkmorrison.com/>

Precedents

Eagle Rock Elementary

Eagle Rock Elementary School

Los Angeles, CA

Landscape Architect: Studio-MLA

Highlights:

- Removed approximately 21,000–23,000 square feet of asphalt and introduced permeable surfaces, native planting, and shade trees.
- The project integrates stormwater systems, outdoor learning spaces, and diverse play environments, focusing on transforming underutilized areas of the campus.
- Introduced shade and planting directly into high-use play areas rather than isolating them at the edges.

Takeaways:

- Replacing asphalt in targeted areas with planted systems improves thermal comfort, stormwater performance, and usability.
- Breaking up large play areas into smaller, shaded zones increases activity and inclusivity. Environmental systems can be integrated into everyday play and learning.
- Designing interventions within high-use areas is critical to improving comfort and access to nature.



<https://studio-mla.com/design/eagle-rock-elementary-school/>



<https://studio-mla.com/design/eagle-rock-elementary-school/>



<https://storymaps.arcgis.com/stories/9173f97ac0f940a795f4de60e>

Walgrove Elementary

Walgrove Elementary (Walgrove Wildlands)
Los Angeles, CA
Landscape Architect: Ryan Drnek, Sodder
Studios

Highlights:

- Converted approximately 25,000 square feet of asphalt and former building area into a native habitat "eco-lab."
- Designed as a hands-on outdoor learning environment with multiple habitat types including meadow, woodland, and arroyo systems.
- The project includes outdoor classrooms, informal gathering spaces, and habitat-based planting. Designed specifically as an outdoor laboratory to support STEAM and curriculum-based learning.

Takeaways:

- Schoolyards can function as living ecosystems that support both education and ecology.
- Designing with native plant communities creates resilient, low-maintenance systems.
- Outdoor environments can serve as flexible, curriculum-based learning spaces.
- Learning outcomes can be strengthened when ecological systems are intentionally designed for hands-on use.



<https://friendsofwalgrove.com/wildlands-about/>



<https://friendsofwalgrove.com/wildlands-about/>



<https://friendsofwalgrove.com/wildlands-about/>

Precedents

Visitacion Valley Middle School

Visitacion Valley Middle School

San Francisco, CA

Bay Tree Design, CAW Architects, Lotus Water Engineering

Highlights:

- Full-campus redesign integrating play, learning, and environmental systems.
- The project includes outdoor classrooms, an orchard, bioretention areas, and multi-use athletic spaces.
- It was developed with input from students, staff, and the community and is being implemented through a phased approach.

Takeaways:

- Schoolyards can be reimagined at the campus scale through coordinated planning that brings together recreation, ecology, and learning.
- Integrating multiple program elements across the site improves flexibility and overall usability.
- Community engagement and phased implementation are critical for delivering large-scale schoolyard transformations.



<https://www.baytreedesign.com/visitacion-valley>



<https://www.baytreedesign.com/visitacion-valley>

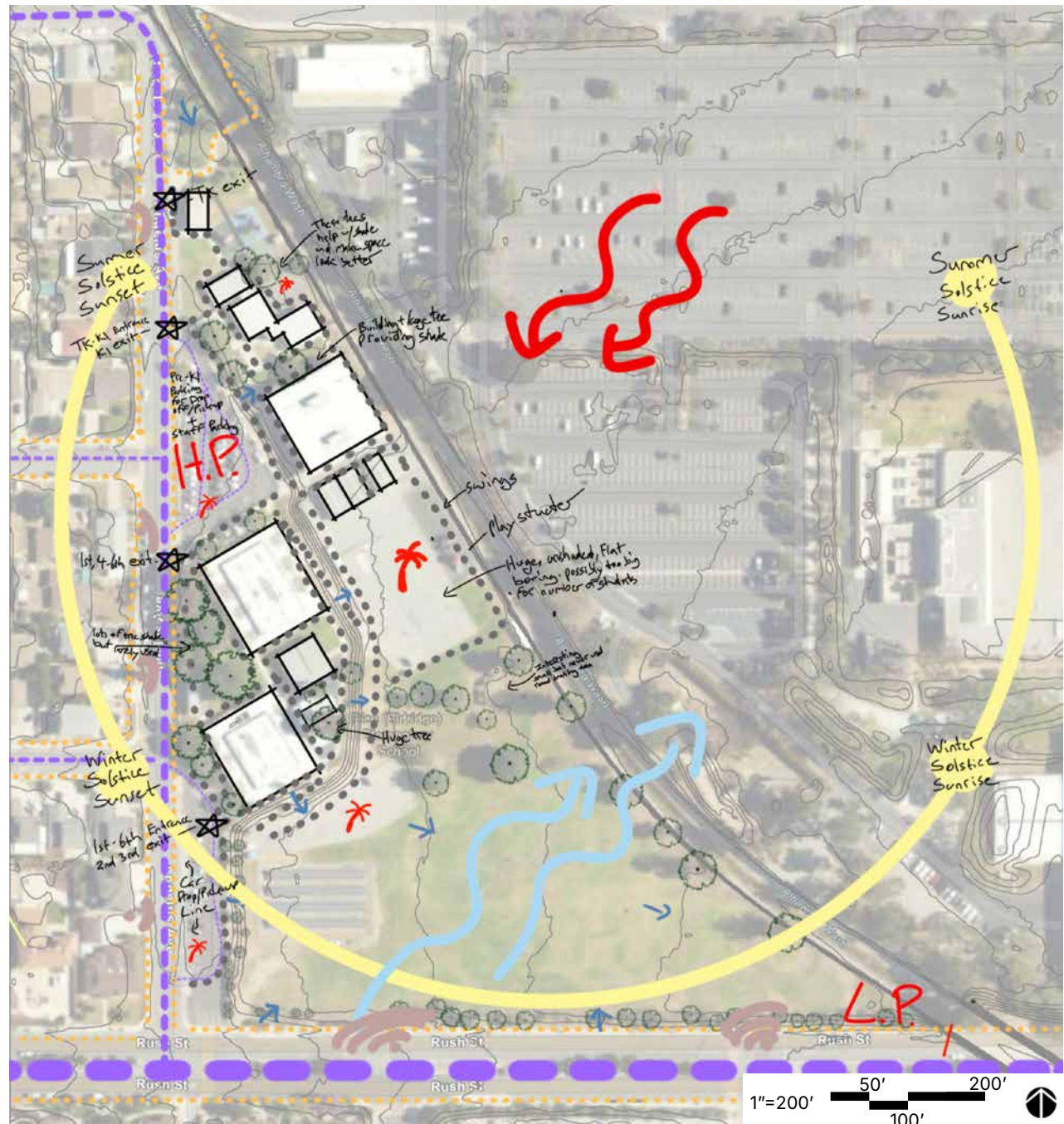


<https://www.baytreedesign.com/visitacion-valley>

Site Analysis

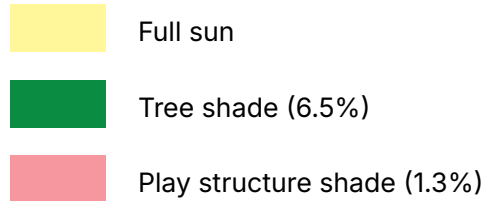
Environmental Factors and Circulation

-  Sun Path
-  Prevailing Winds
-  Santa Ana Winds
-  Drainage
-  Heat Island
-  On Site Pedestrian Circulation
-  Off Site Pedestrian Cir
-  Vehicular Circulation
-  Heat Island
-  Noise



Site Analysis

Recess Area Sun/Shade



Total Recess Area: 216,390 square feet

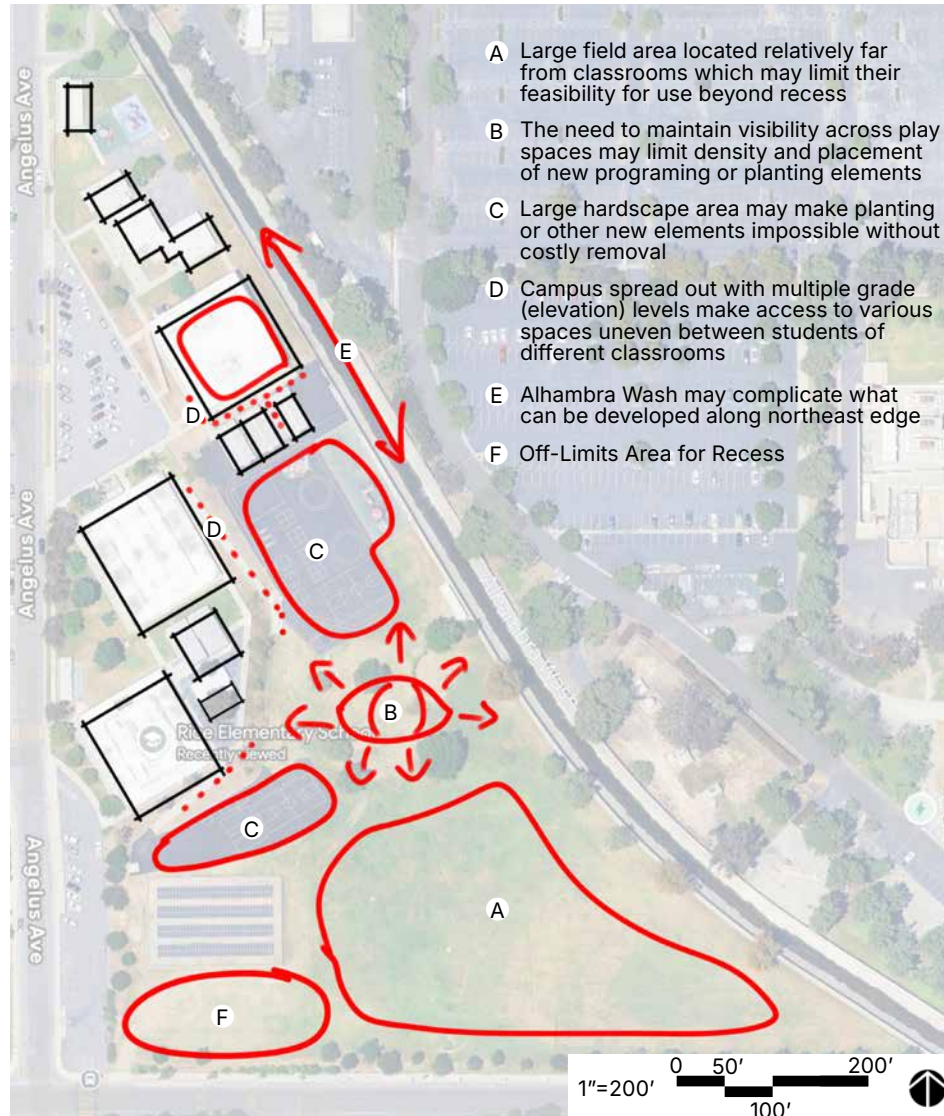
Tree Shade: 13,721 square feet

Play Structure Shade: 300 square feet

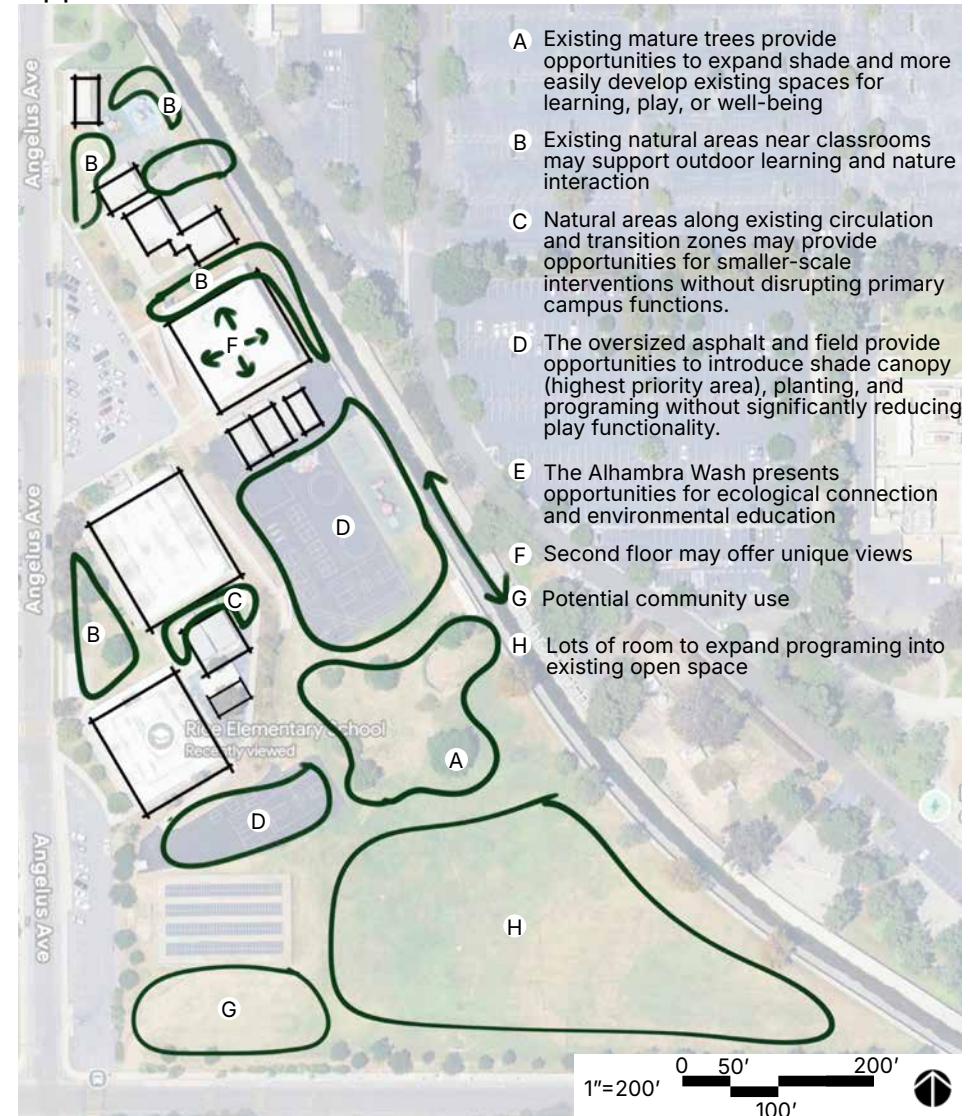


Constraints and Opportunities

Constraints



Opportunities



Design Concepts

BALANCE



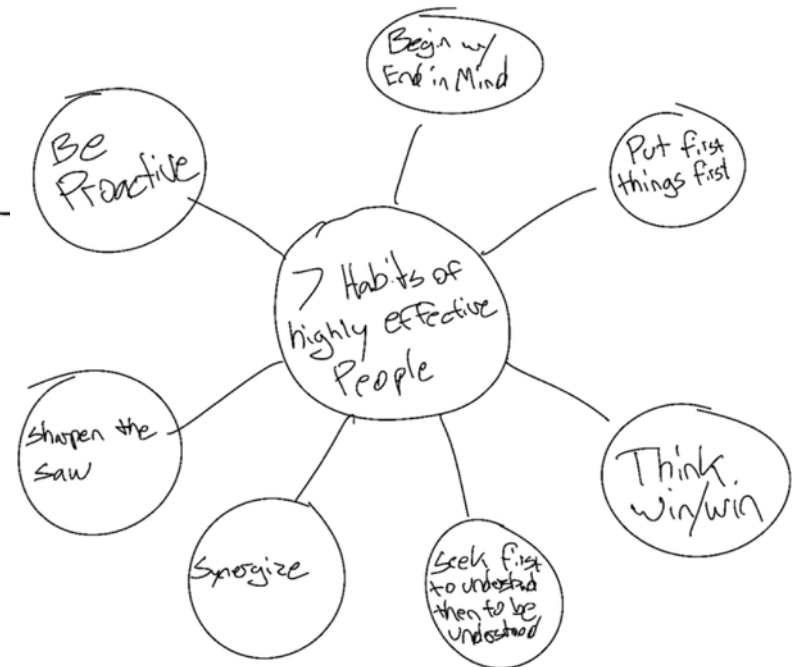
The Watershed



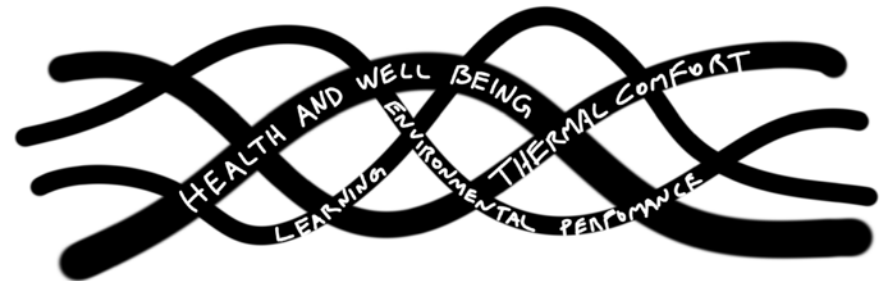
Choose your own adventure



7 HABITS OF SUCCESS

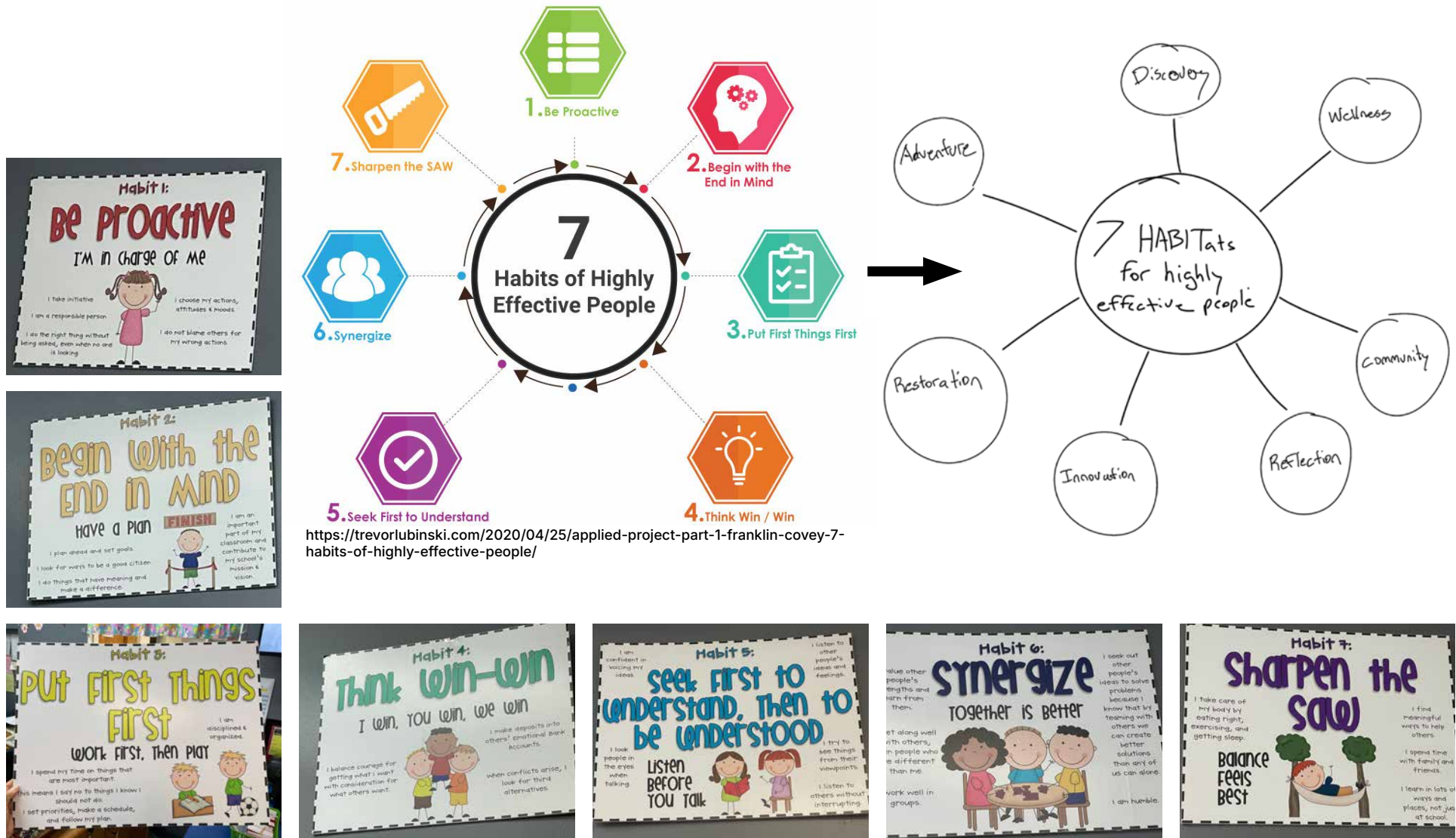


CONNECTED SYSTEMS



Design Concept Development

7 Habitats for Success



7 Habitats of Success

Concept Development and Bubble Diagram

7 Habits

1) Be Proactive



Adventure

Climb | Balance | Play
Explore | Challenge

2) Begin with the end in mind



Discovery

Learn | Experiment
Question |

3) Put first things first



Recreation

Run | Exercise
Play | Compete

4) Think Win/Win



Community

Gather | Socialize
Perform | Connect

5) Seek first to understand than to be understood



Reflection

Rest | Reflect | Recharge
Connect with Nature

6) Synergize



Innovation

Imagine | Build
Problem-Solve

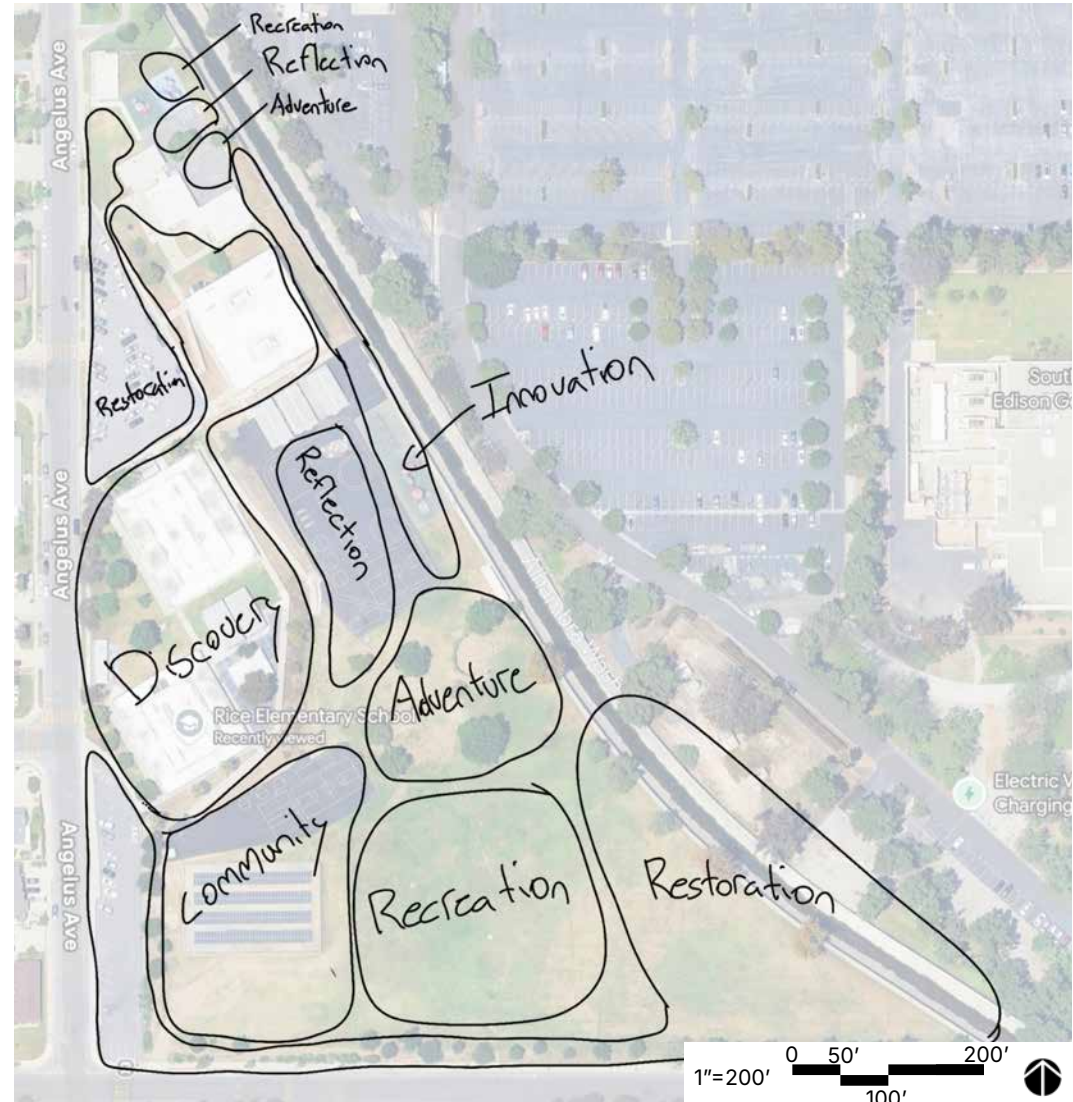
7) Sharpen the Saw



Restoration

Regenerate | Restore
Protect | Sustain

7 Habitats



7 Habitats of Success

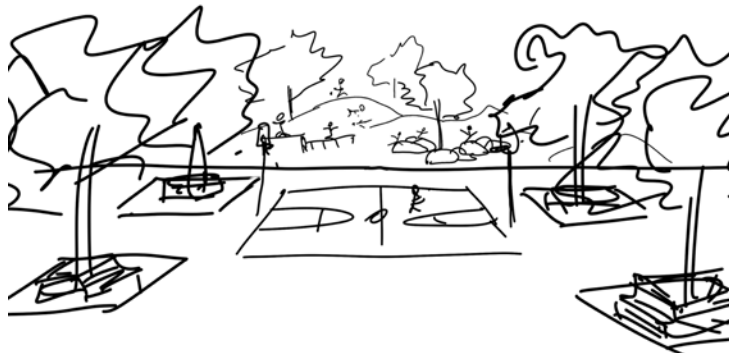
Concept Development



Innovation Zone with "Loose Parts" learning



**Restoration Habitat with riparian zone
(and de-channelized Alhambra Wash)**



**Recreation Habitat with shaded ball courts and
Adventure Habitat with varied terrain, balance course and boulders**



**Community Habitat with stage for performances,
graduation or special events**

Watershed Design Concept



<https://planting-natives.com/2022/03/15/upper-arroyo-seco-visit-1/>



<https://www.instagram.com/p/DYQOsI9AX-Gc/>



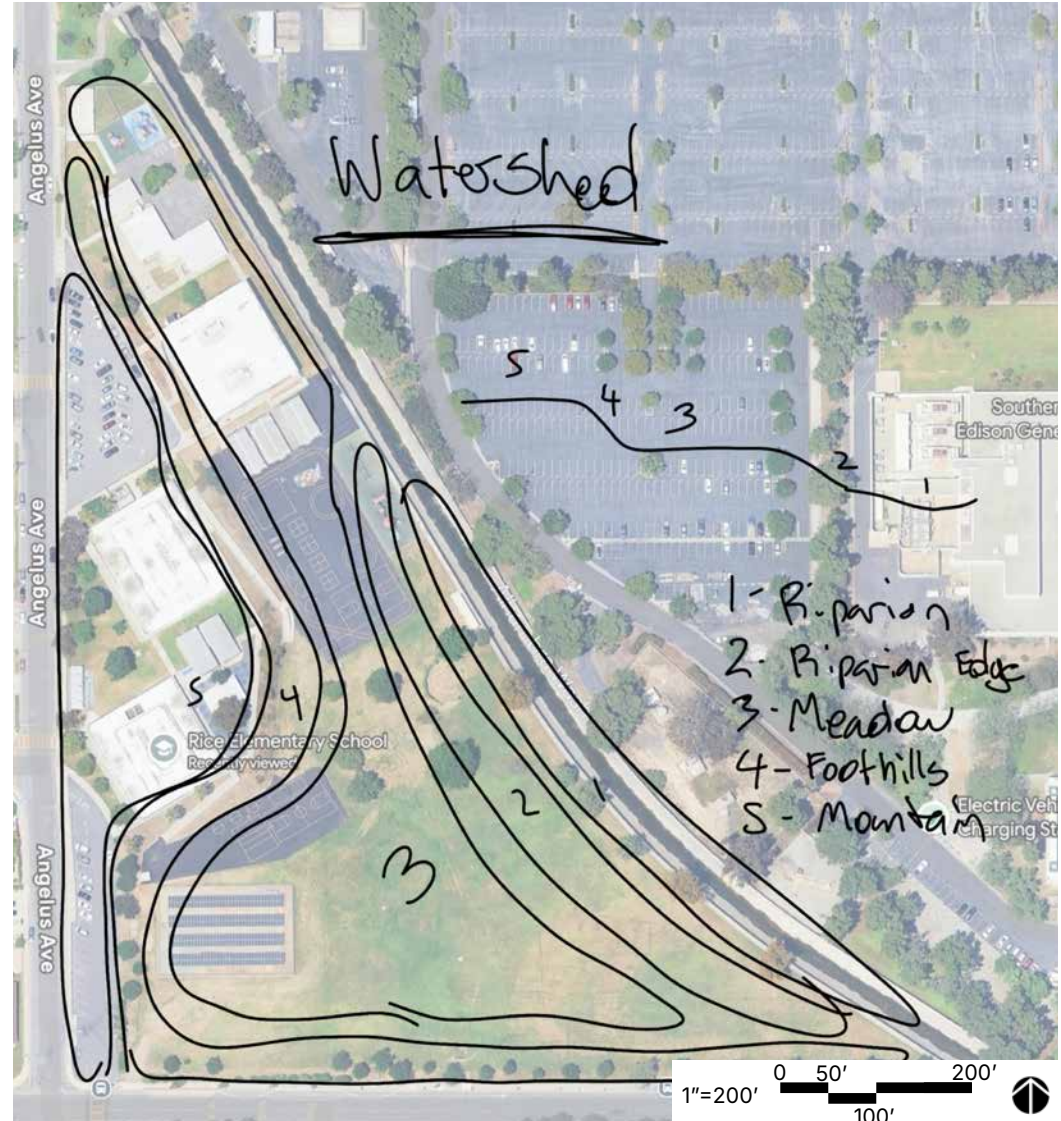
<https://www.laspilitas.com/easy/easywild-flower.htmGc/>



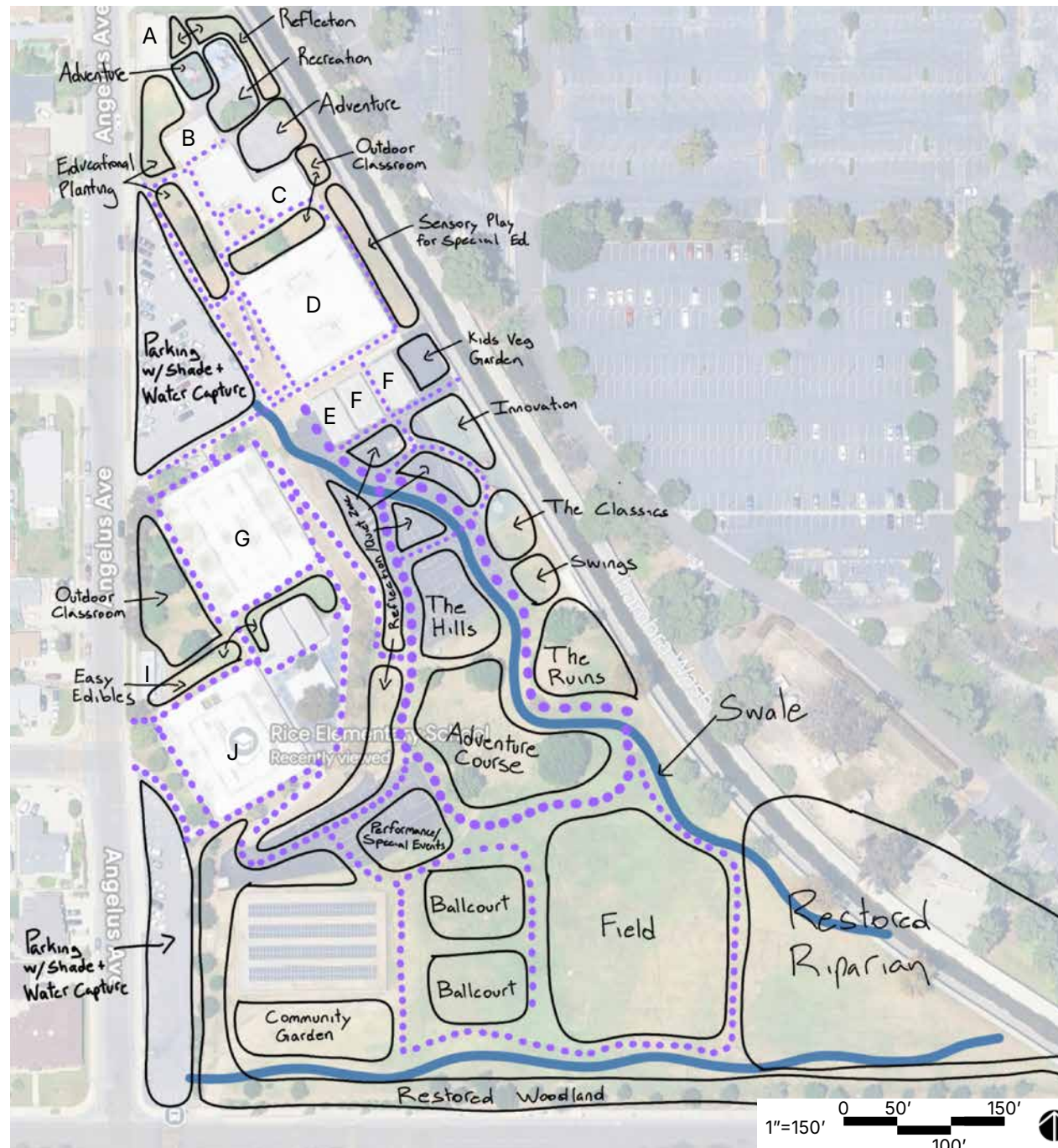
<https://www.laspilitas.com/nature-of-california/communities/coastal-sage-scrub>



https://en.wikipedia.org/wiki/California_oak_woodland



Preliminary Site Plan



● ● ● ● Pedestrian Circulation

— Planted Swale

BUILDING LEGEND:

A Pre-School	E P.E. Equipment
B Headstart	F After school Program
C TK	G Principal, Nurse, 2nd-5th, Multi-Use Room
D Top Floor: 4th-6th, Psychologist, Resource Specialist	H After school Program
	I Bathroom
	J Cafeteria, 3rd, After School Program
Bottom Floor: 1st, Library, Special Ed, Teacher Workroom	

Plant and Hardscape Materials



<https://summer-dry.com/coast-live-oak/>

Oak Woodland

For perimeter, upper level, and designated planting areas not used for play.



<https://www.instagram.com/p/DVdOrfHCD3C/>

Foothill Chaparral

For sloped areas and some transitions zones



<https://greenportal.wca.ca.gov/strategies/water-capture>

Riparian/Swale

For swale and riparian areas



<https://pacifichorticulture.org/articles/our-plant-collection-is-for-the-birds-and-butterflies/>

Pollinator Garden/Education

For planting areas in "Reflection" zone and other educational planting areas



<https://summer-dry.com/coast-live-oak/>

Concrete (heat reflective)

For circulation paths, ballcourts, and community/performance area



<https://www.instagram.com/p/DVdOrfHCD3C/>

Decomposed Granite

For sitting areas in main recess area



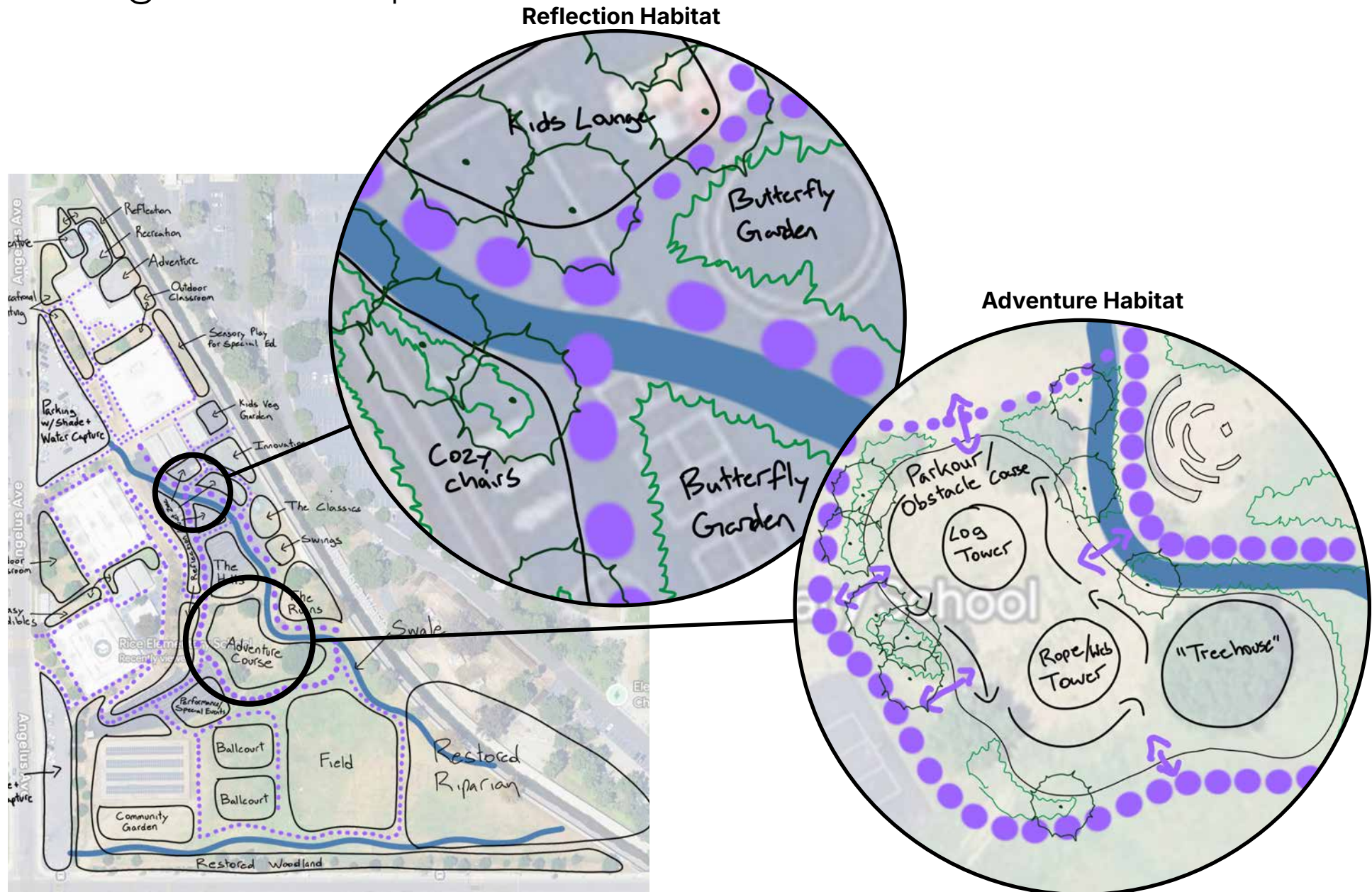
<https://greenportal.wca.ca.gov/strategies/water-capture>

Engineered Wood Mulch

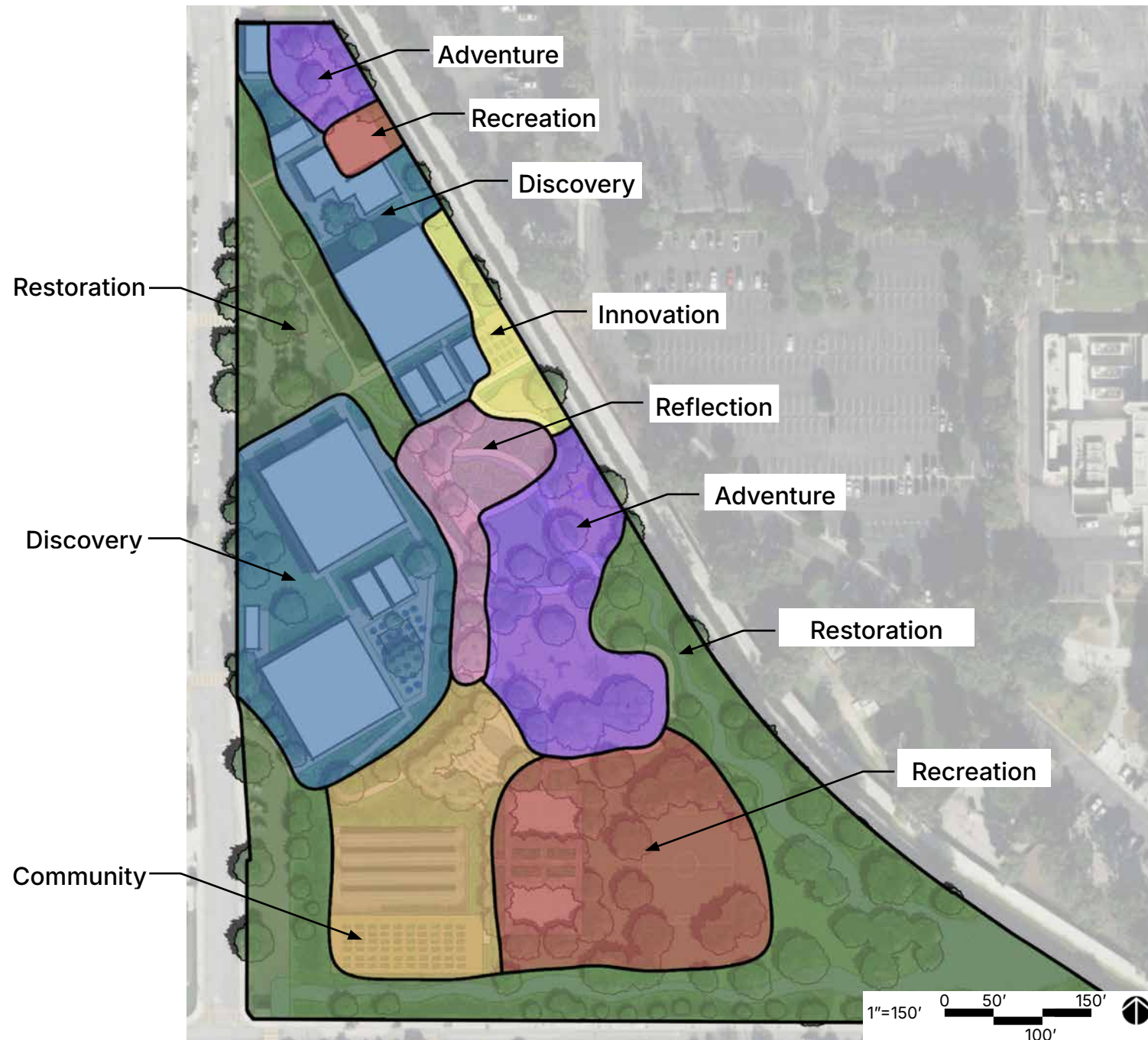
For designated play areas

7 Habitats of Success

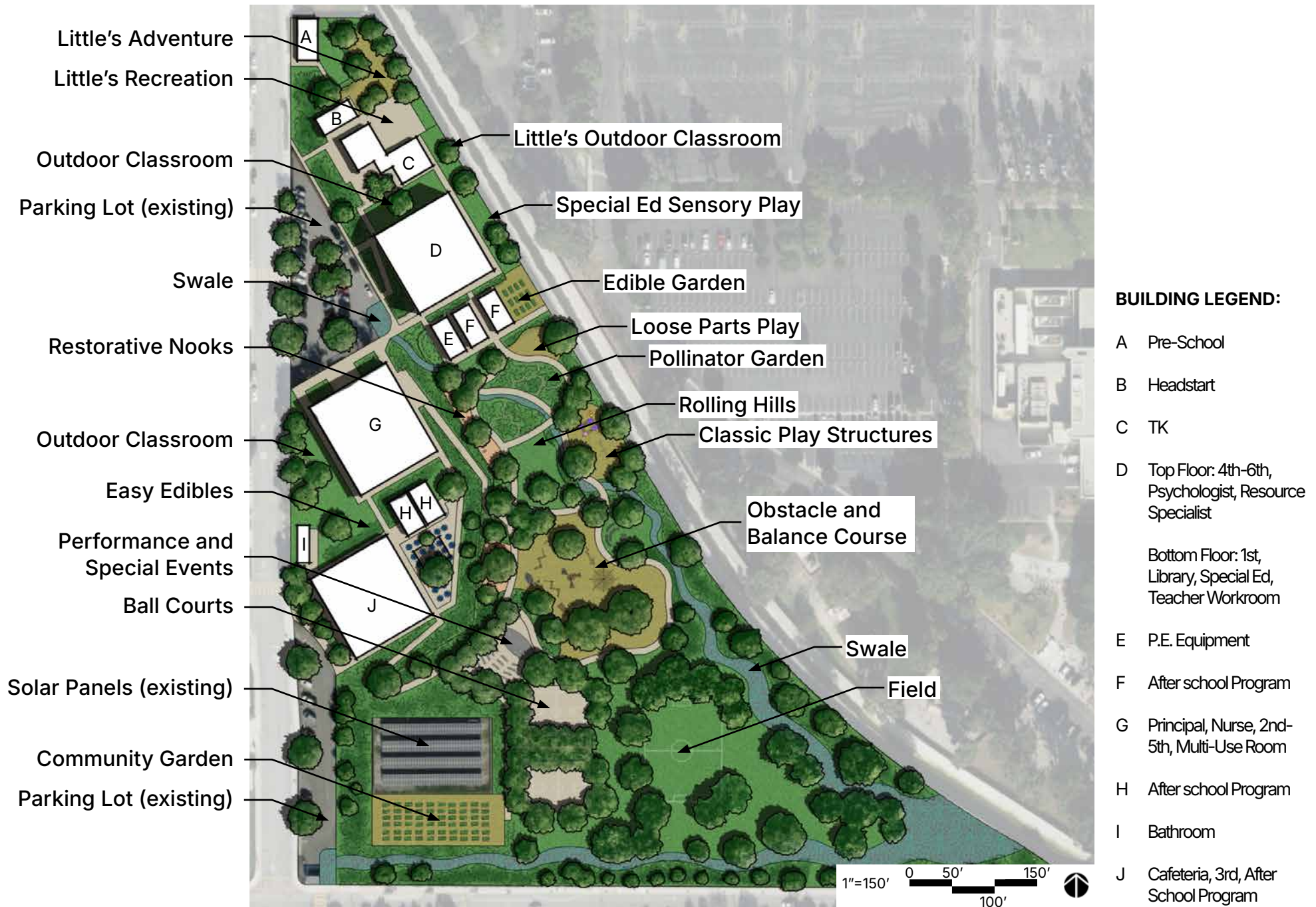
Design Development



Illustrative Site Plan 7 Habitat Zones



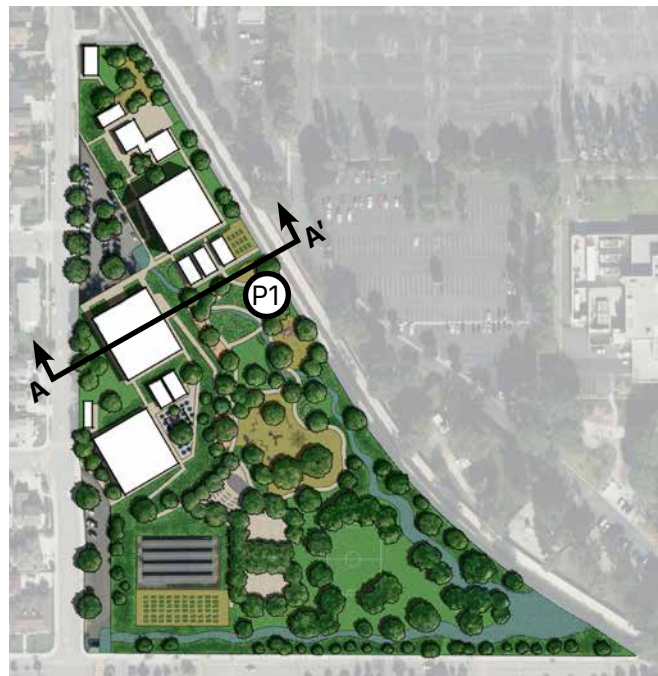
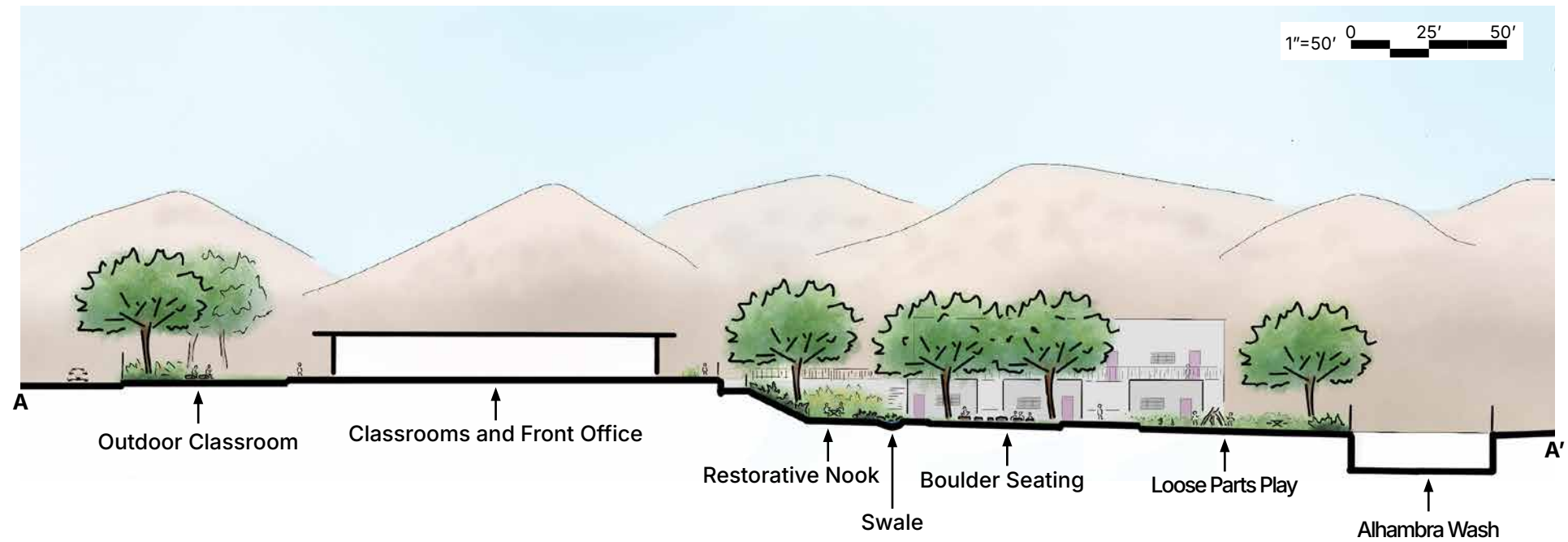
Illustrative Site Plan



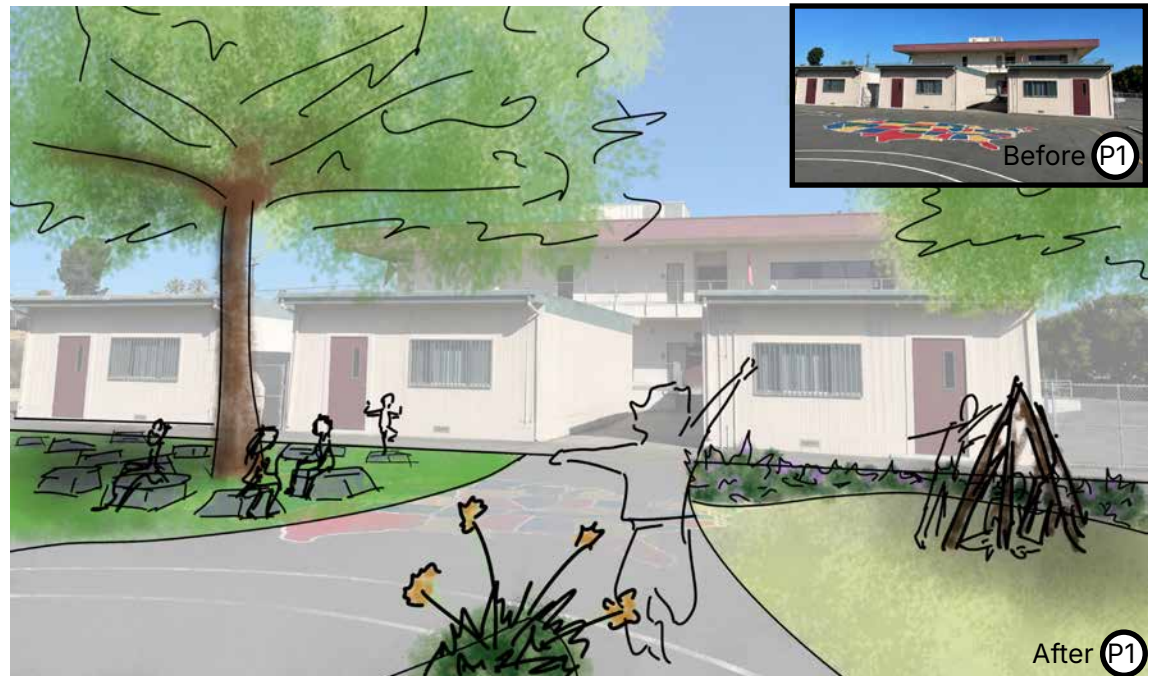
Enlargement 1st-6th Grade Area



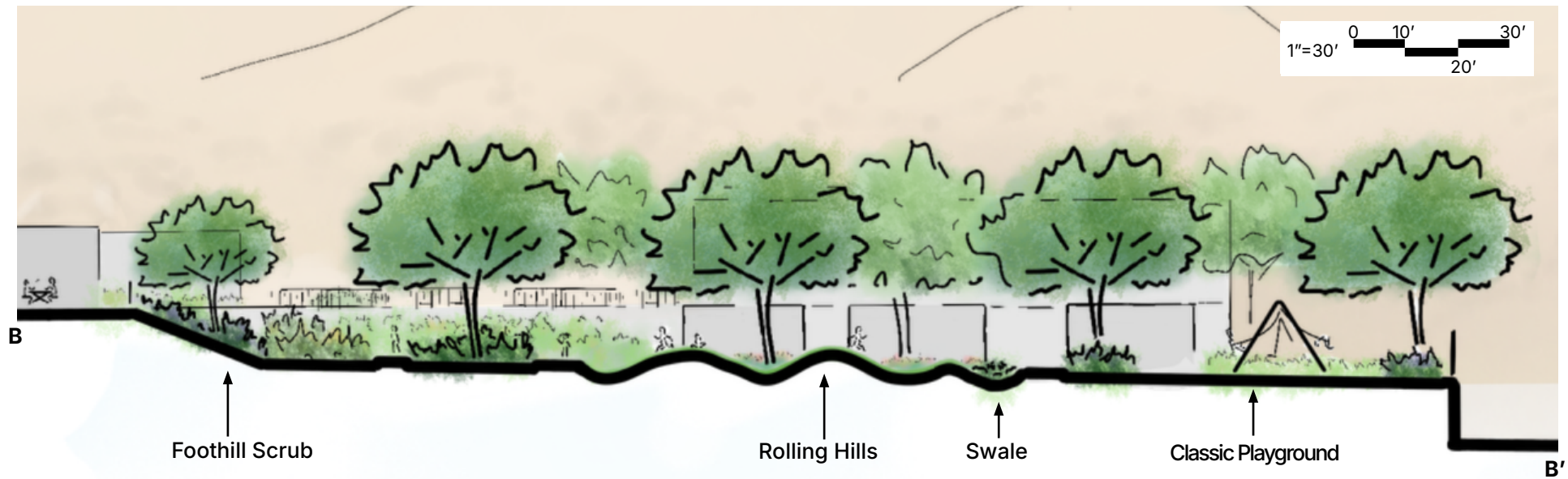
Section Elevation 1st-6th Grade Area



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Section Elevation 1st-6th Grade Area



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<https://www.millercomp.com/rl-stevenson-school-1>

Outdoor Learning



Health and Well-Being



Environmental Performance

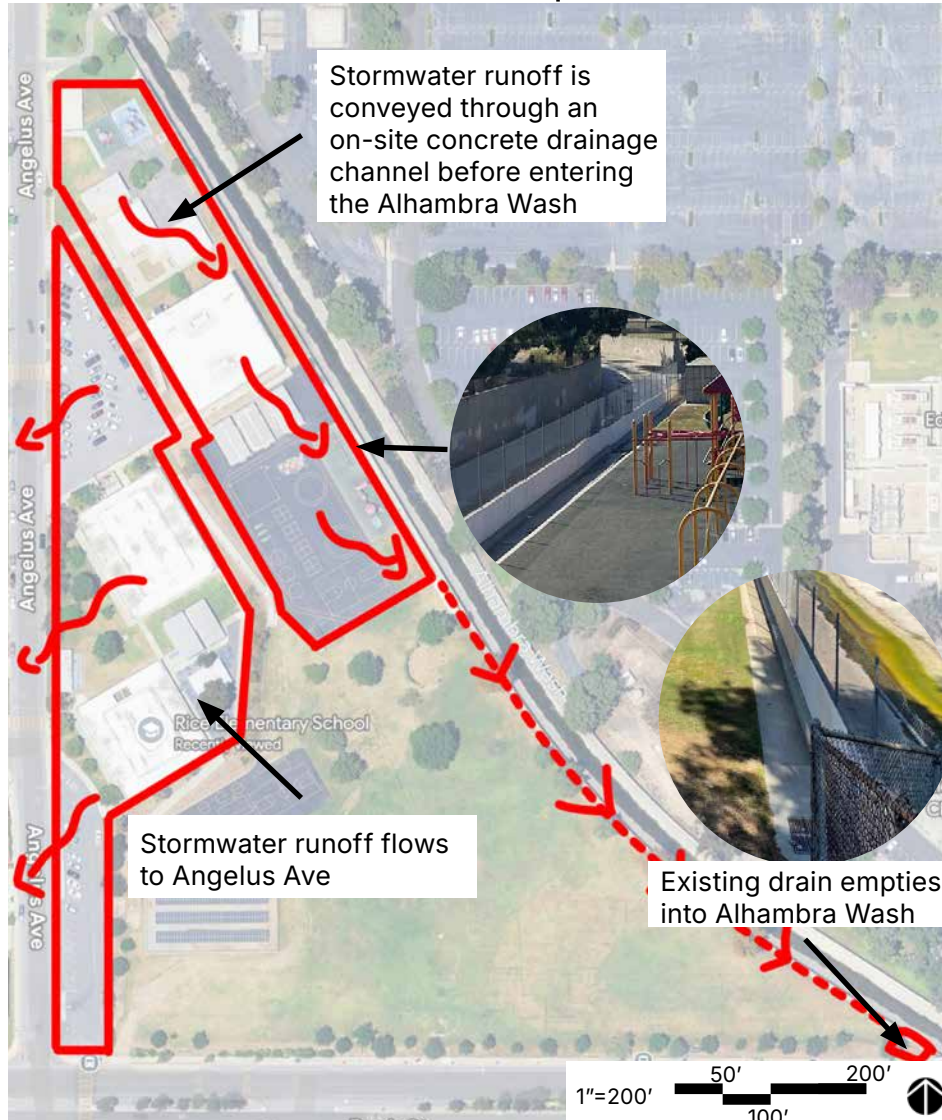


AI used to remove trash bins and fence



Environmental Performance

Stormwater Capture



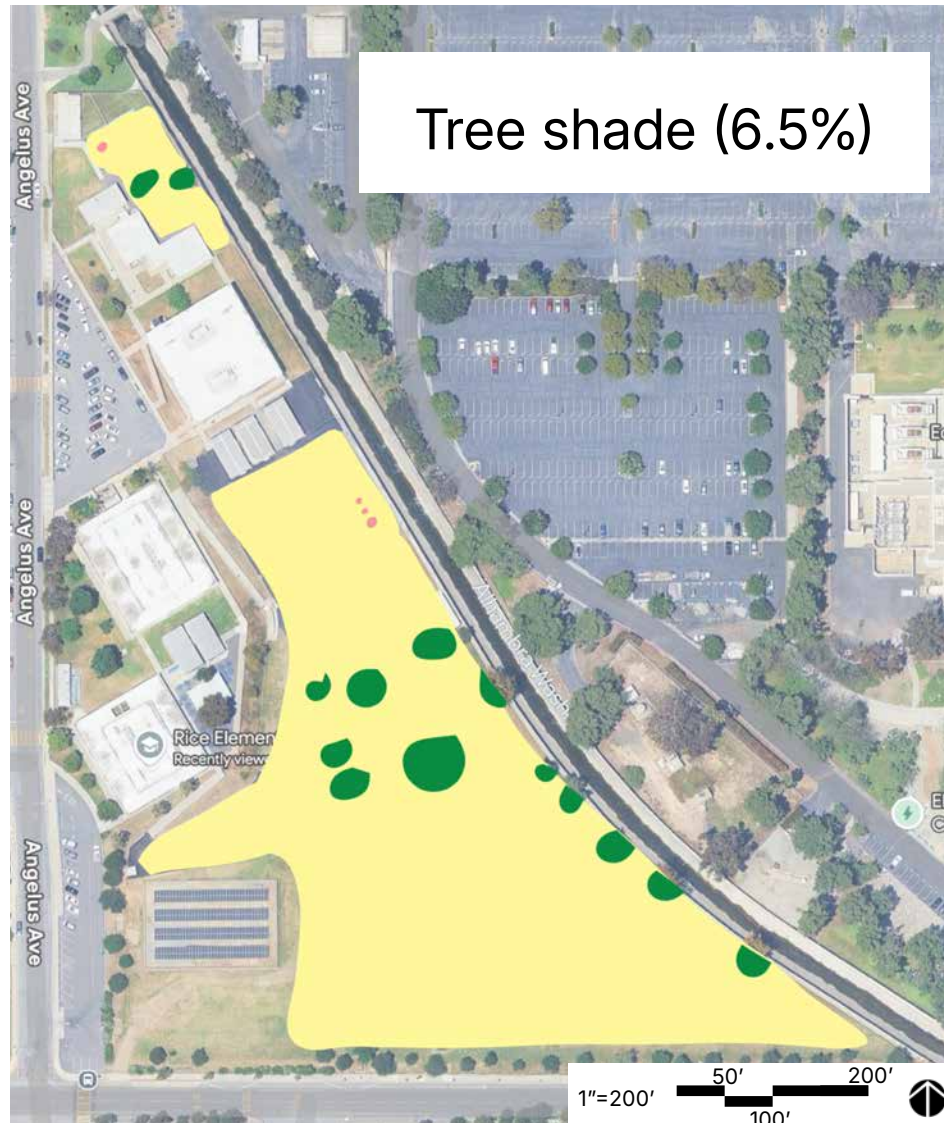
Before



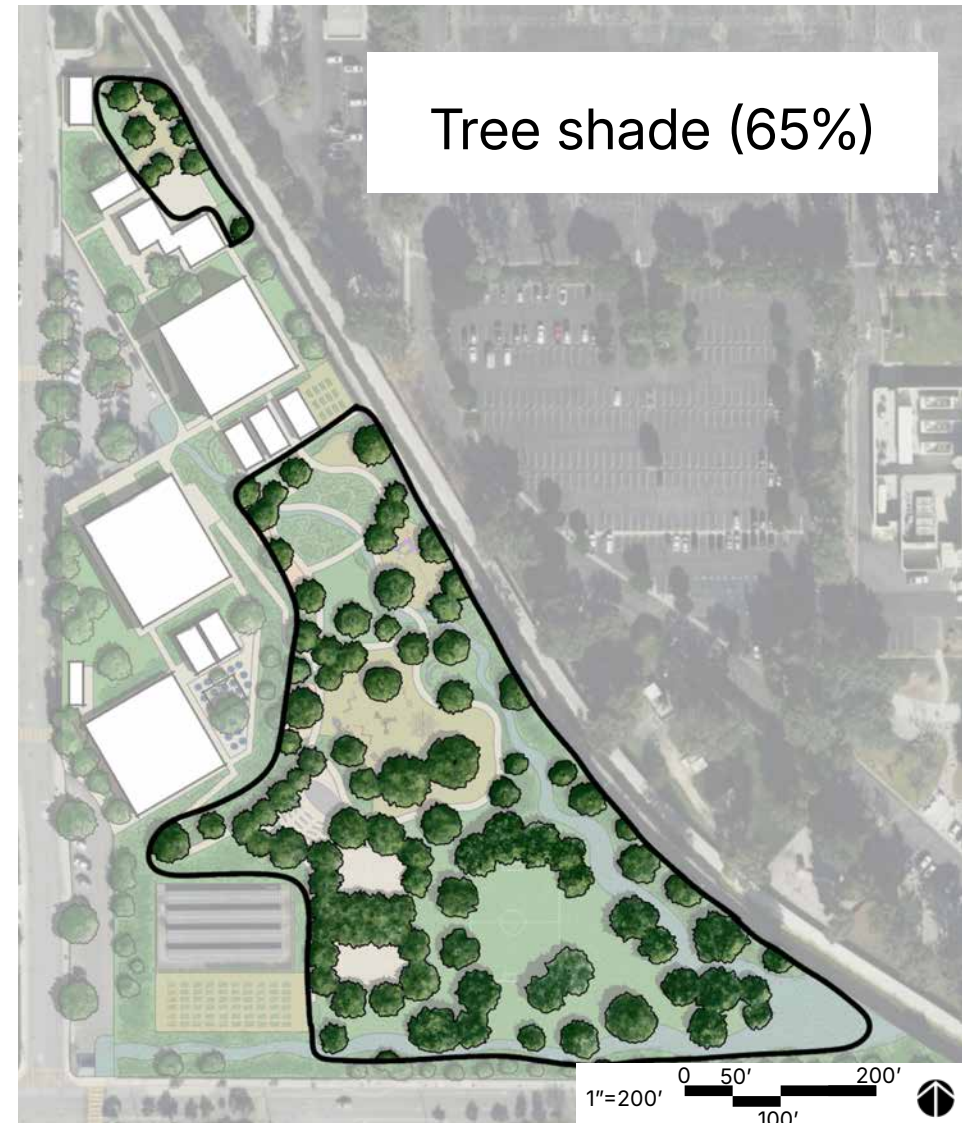
After

Thermal Comfort

Tree Shade in High Use Areas



Before



After

Conclusion



Goals and Objectives Met:

Increase Shade and Thermal Comfort

- Tree canopy shade in high-use areas increased from 6.5% to 65%
- 49,900 SF of asphalt removed and replaced with planting, habitat, and permeable landscapes
- New hardcourts use more reflective, lower-heat materials

Support Student Health and Well-Being

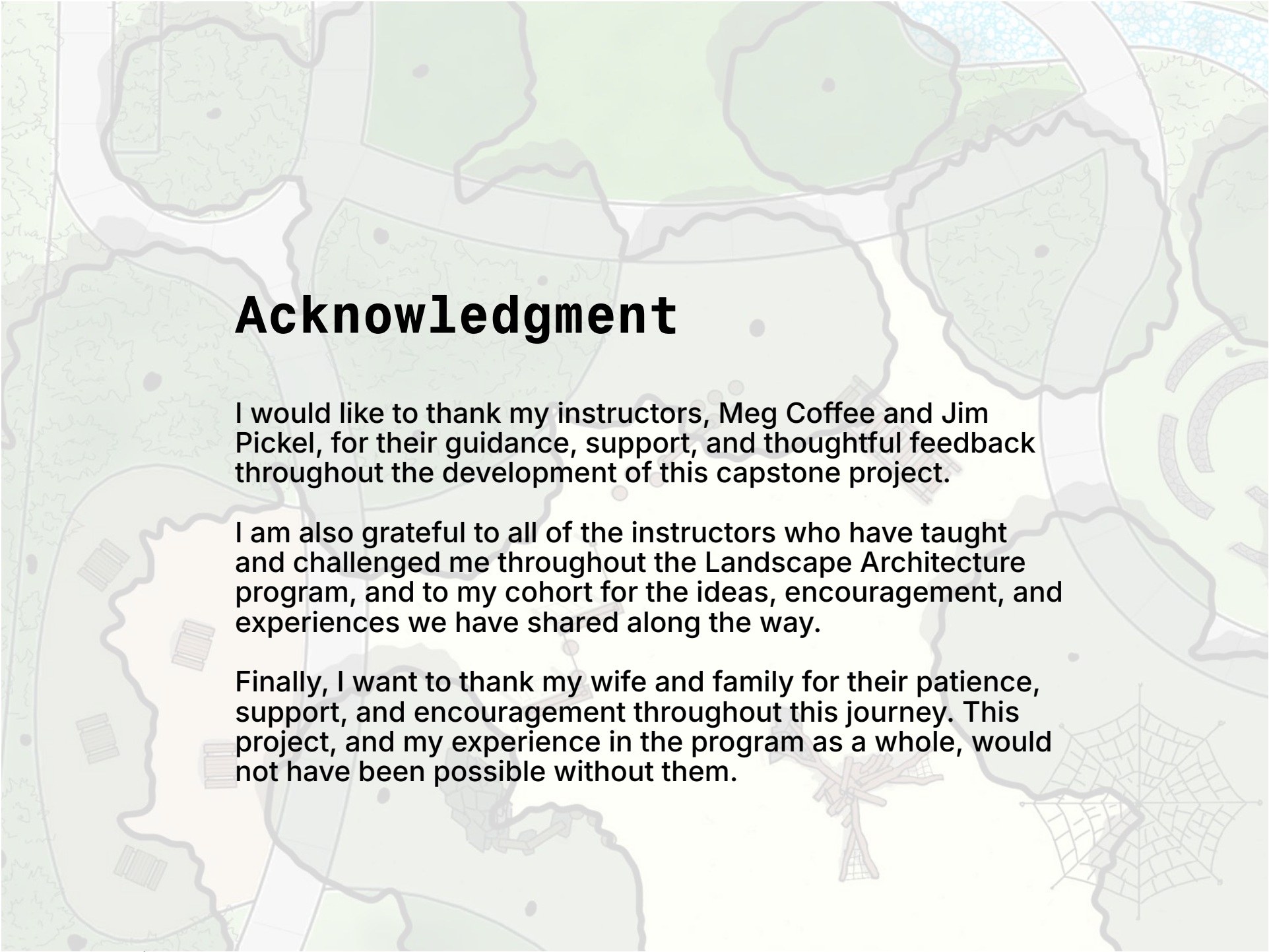
- Adventure Habitat expands opportunities for movement and physical challenge
- Reflection Habitat provides shaded restorative spaces
- Recreation Habitat maintains two hard courts and open field
- Community Habitat supports social connection and gathering

Expand Learning Beyond the Classroom

- Discovery habitat provides four outdoor classrooms integrated near existing classrooms
- Pollinator garden and native habitats support observation and environmental learning
- Innovation Habitat provides opportunities for building and collaborative play
- Edible garden supports hand-on learning

Strengthen Environmental Performance and Environmental Education

- Stormwater redirected from streets and concrete drainage into two planted bioswales
- Bioswales capture, slow, filter, and infiltrate runoff before overflow reaches the Alhambra Wash
- Native planting expands habitat and biodiversity



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