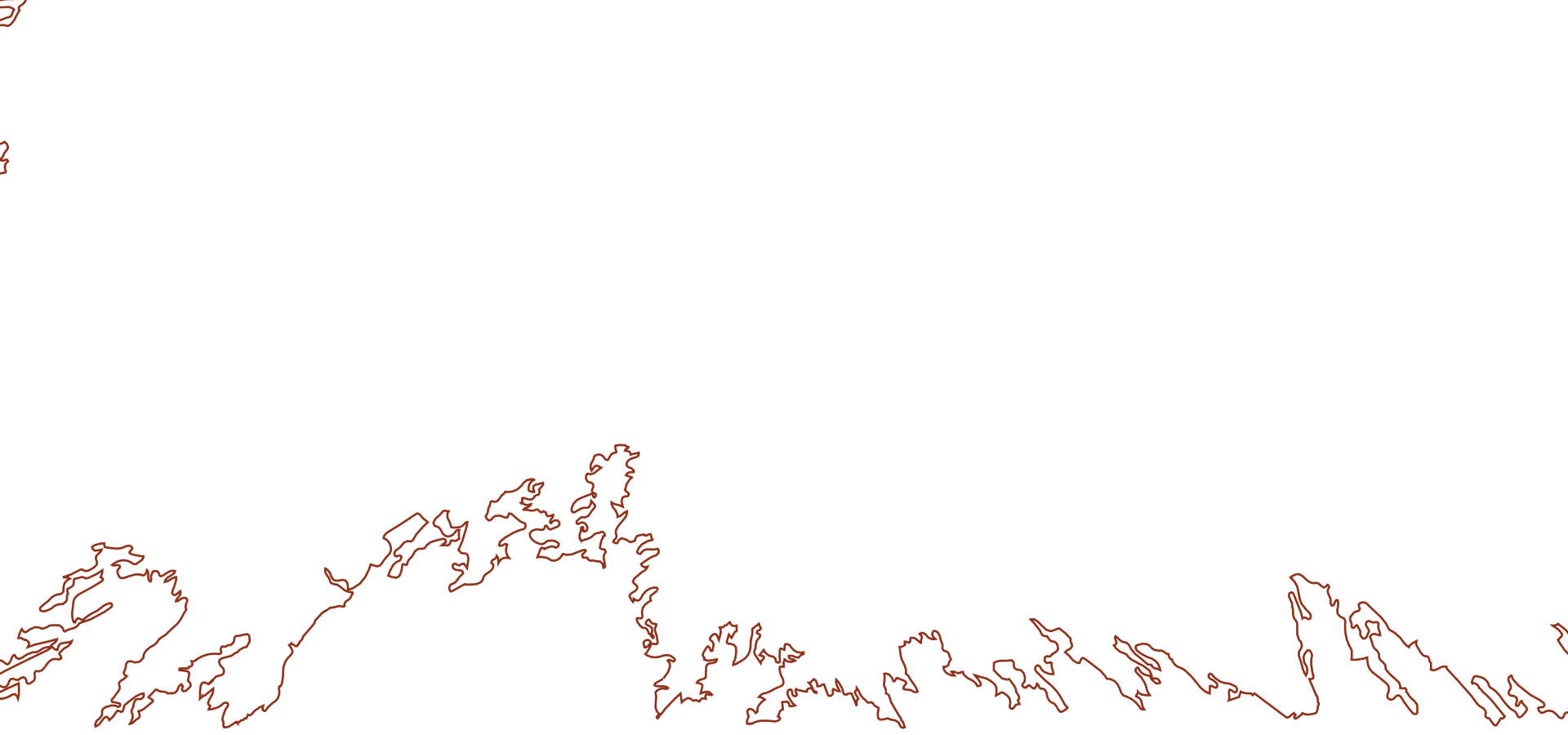
LIVING WITH FIRE

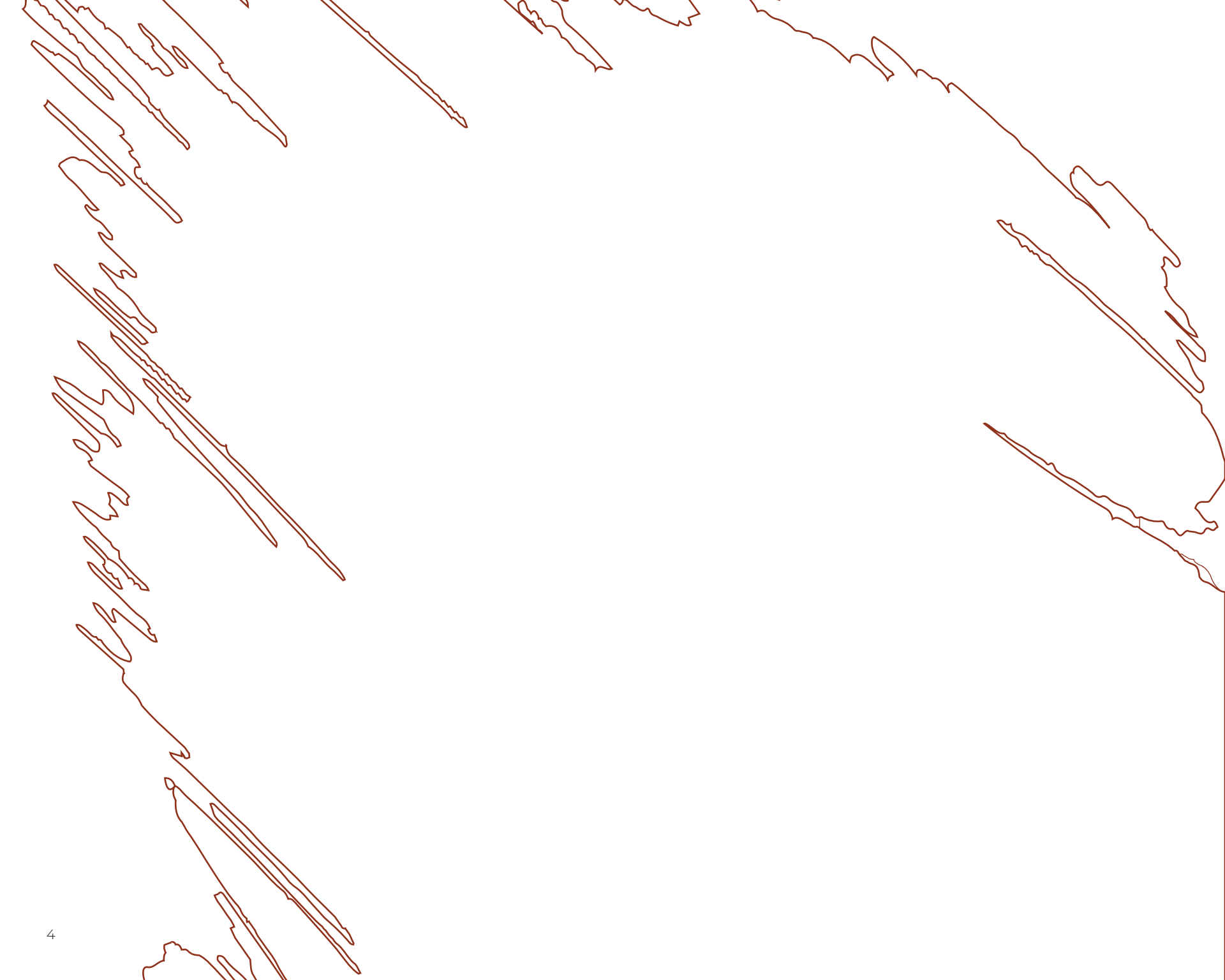
Generating public awareness on wildfire mitigation through defensible landscape design principles



A thesis submitted to the department of Art and Architecture to fulfill
a Masters Degree in Landscape Architecture at the University of Idaho.
Created by Olivia Harman
Under the supervision of Elizabeth Scott May 2021

"THE FIRST STEP TOWARD BUILDING A FIRE ADAPTED COMMUNITY IS EDUCATION"

Ada Fire Adapted Working Group



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1 INTRODUCTION

As I began researching various topics for my masters project, I wanted something to be relevant and applicable. Something that I could carry with me as I entered into the professional world.

As most of you know, fire has been a very hot topic over the last decade and especially in Boise Idaho. If anyone has lived in Boise for a summer, you would have experienced the weeks of no sun as hundreds of regional wildfires mask the sky. And if you have lived here for at least five years you would have experienced the devastation of Table Rock, our local city attraction, being burned to the ground from one stupid mistake. Living in Boise for 13 years has given me an understanding that we are at risk of wildfire and it's not just Boise that is experiencing this devastation, but places all over the world.

Many organizations, like fireADApted and Idaho Firewise work hard implementing programs and generating awareness about this issue. Unfortunately, through extensive research, various stakeholder interviews, and case studies I found that homeowners are aware of fire risk, yet neglect taking the initiative in creating defensible space. To solve this problem, it is important to begin shifting the culture and focus on changing individuals risk perception. I formulated a question asking, **how to increase public awareness on wildfire risk and demonstrate proper mitigation solutions through landscape design?**

Wildfire Problem

Fire Ecology

Fire History

Changing Conditions

WUI Expansion

Just the Right Conditions

LITERATURE REVIEW 1

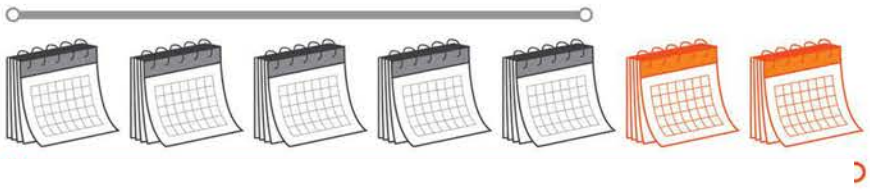
WILDFIRE PROBLEM

Wildfires are getting worse.

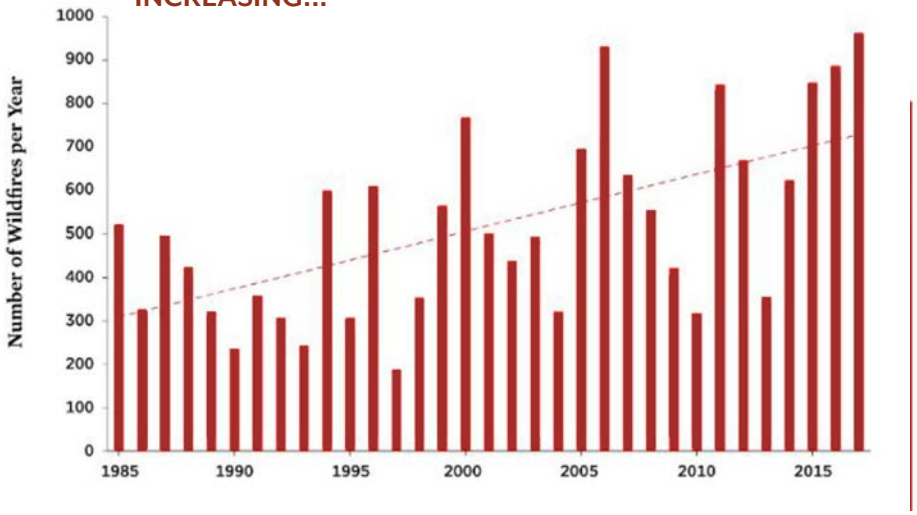
Since 2015, the United States has experience, on average, roughly 100 more large wildfires every year than the year before. This changes region by region, and year to year but generally we're seeing more wildfires, more acres burned, and longer, more intense fire seasons.

Wildfire season is lasting longer...

Early 1970s: 5 months



The Number of wildfires is INCREASING...



Data from the Monitoring Trends in Burn Severity program. MTBS only includes large fires in the United States (>500 acres for the eastern US, >1000 acres for the west). Prescribed fires removed.

USGS 21st Century Science of WILDLAND FIRE

$71-$246 BILLION Net annual economic impact of wildland fire accross the US

650 MILLION Acres of public lands that are managed for wildland fire

16.1 FATALITIES Acerage annual fatalies from wildland fire

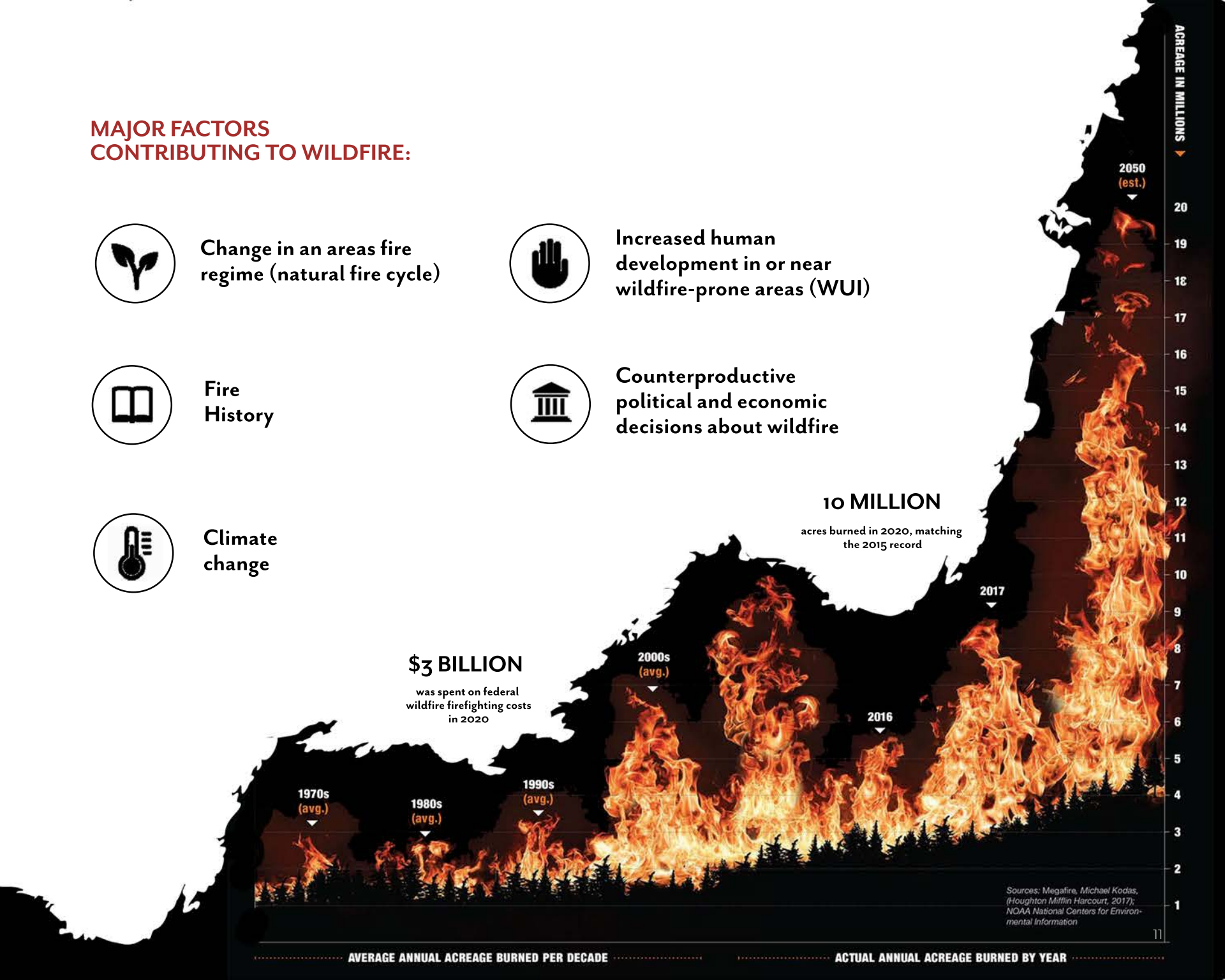
64,000 WILDFIRES Average number of wildfires per year

68 MILLION Average acres burned per year by wildfires

3.7 MILLION Average acres burned per year in prescribed fires

MAJOR FACTORS CONTRIBUTING TO WILDFIRE:

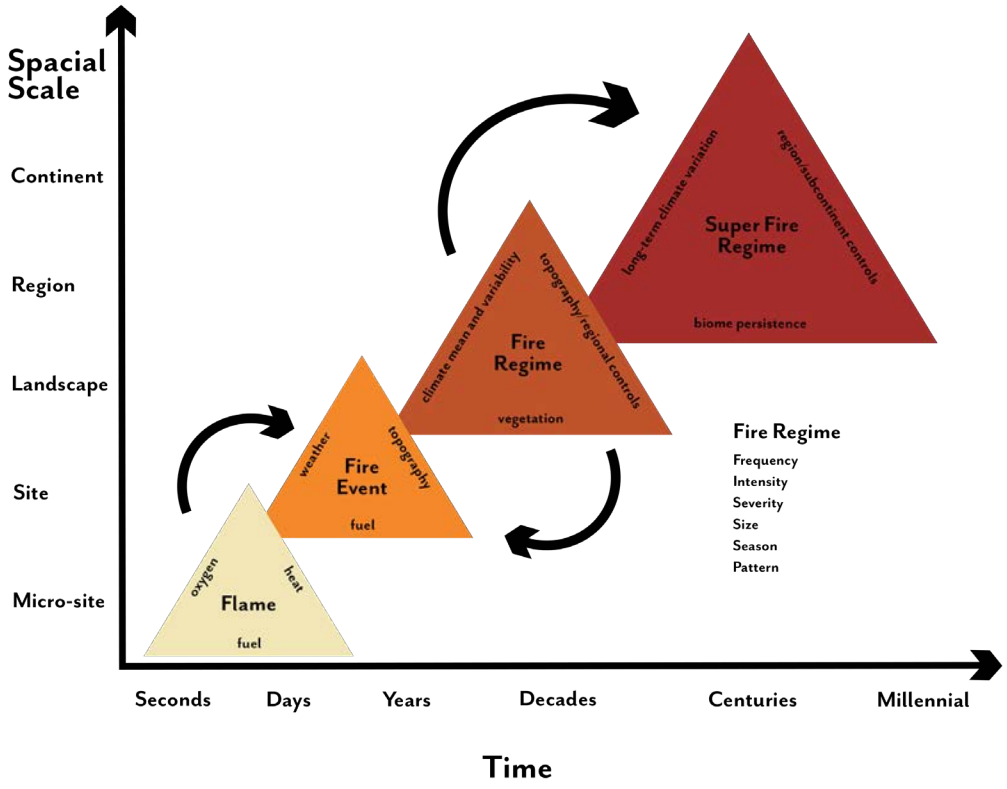
- Change in an areas fire regime (natural fire cycle)
- Increased human development in or near wildfire-prone areas (WUI)
- Fire History
- Counterproductive political and economic decisions about wildfire
- Climate change



FIRE ECOLOGY

Fire ecology is a scientific discipline concerned with natural processes involving fire in an ecosystem and the ecological effects, the interactions between fire and the abiotic and biotic components of an ecosystem, and the role as an ecosystem process. Many ecosystems, particularly prairie, savanna, chaparral and coniferous forests, have evolved with fire as an essential contributor to habitat vitality and renewal. Many plant species in fire-affected environments require fire to germinate, establish, or to reproduce.

A **FIRE REGIME** describes the characteristics of fire and how it interacts with a particular ecosystem. Its "severity" is a term that ecologists use to refer to the impact that a fire has on an ecosystem.

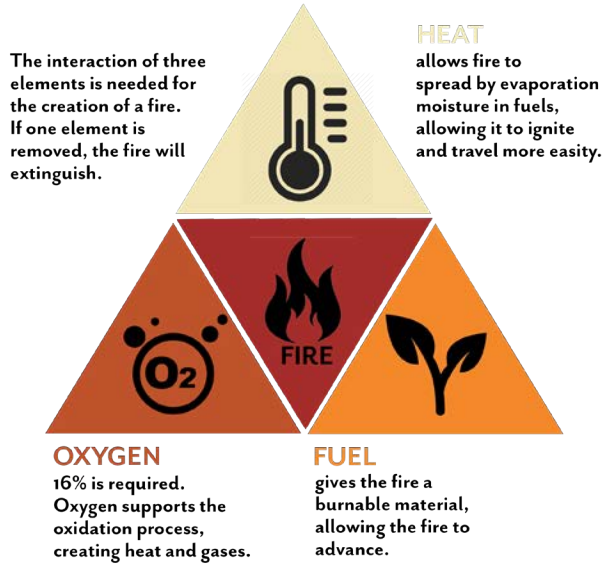


Wildfire regimes *are influenced by basic physical characteristics of topography, vegetation, and their ignition. In addition, humans alter the structure of vegetation, the type of vegetation, and how fires start.*

Topography, *especially steepness, influences how quickly a fire moves and how much energy is released by it. On steep slopes for example, fuels are preheated by the fire and burn more quickly with a larger energy release.*

Vegetation, *especially dense vegetation or plants with highly flammable resins, also foster fires that move quickly and have large energy releases. People alter this by removing plants, plantings, or by allowing plants to grow through fire suppression.*

Ignitions, *occur by lightning and people. Lightning is frequent at higher elevations in California, and caused many of the wildfires here. Lighting is uncommon at lower elevations, and Native Americans historically ignited more of the fires in this region. Today people cause the majority of lower elevation fires.*



IDAHO FIRE HISTORY

Early 1900s

Timber Owners Influence

Sawmill owners and loggers protected their livelihoods by suppressing all wildfire

1910

"Big Blowup"

Burned over 3,000,000 acres
Destroyed Wallace, Idaho

1911

Weeks Act

Promoted cooperation between federal and state protection agencies

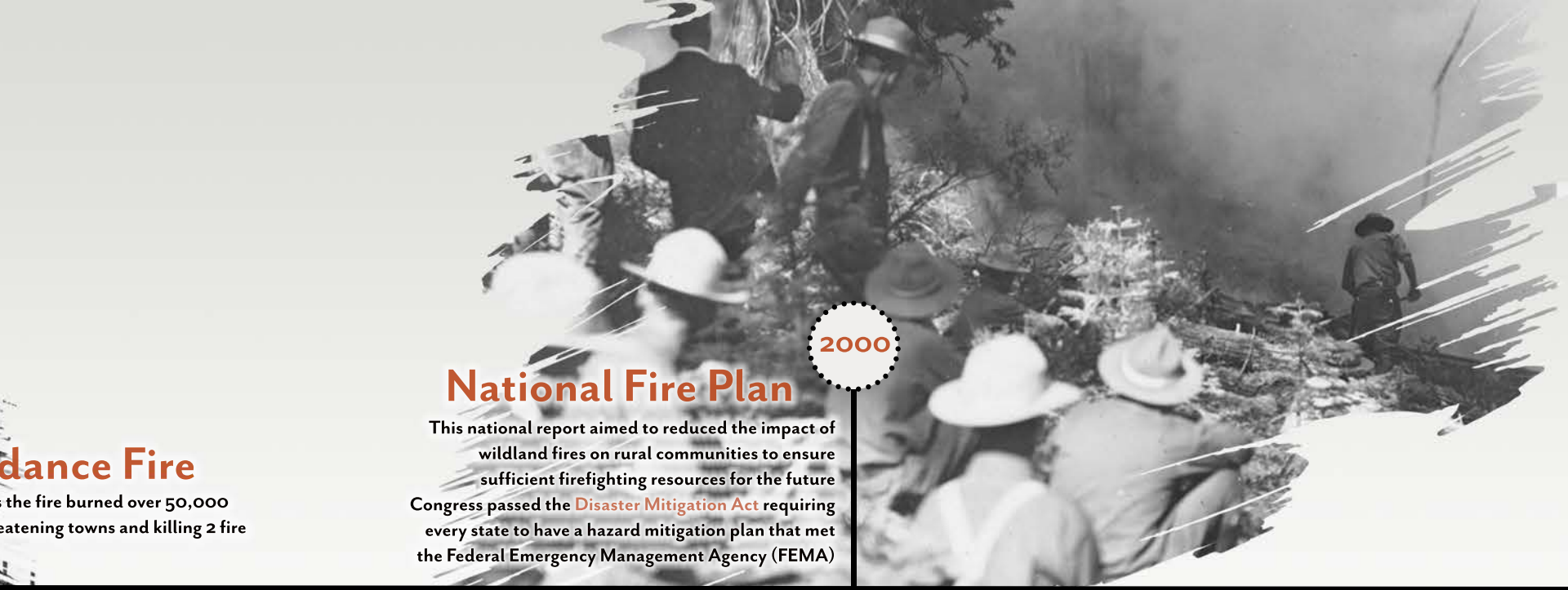
1925

Land owners were held responsible for providing efficient fire protection

1967

Sun

In 9 hours
acres, thre
fighters



dance Fire

s the fire burned over 50,000
eatening towns and killing 2 fire

2000

National Fire Plan

This national report aimed to reduced the impact of wildland fires on rural communities to ensure sufficient firefighting resources for the future Congress passed the Disaster Mitigation Act requiring every state to have a hazard mitigation plan that met the Federal Emergency Management Agency (FEMA)

1972

An increase in govenment assistance to emergency agencies
Upgraded fire equipment
Better firefighter training

1983

Cooperative Fire Agreement

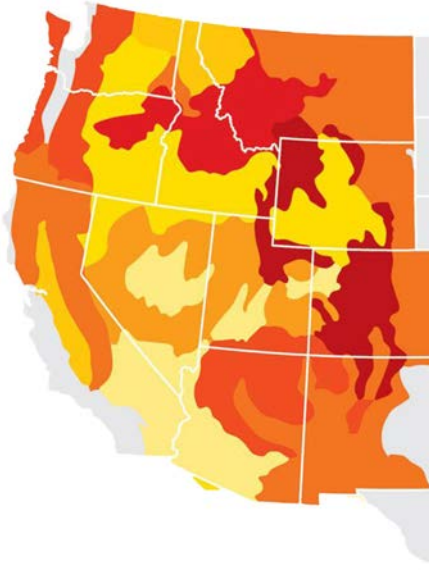
was modified to provide stability in protection funding between the government and state agencies

2015-2016

Ada County was threatened by numerous wildland fires causing the county to adapt GIS fire risk assessment and establish firewise programs

CHANGING CONDITIONS

Through common trends and historical data, researchers found the Rocky Mountain region has warmed more than other parts of the country since 1895. These rising temperatures have led to reduced spring snow pack, earlier snow melt, and preseason peak stream flow. With earlier snow melt and reduced spring snow cover, this has caused new water stresses and has led to a decline in forest vitality. Many researchers believe these changes in temperature and hydrology are outside the range of natural variability, which is largely driven by climate change. Their prediction showed that if we were to reduce future carbon emissions, the average temperature in the Rocky Mountains would rise 3 degrees Fahrenheit by the mid-century. If we did nothing to reduce carbon emissions the temperature would double in severity. With these predictions, there are series of effects that could cause changes to our forests.



Projected increase in annual burn area with an additional 1.8 degree rise in temperature

By mid-century, temperatures in the Western US are expected to increase even more (2.5 degrees - 6.5 degrees F) due to heat trapping emissions from human activity.

www.ucsusa.org/western wildfires

Climate change is fueling wildfires. Here's how.

Temperatures are rising

Average annual temperatures in the Western US have increased 1.9°F since 1970.

Snow melts sooner

Winter snowpack melts up to 4 weeks earlier than in prevous decades.

Fires are getting worse

Wildfires are larger and costlier than ever before, and their emissions are worsening global warming.

Forests are drier, longer

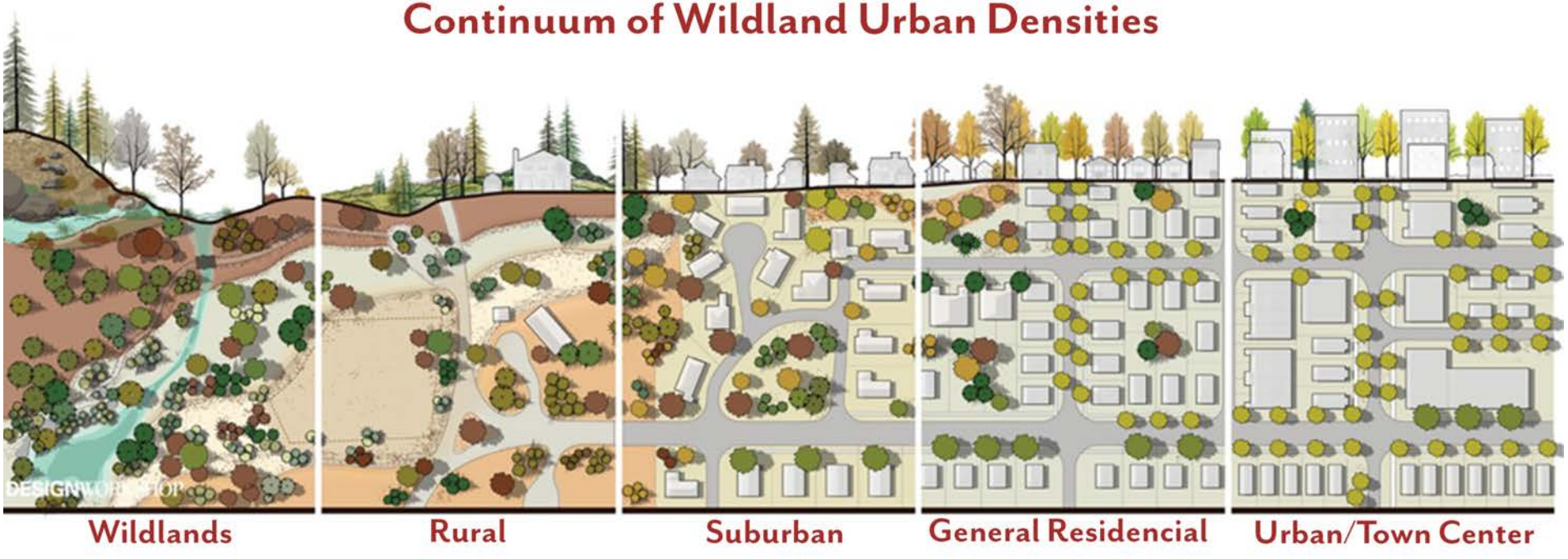
Ecosystems are primed for wildfires to ignite and spread.

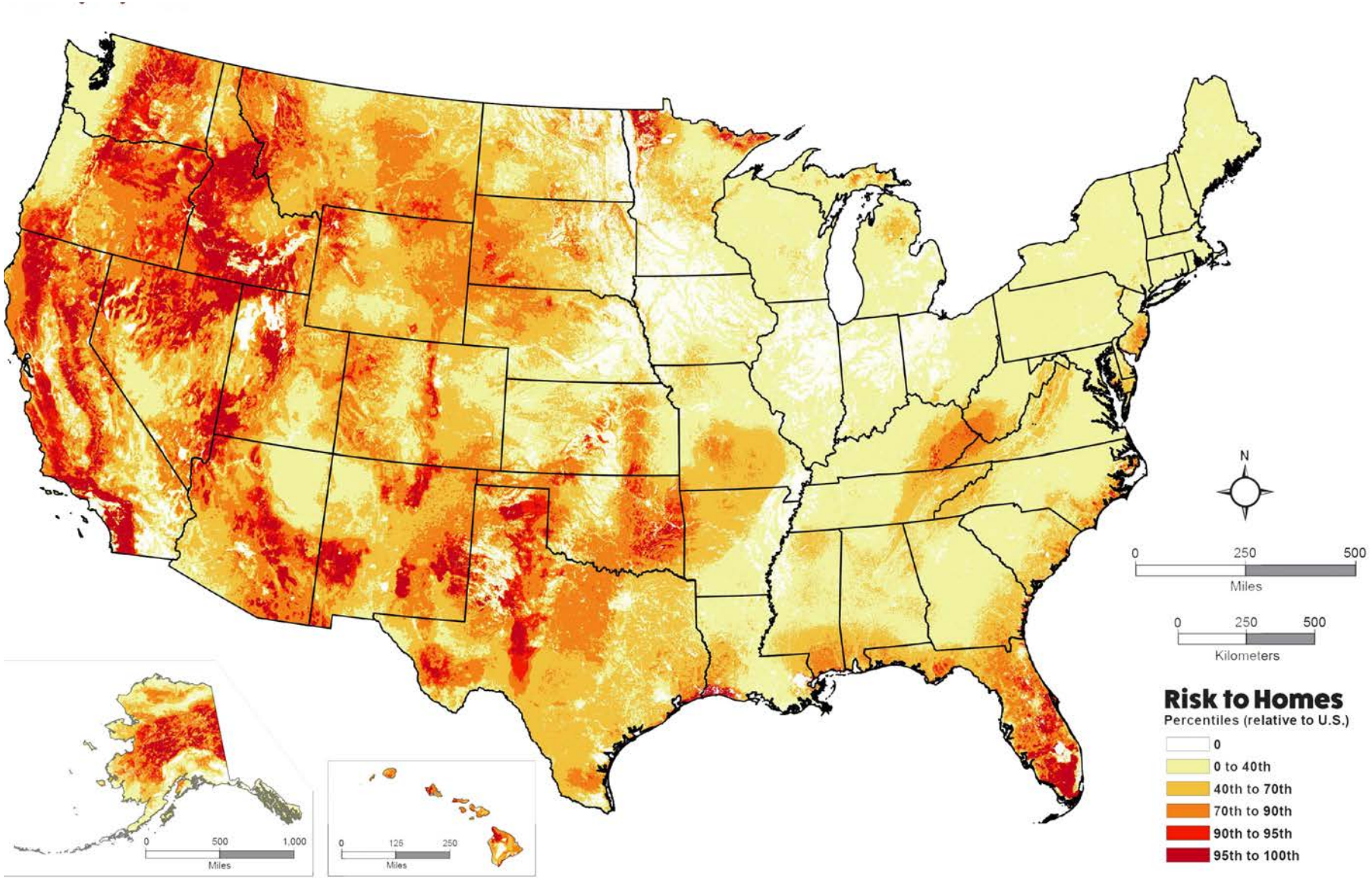
WILDLAND-URBAN INTERFACE EXPANSION

Compounding this issue suggests that more people are choosing to live in fire prone areas like the Wildland-Urban interface (WUI). As population increases and people desire easy access to recreation, panoramic scenery, and lower property costs, this causes people to gravitate into the outer fringes of urban areas (WUI). In the United States particularly, the WUI covers 9.9% of land area and contains 44.8 million housing units. From 1990 to 2010 the wildland urban interface expanded from 30.8 to 43.4 million homes, covering 581,000 to 770,000 km (33% growth), making it the fastest growing land use type in the conterminous US.

. This specific area (where houses intermix with undeveloped wildland vegetation) poses challenges for wildfire management with respect to public safety, financial responsibility and natural resource integrity. The WUI creates an environment in which fire can move readily from forest to grassland and into neighborhoods. With populations increasing and more people moving to the 'peri-urban fringe' the growing likelihood that wildfires will threaten structures and people has changed drastically.

Continuum of Wildland Urban Densities

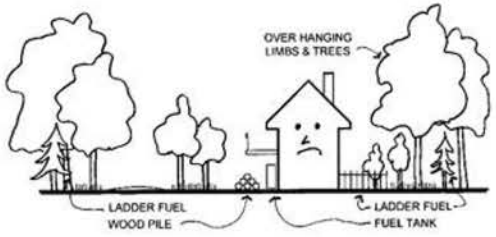



N
0 250 500
Miles
0 250 500
Kilometers
Risk to Homes
Percentiles (relative to U.S.)
0
0 to 40th
40th to 70th
70th to 90th
90th to 95th
95th to 100th
0 500 1,000
Miles
0 125 250
Miles

JUST THE RIGHT CONDITIONS

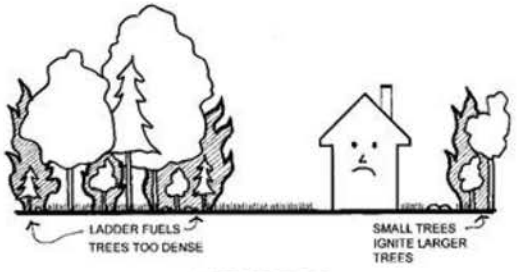
Conditions must be just right for wildfire to start and spread. Specifically, fuel, weather and topography work together to determine how quickly a wildfire travels and at what intensity.

Fuels: The two basic fuel types in the wildland/urban interface are vegetation and structures.



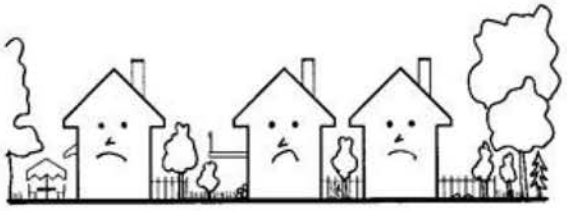
FUELS

Vegetation: Fuel in its natural form consists of living and dead trees, bushes, and grasses. Typically grasses burn more quickly and with less intensity than trees. Any branches or shrubs between 18 inches and 6 feet are considered ladder fuels. Ladder fuels help convert a ground fire to a crown fire (tree tops).



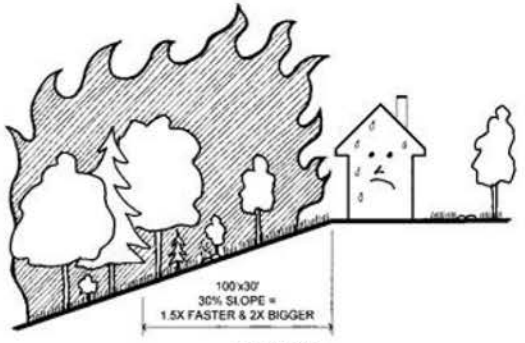
LADDER FUELS

Structural Density: The closer the homes are together, the easier it is for the flames to spread from one structure to another.



Weather: High temperature, low humidity, and swift winds increase the probability of ignitions and difficulty to control. Short and long term drought further exasperates the problem.

Slope: Hot gases rise in front of the fire along the slope face, pre-heating the up-slope vegetation, moving a grass fire up to four times faster with flames twice as long as a fire on level ground.



UP SLOPE

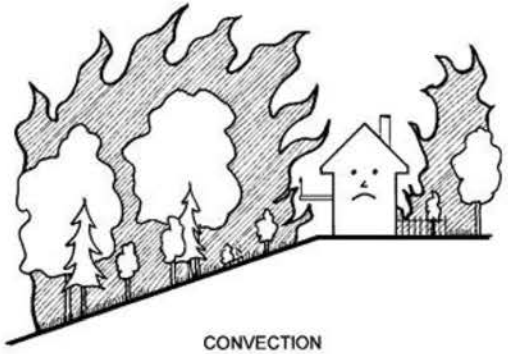
HOW HOMES CATCH ON FIRE

There are three ways that the wildfire can transfer itself from the natural vegetation or other burning homes to your home. Radiation, convection or firebrands can cause ignition.

Radiation: Wildfires can spread to your home by radiating heat in the same way a radiator heats your rooms in the wintertime. Radiated heat is capable of igniting combustable materials from distances of 100 feet.

RADIATION

Convection: Contact with the convection column (flames) may also cause the wildfire to ignite your house. Typically, the convective heat column rises vertically, within the smoke plume.



CONVECTION

Firebrands: Firebrands (embers) are burning materials that detach from a fire furing strong convection drafts in the burning zone. Firebrands can be carried long distances - more than a mile - by winds associated with the wildfire.

FIREBRANDS

QUESTION:

How can landscape design demonstrate proper risk mitigation and increase public awareness of wildfire risk through landscape design?

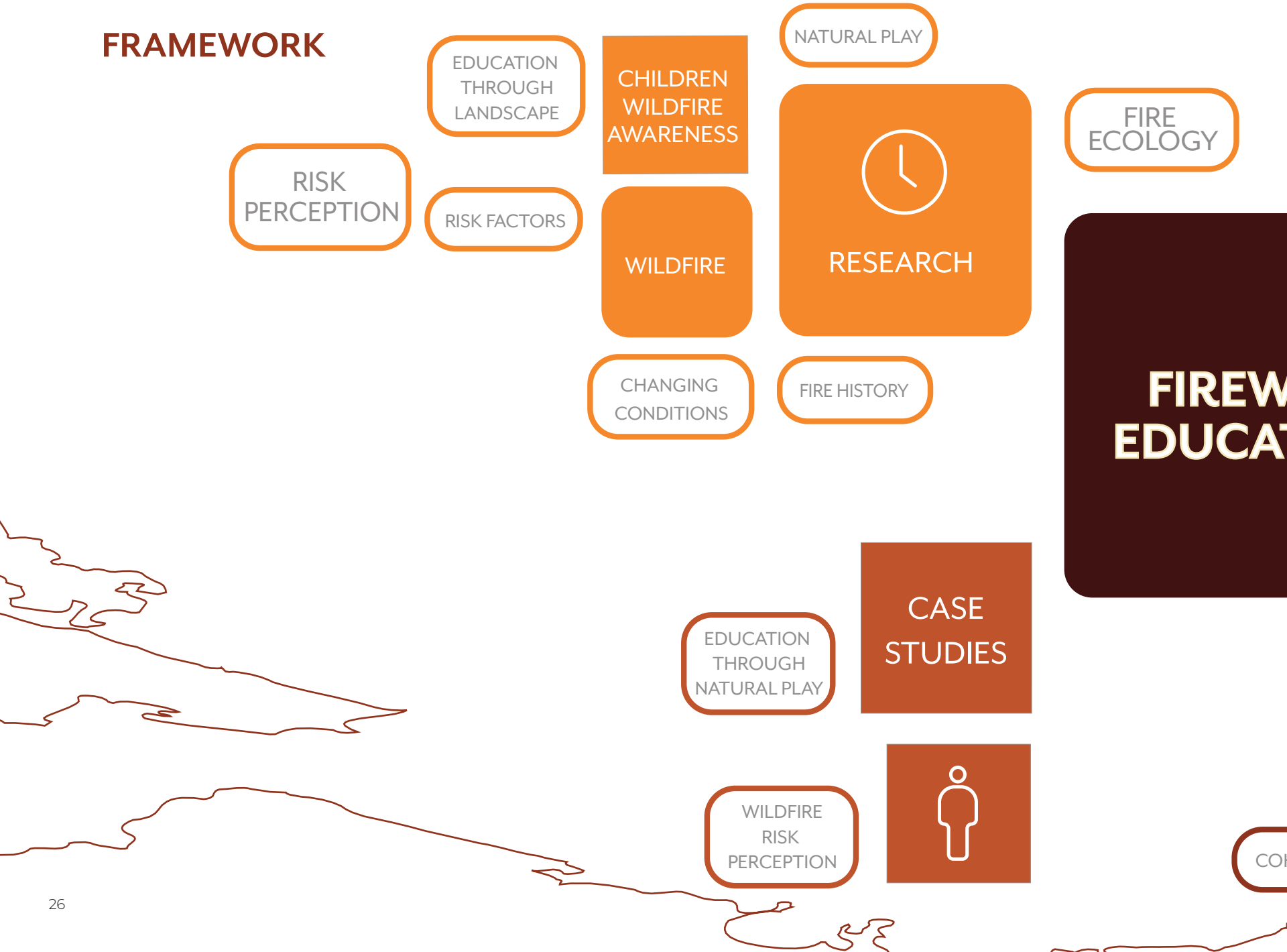
Framework

Interviews

Case Studies

ADDITIONAL RESEARCH METHODS 2

FRAMEWORK


EDUCATION THROUGH LANDSCAPE
CHILDREN WILDFIRE AWARENESS
NATURAL PLAY
FIRE ECOLOGY
RISK PERCEPTION
RISK FACTORS
WILDFIRE
RESEARCH
CHANGING CONDITIONS
FIRE HISTORY
FIREW
EDUCA
EDUCATION THROUGH NATURAL PLAY
CASE STUDIES
WILDFIRE RISK PERCEPTION
COI

NEIGHBOURHOOD REPRESENTATIVE

FIRE ECOLOGIST

INTERVIEWS

EMERGENCY RESPONDERS

FIREWISE EXPERTS

POLICY MAKERS

VISE
TION

DEFENSIBLE

$
BUDGET

NATURAL

DESIGN

INTERPRETIVE

INTERACTIVE

ANALYSIS

USERS

CIRCULATION

LOCATION

HESIVE

CASE STUDY 1: FIRE RISK PERCEPTION

Most of these wildfire education programs around the United States are designed to inform WUI residence of the risk associated with their location of living. They help provide information on mitigation options and encourage them to act in disaster management. Unfortunately, recent case studies of wildland-urban communities suggest that these national, state, and local education programs are only somewhat successful. Property owners are already aware of wildfire risk, yet majority of the population continues to ignore the need for preventative action. There seems to be a disconnect between the knowledge and education about reducing the impacts of wildfire and engaging homeowners in property management. This poses a significant challenge because risk prevention requires the willingness for landowners to accept a high degree of responsibility and preventative action.

It is important to understand there are several factors that play into individuals' perception on mitigating their own risk. Understanding these factors that affect community actions is crucial for the success of mitigation and risk reduction programs.

"PROPERTY OWNERS ARE ALREADY AWARE OF WILDFIRE RISK, YET MAJORITY OF THE POPULATION CONTINUES TO IGNORE THE NEED FOR PREVENTATIVE ACTION."

Factors Associated with Risk Mitigation Perception and Behavior:

Demographics: such as age, sex, and income have related to risk behavioral actions. Characteristics like retirement status, length of residence, and livelihood dependence have been found significant in wildfire prevention efforts (11).

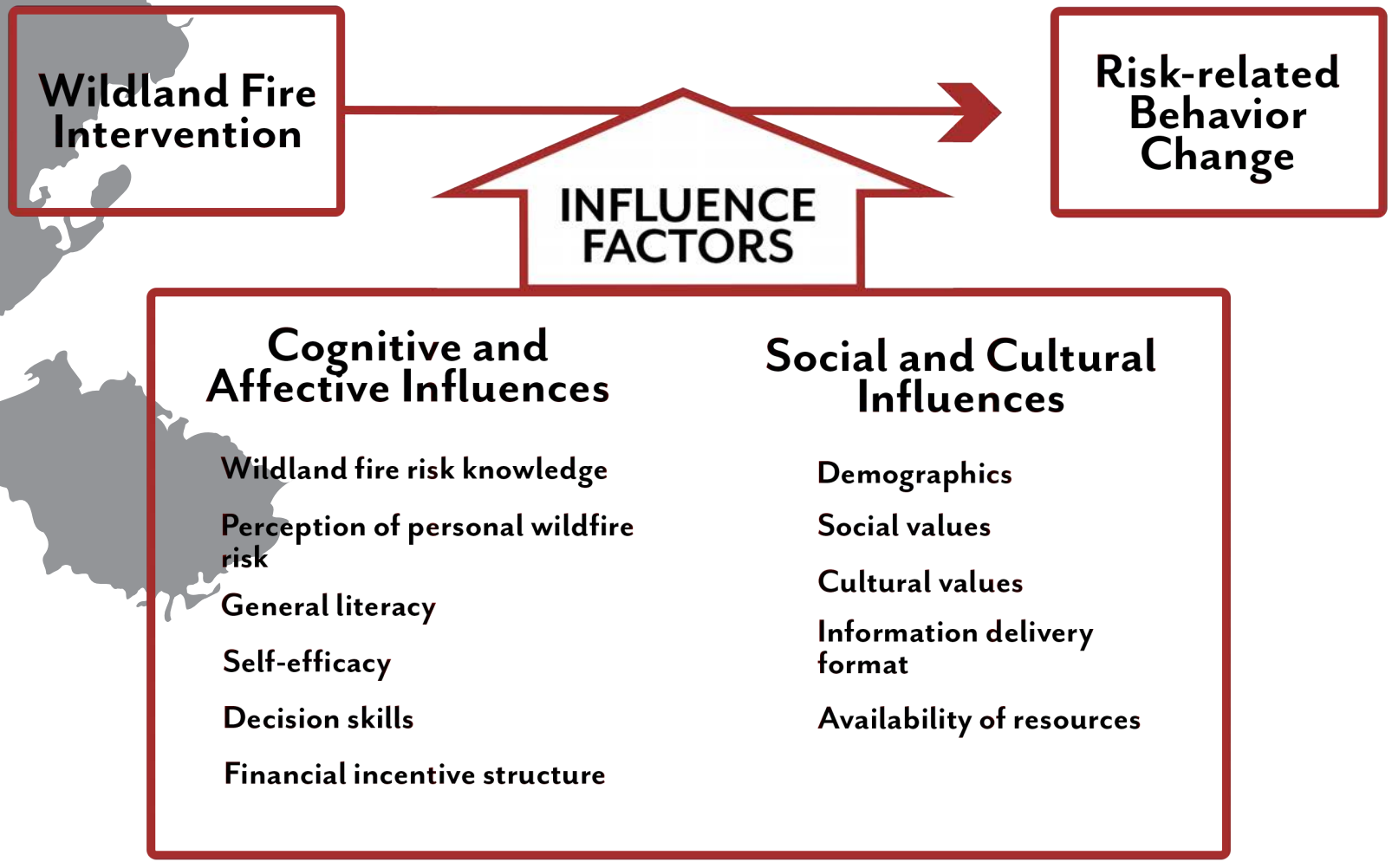
Hazard Experience: Most individuals who have experienced a natural disaster are more aware of the need for risk management. Going through a traumatic event such as a home being burnt down can cause action.

Self-efficacy: Homeowners motivated by perceived risk severity and response. It reflects the confidence in the ability to exert control over one's own motivation, behavior, and social environment. Some characteristics like the aspect of fire and homeowner's perspective of fire being uncontrollable and random factor into risk reduction efforts. While others have an optimistic view of wildfire and believe these disasters will never affect them.

Perception of the Environment: Concerns regarding the landscape and ecosystem of the area play an important role in risk perception and behavior. If a homeowner feels strongly about protecting the nearby ecosystem this can cause an increase in individual fire preparedness. In contrast, if a homeowner is in favor of the vegetation surrounding the home, they may not act in clearing the necessary trees or bushes on their property.

The importance of **social interactions** in mitigation perception is demonstrated on three levels: community expectations, informal social interactions, and communication within the individual's household. Successful neighborhoods describe wildfire risk as something that is a need. They focus primarily on prevention or mitigation rather than defensive action from emergency responders (12).

The **individual's capacity** to implement actions is a huge factor in mitigating their own risk. To create an entirely defensible space, there is a lot of maintenance and structural changes involved. Furthermore, taking action to decrease risk is contingent on the belief that their action will be effective and worthwhile. The homeowner wants to believe their time and the cost requirement is worth the risk prevention in the long run.


Wildland Fire Intervention
INFLUENCE FACTORS
Risk-related Behavior Change
Cognitive and Affective Influences
Wildland fire risk knowledge
Perception of personal wildfire risk
General literacy
Self-efficacy
Decision skills
Financial incentive structure
Social and Cultural Influences
Demographics
Social values
Cultural values
Information delivery format
Availability of resources

WHY IS THIS IMPORTANT?

It is important to understand the range of factors associated with risk perception to help agencies or individuals who want to make a difference in fire preparedness. By looking at the factors I was then able to generate the best possible solutions to influence the publics perception.

INTERVIEWS

The interview process was an essential part of my research as it provided information that was unavailable in written sources. I obtained specific stakeholder information from people who are experts on the topic. These interviewees were chosen based on their vast knowledge and experience. Whether it was a neighborhood president, firewise expert, regional planner, senior firefighter, GIS analyst, or public affairs specialist, each presented a unique view on wildfire awareness. It was important to incorporate a wide range of stakeholder backgrounds as each presented a different understanding on the topic. These interviews presented opportunity for the various individuals to voice their concerns about the project and helped fill in gabs of information that were important moving forward with the design work.

"Good stakeholder interviews are an essential element in user research. They help identify the problems that needs to be solved, illuminate priorities, expose aspirations, objections and visions of success."

Cottrell, E., Whitlock, E., Kato, E., Uhl, S., Belinson, S., Chang, C., Humans, T., Meltzer, D., Noorani, H., Robinson, K., Schoelles, K., Motu'apuaka, M., Anderson, J., Paynter, R., & Guise, J.-M. (2014). Defining the Benefits of Stakeholder Engagement in Systematic Reviews. In Defining the Benefits of Stakeholder Engagement in Systematic Reviews. Agency for Healthcare Research and Quality. http://www.ncbi.nlm.nih.gov/pubmed/24783309%5Cnwww.effectivehealthcare.ahrq.gov/reports/final.cfm

Questions Asked:

1. What is you roll?
2. How did you acquire that role? What sparked interest in the topic?
3. Do you think fire risk is increasing in the treasure valley?
4. Do you think we are taking the necessary precautions as a community in preventing a large devastating fire like Oregon and California are experiencing?
5. I noticed there are fire safety codes in place for residence in the WUI for new homeowners about to build. Did you know about these codes? Are they followed?
6. Are these codes the only policies that exist to mitigate risk?
7. Do you think there is a disconnect between wildfire mitigation information/education and public awareness?
8. Do you think there is a disconnect between city planning/development and wildfire risk?
9. Are there any local/government incentives for being firewise?
10. Do you have any ideas on new policies that could/ should be implemented for homeowners to mitigate risk? Government incentives?
11. Do you have suggestions for my project on how to inform policy and generate awareness within our community on wildfire preparedness?
12. Do you have any suggestions for future research?

The first thing fire fighters assess when approaching a neighborhood at risk of wildfire is **how defensible is the space**. We flag homes (if we have time) that need most work in terms of vegetation clearing, tree cutting, etc. Depending on how defensible the houses are determines the amount of work needed to prepare for the approaching fire. The less work we have to put into clearing the vegetation the better.

Casey Steenhoven
Firefighter, BLM Outdoor Recreation Planner

When planning and a project is proposed in the WUI, the area is flagged. Certain building codes are already in place and as the area is being developed it has to follow the building codes.

The government is not going to solve the fire risk problem. Especially in Idaho.

Andrea Tuning
City of Boise Urban and Regional Planner

There is a **disconnect between education and action**.
It would be helpful to have more incentives.

There is a lot of **value in community collaboration** and people need to realize their decisions and actions impact their neighbors.

Terri Muse
Boise Heights Neighborhood Association President
Recognized as a firewise community

There is **no need for fire mitigation efforts as everything we build within the road is non-combustible.**
Maintenance and funding is a huge factor in landscaping roadsides. ICHD does not have any thought to roadside landscape besides erosion control. **What can we get to grow as quick as possible** to stabilizes the ground... usually grasses.

Zach Piepmeyer
Transportation Planner - ICHD

Fire education and awareness is the first step in building a fire adapted community.

86% of fires are human caused.

Boise continues to expand into the WUI and unfortunately it takes a catastrophe, like the Oregon Trail Fire, to generate awareness among homeowners.

It's hard to be a government employee and impose change on homeowners. Homeowners need to take the initiative themselves.

"IT'S REALLY HARD TO CHANGE PEOPLE'S VALUES AND THE WAY THEY DO THINGS, THE FOCUS NEEDS TO BE ON EDUCATING THE YOUNGER GENERATION ON WILDFIRE AWARENESS AND DEFENSIBLE SPACE."

Incentives are huge. People respond better to community driven fire mitigation efforts like chipper clean up days.

-Carrie Bilbao

Public Affairs Specialist at National Inter-agency Fire (NIF)

It's hard to be a government employee and impose change on homeowners.

Homeowners need to take the initiative themselves.

I find the **'healthy ecosystems' topic is one that people value** and will buy into more often than just providing community protection.

"WHAT IS MISSING IS THE APPLICATION, THE POLICY AND THE PARTNERSHIPS."

If the landscape designers new in advance how to be firewise then that would be helpful!
Landscape is critical to mitigate fire risk.

10% homes are burned from large flames... **90% of the homes burned down are from embers** or small flames after the fire has actually been considered out for days.

California has created **incentives in communities** were homeowners would used their property as a demonstration defensible space and the landscape installation would cost half or be free of charge.
People need to visualize what firewise gardens look like.

Pat Durland

Wildland Fire Mitigation, Planning and Training Consultant

We created an updated fire risk map because, we wanted a better understanding of where our WUI was based on fuel type and density, topography, building stock (how old the homes are), and critical watersheds.

Idaho Smart growth is a great example of a **community up approach.** I like to see the community involved and making changes.

In fire mitigation the **homeowners are the first lines of defense**. What they do matters greatly.

"I WANT TO SEE THE COMMUNITY INVESTED AND INTERESTED IN DOING SOME WORK THEMSELVES INSTEAD OF THE CITY DOING THE WORK FOR THEM."

There should be wildfire mitigation components to every landscape architecture, civil engineering and horticulture program in the country. It should be incorporated into the curriculum for universities across the board. You need to learn from the beginning that wildfire is serious and if you are a landscape architect in a wildfire prone area you should know to plant firewise and avoid building something that is hazardous.

Jerry McAdams

Certified Wildfire Mitigation Specialists (CWMS)

“IT’S REALLY HARD TO CHANGE PEOPLE’S VALUES AND THE WAY THEY DO THINGS, THE FOCUS NEEDS TO BE ON EDUCATING THE YOUNGER GENERATION ON WILDFIRE AWARENESS AND DEFENSIBLE SPACE.”

-Carrie Bilbao

Combining the case study on risk perception and the information from the interviews, it became apparent that education is one of the most effective approaches in convincing the public the value of protecting their properties using firewise landscape principles. Not only is education important but targeting the future generation will cause a shift in the public's perception. Concluding, the **best solution to increasing public awareness on wildfire risk and demonstrate proper mitigation efforts is by designing a children's firewise demonstration garden.** By targeting a younger age group, this will build a firm foundation on wildfire risk mitigation decisions, as well as generate talk within the families and general population.

Designing a children's firewise demonstration garden posed various constraints as it was necessary to create a space that was educational, fun and kept the child engaged. This type of learning is know as a passive education approach and derives from the fundamentals of basic play.

CASE STUDY 2: EDUCATION THROUGH NATURAL PLAY

Many researchers have discovered the need to reintroduce play back into children's environments. Planners and designers are aiming to bring kids back to nature by incorporating holistic play through engagement of the hands and mind. They are attempting to develop the whole learner, cognitively, socially, and physically. The need for more sensory oriented, stimulating, and intriguing playgrounds is growing in our society as many are understanding the disconnect is detrimental between people and nature. As a result, the attempt to create 'nature play' is a new design many individuals are implementing.

Sacha Coles, a landscape architect, and the director of ASPECT Studios in Sydney Australia recognized the importance of unstructured natural play. She explains how we are at risk of forsaking the lessons, perspectives, and joys that connecting with the natural world brings. She had recently completed a project called the "Ian Potter Children's Wild Play Garden" in Sydney's Centennial Park. This garden aims to encourage children to connect with nature and through this, their inner wildness.

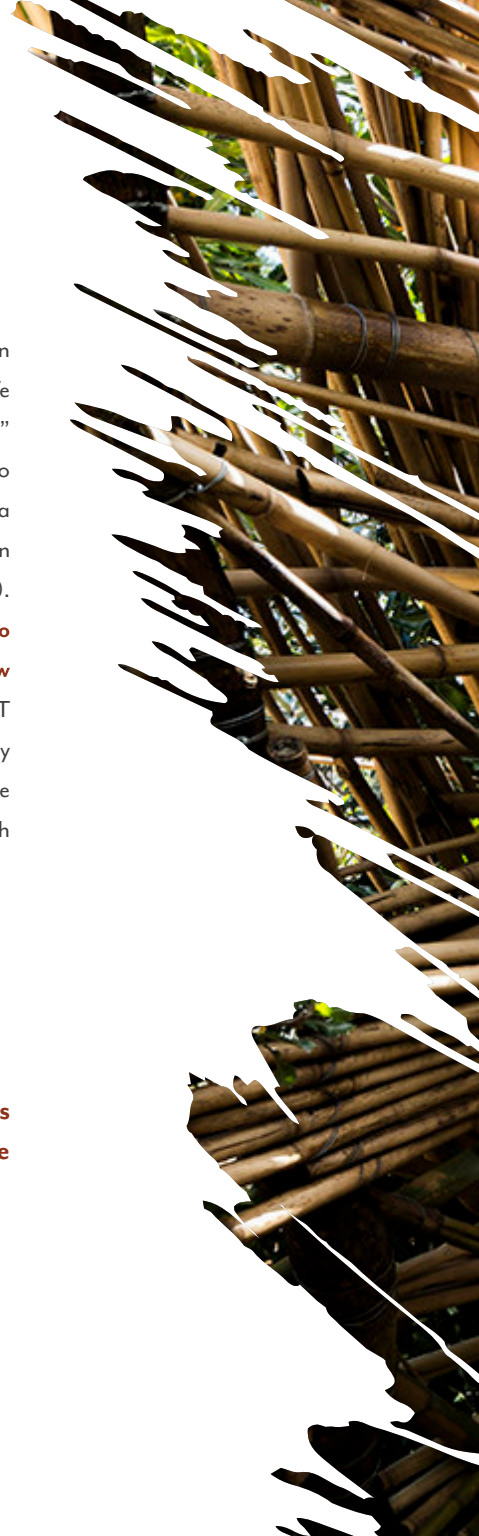
"It's really hard to change people's values and the way they do things, the focus needs to be on educating the younger generation on wildfire awareness and defensible space."

-Carrie Bilboa Public Affairs Specialist

Photos (Ian Potter Children's Wild Play Garden - Info - Sydney - Busy City Kids, 2018)

"AS A DESIGNER IT IS IMPORTANT TO UNDERSTAND THE TARGET AUDIENCE AND TRULY THINK ABOUT HOW THE INDIVIDUALS WOULD INTERACT IN THE SPACE"

One of the most important parts about the teams design process was having to **reconnect with their inner child**. "We don't need a license to be playful and childish in our office," Sacha the head principle explains. "It is good, though, to have an official reason as to why I'm imagining myself as a wild boar, tunneling through the forest" (Wild Play Garden opens in Centennial Park lands – Green Magzine, N.d). As a designer and landscape architect, **it Is important to understand the target audience and truly think about how those individuals would interact with the space**. ASPECT Studios had to think like an 8-year-old. How would the play in the park? How would they interact with the pieces? Where would their imagination take them? They had to see through the eyes of a child.



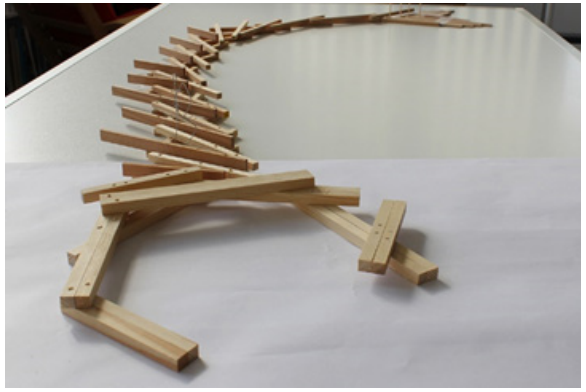
According to the WILD PLAY Garden website, the garden is not a merely a "playground" but is about "nature play" that is "intrinsically motivated, child-centered and comes from the innate desire in children to engage with their immediate environment on their own terms"

(All About The Ian Potter Wild Play Garden Centennial Park, n.d).

Photo: (Ian Potter Children's WILD PLAY by ASPECT Studios - Landezine, N.d)

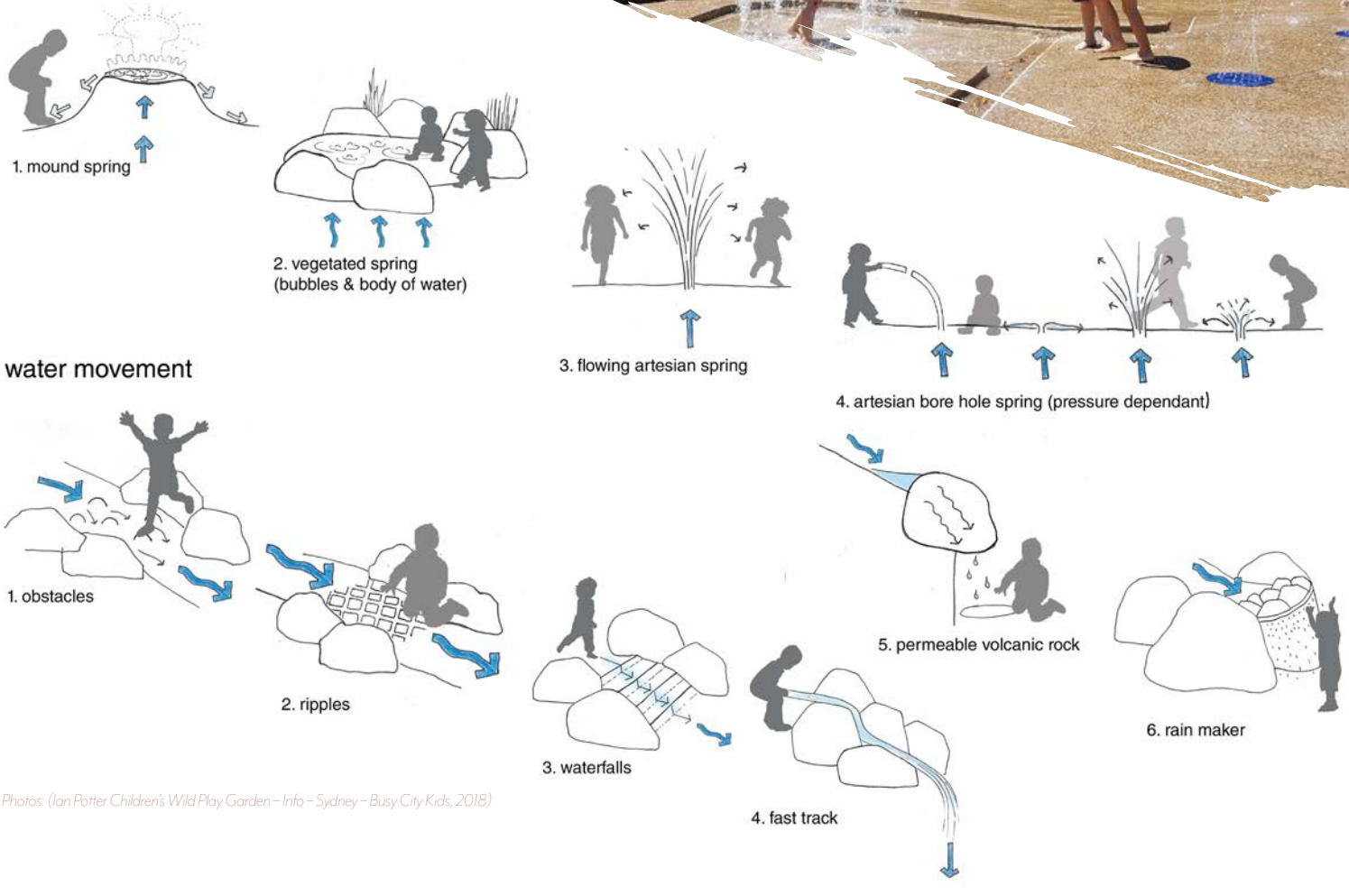
Most of the lessons provided by the garden are not offered in the classroom but generate another sense of creative and social development. **"When things are not considered structured, they don't automatically tell you how to use them. You have to use creativity, intuition, and all your skills to determine how to best use it."** Sacha explained. That is what it means to be slightly wild and that is what natural play is all about.

This case study gave direction for the children's firewise garden design as it showcased a park that is natural, unstructured, and educational. It created an environment that was both fun for children and adults as it focused on sensory experience and aesthetic quality. Taking the general concepts of this case study, it was **necessary to design a demonstration garden that combines principles of wildfire risk and firewise through attractive landscape features that incorporate natural play and aesthetic beauty.**



Photos: (Ian Potter Children's WILD PLAY by ASPECT Studios – Landezine, N.d)

Educating through Play: Water movement park



Photos: (Ian Potter Children's Wild Play Garden – Info – Sydney – Busy City Kids, 2018)

Site Location

Demographics

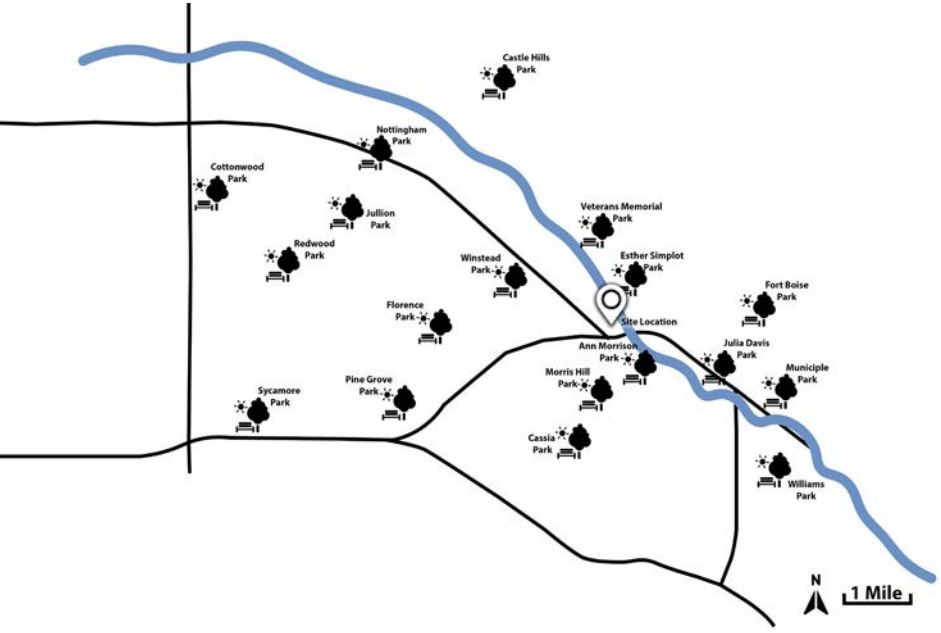
Site Accessibility

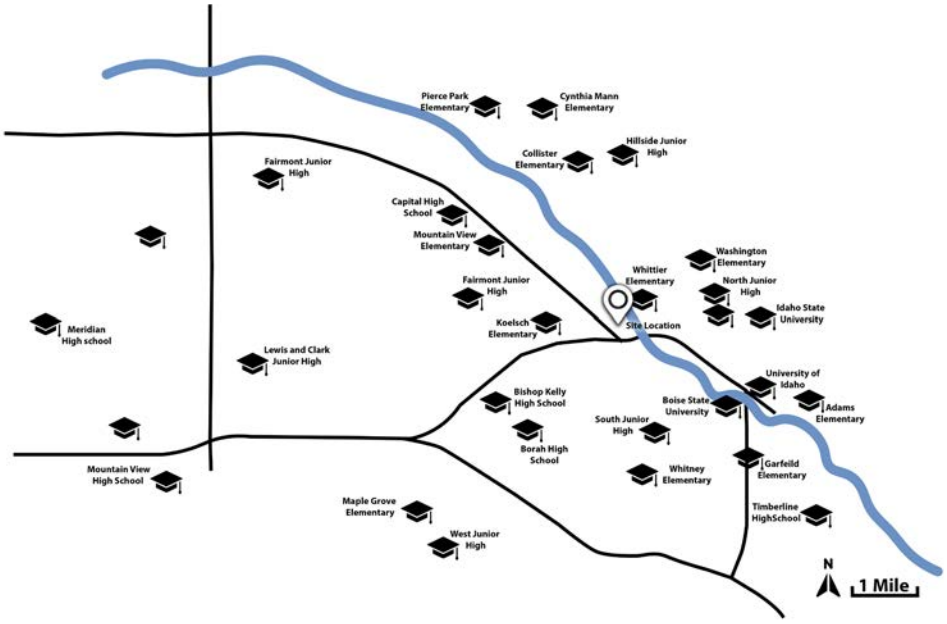
Existing Conditions

Circulation and Climate

PROJECT ANALYSIS 3

SITE LOCATION





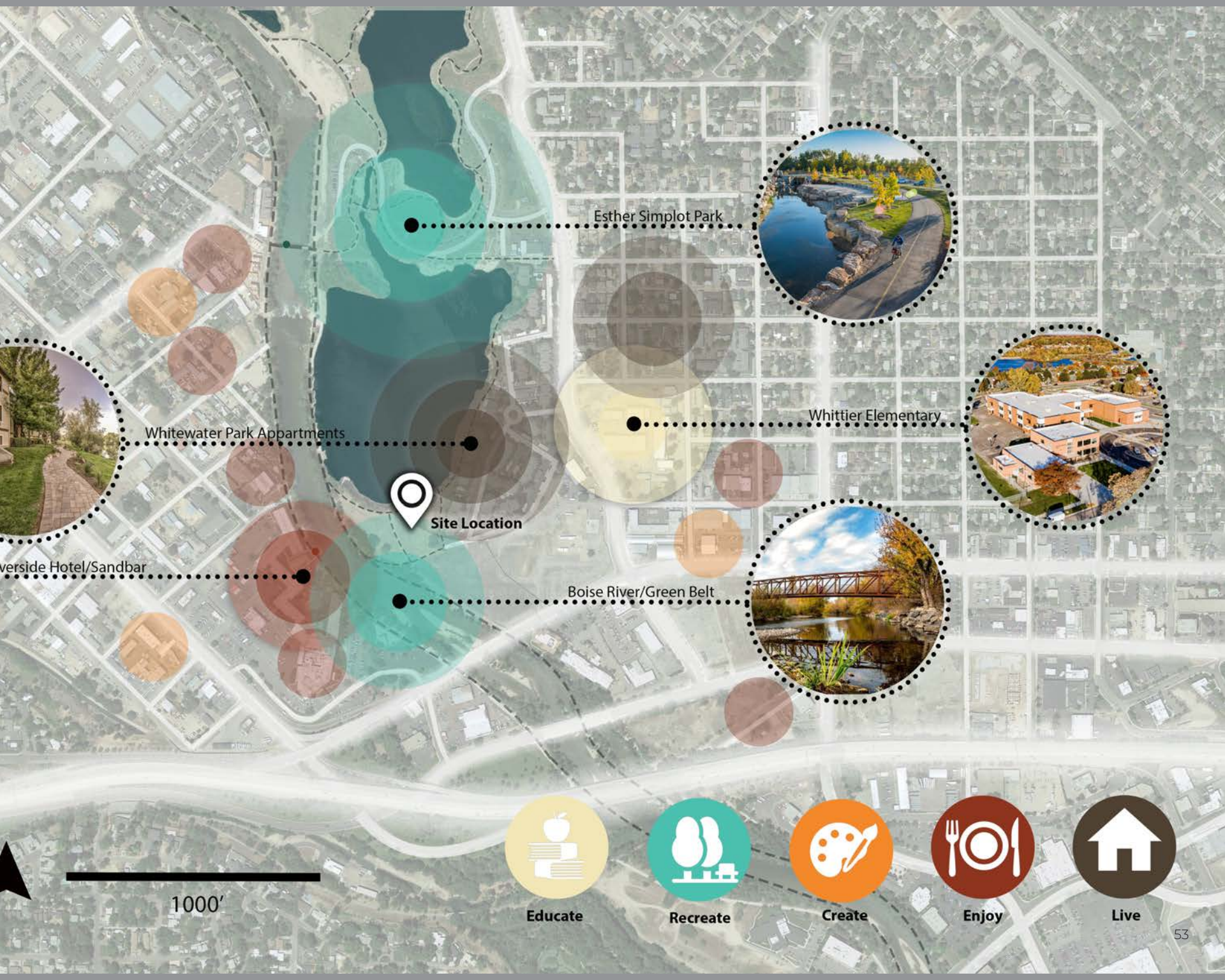
Boise Parks

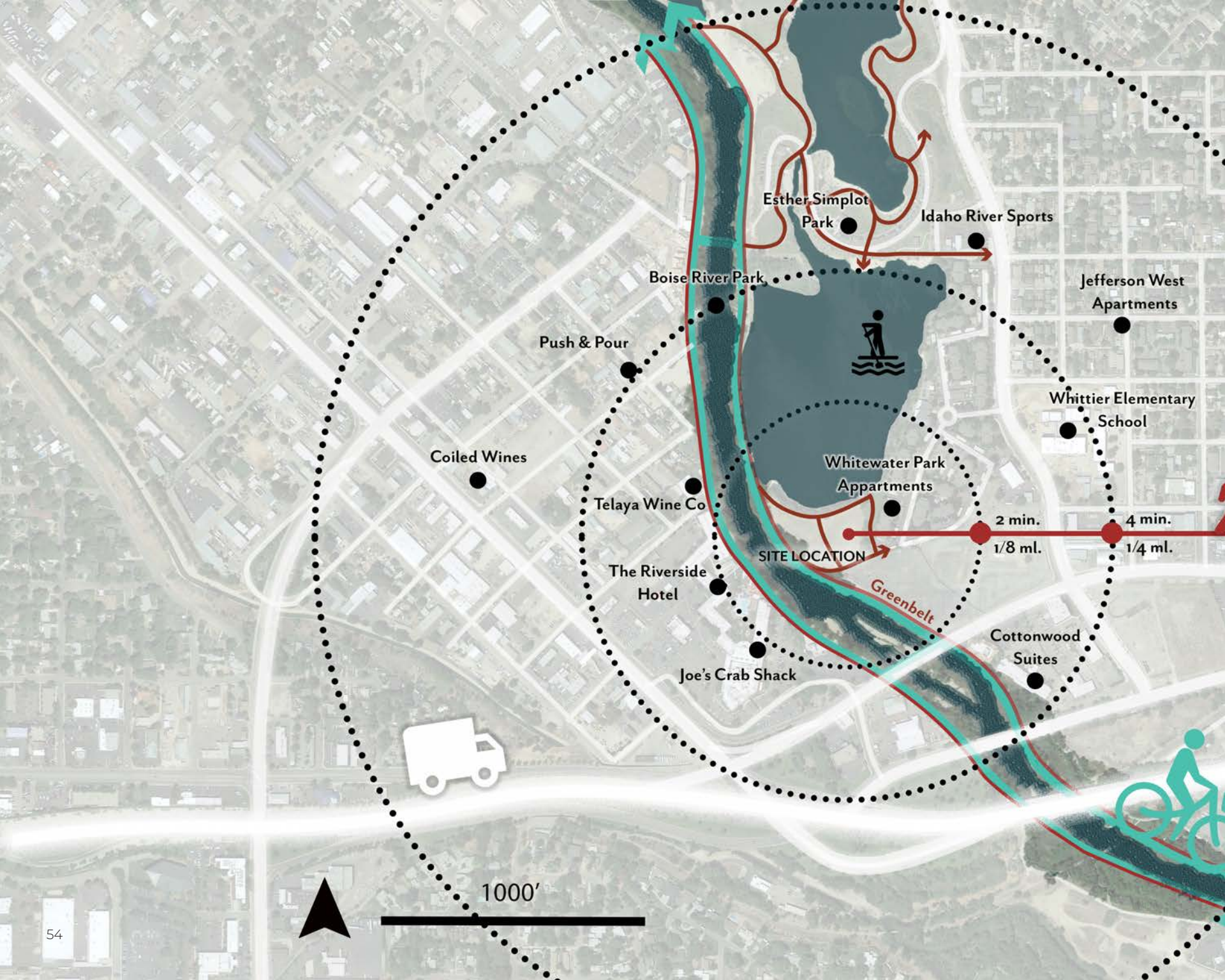
The location is also within a mile of Boise's most visited parks like Ann Morrison and Esther Simplot. The Boise green belt connects many of these parks together allowing for many commuters to have access to the site.

Boise Schools

The site is surrounded by a variety of different schools including Whittier Elementary which is within a quarter mile walking distance. This location will hopefully encourages teachers to utilize the site for local field trips or educational purposes.

DEMOGRAPHICS


Esther Simplot Park
Whitewater Park Appartments
Site Location
Whittier Elementary
verside Hotel/Sandbar
Boise River/Green Belt
1000'
Educate
Recreate
Create
Enjoy
Live


Esther Simplot Park
Idaho River Sports
Boise River Park
Jefferson West Apartments
Push & Pour
Whittier Elementary School
Coiled Wines
Whitewater Park Appartments
Telaya Wine Co
2 min.
1/8 ml.
4 min.
1/4 ml.
SITE LOCATION
The Riverside Hotel
Greenbelt
Cottonwood Suites
Joe's Crab Shack
1000'

SITE ACCESSIBILITY

EXISTING CONDITIONS

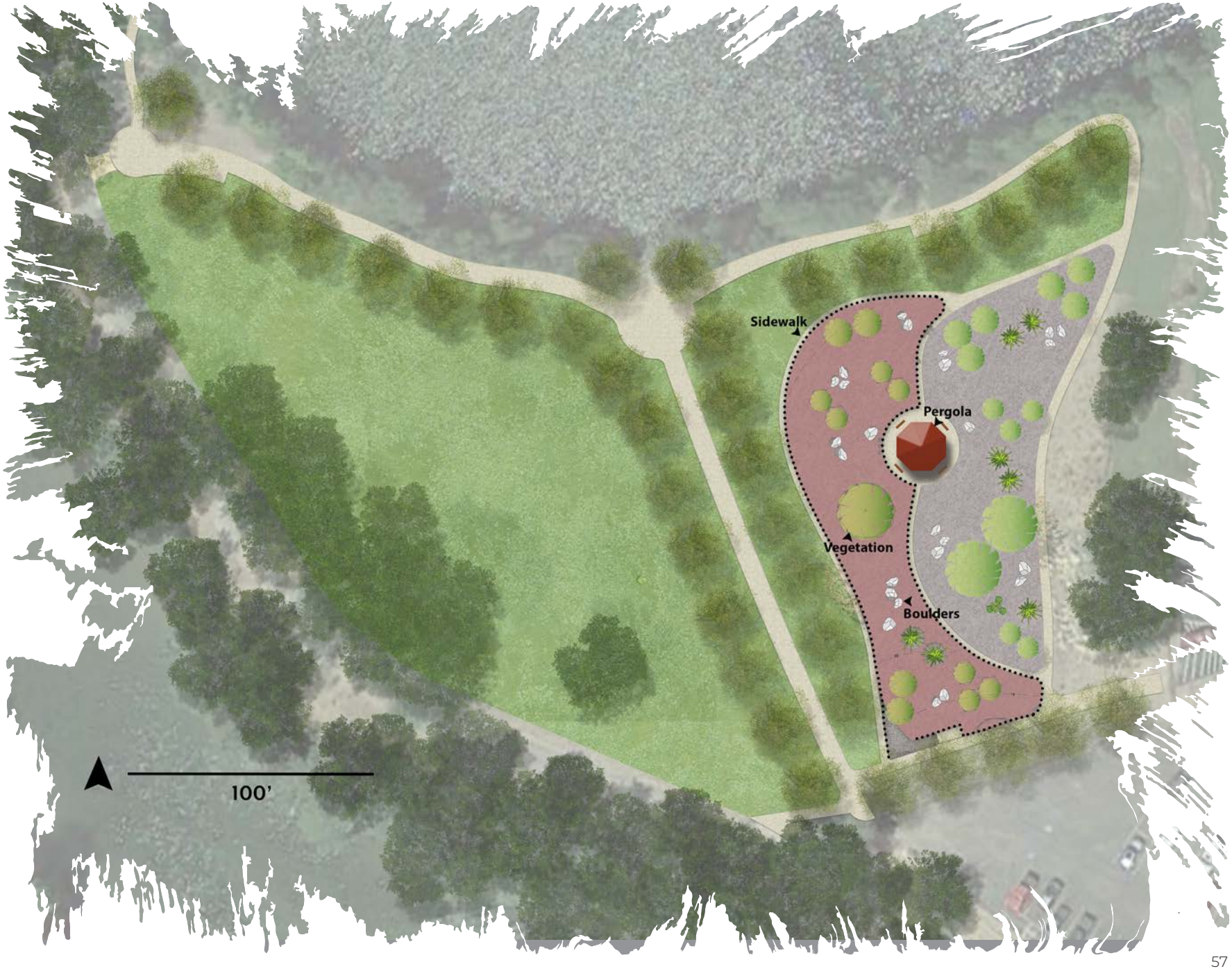
-Large 3-5 ft. boulders

-Pergola with seating

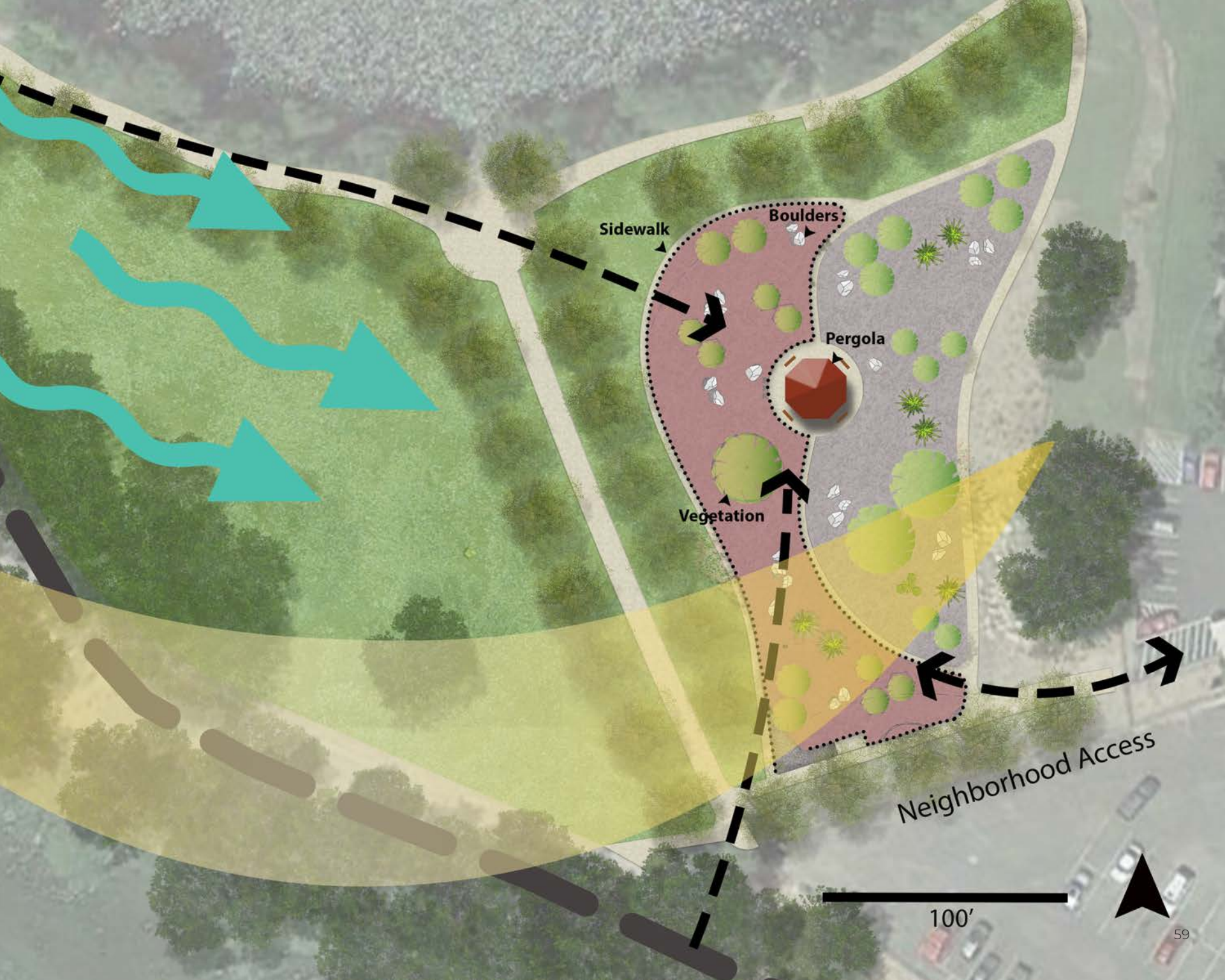
-Sidewalk around the perimeter of the site

-14 Plants/Trees

-Gravel


Sidewalk
Pergola
Vegetation
Boulders
100'

SITE CIRCULATION AND CLIMATE


Sidewalk
Boulders
Pergola
Vegetation
Neighborhood Access
100’

Design Concept 1: Defensible Space

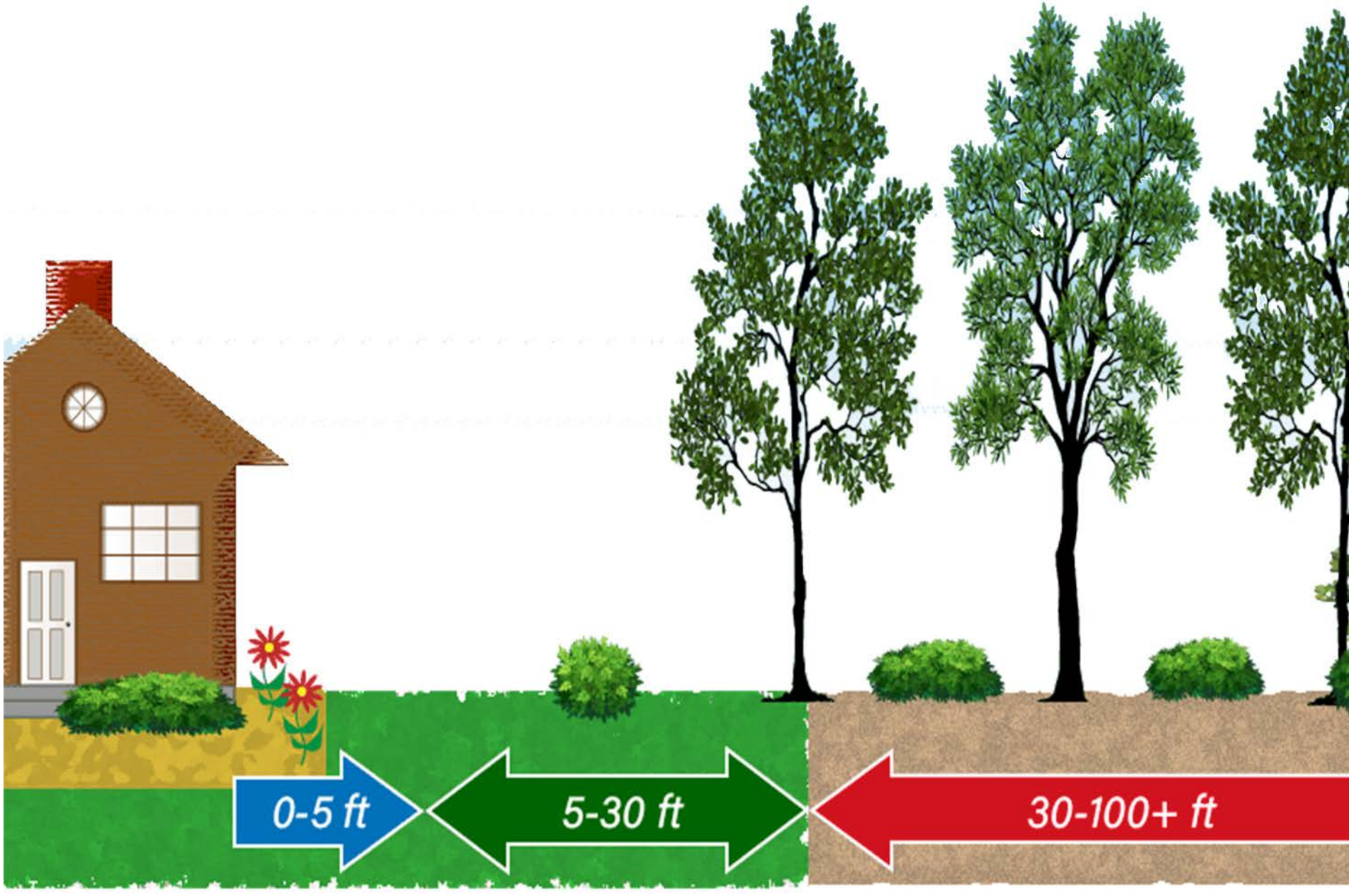
Design Concept 2: Beautiful Plant Palette

Design Concept 3: Fun, Natural and Educational

Master Plan

Perspectives

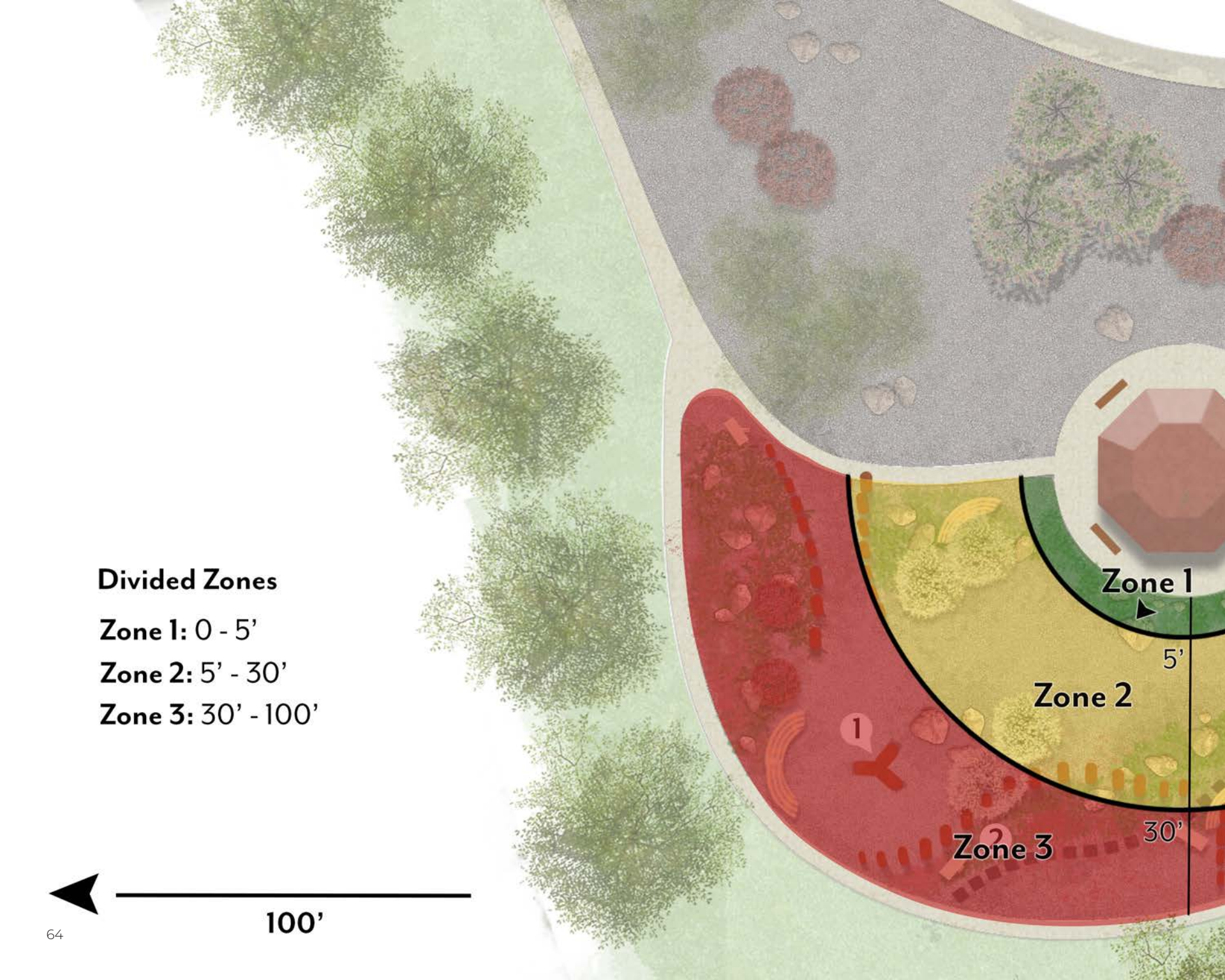
DESIGN 4


0-5 ft
5-30 ft
30-100+ ft

DESIGN CONCEPT 1: DEFENSIBLE SPACE

One of the most important concepts highlighted in the design is the incorporation of **defensible space**. The key to protecting a home and property from fire in the wildland-urban interface (WUI) starts at the home itself. As mentioned in the literature review, up to 60% of ignitions from wildfires are caused by embers. Fortifying or retrofitting a home can be the best defense against ember intrusion.

To create defensible space the homeowner must establish a series of zones. Zone 1 is located within 5 feet from the home. This area needs to be clear of any combustible material and trees. Only low growing and low flammability plants should be located here. Zone 2 is within 30 feet from the home. This area requires properly spaced trees and low growing plants and shrubs. Beyond the 30 feet is zone 3. This zone should be maintained as well, but more vegetation could be planted here.

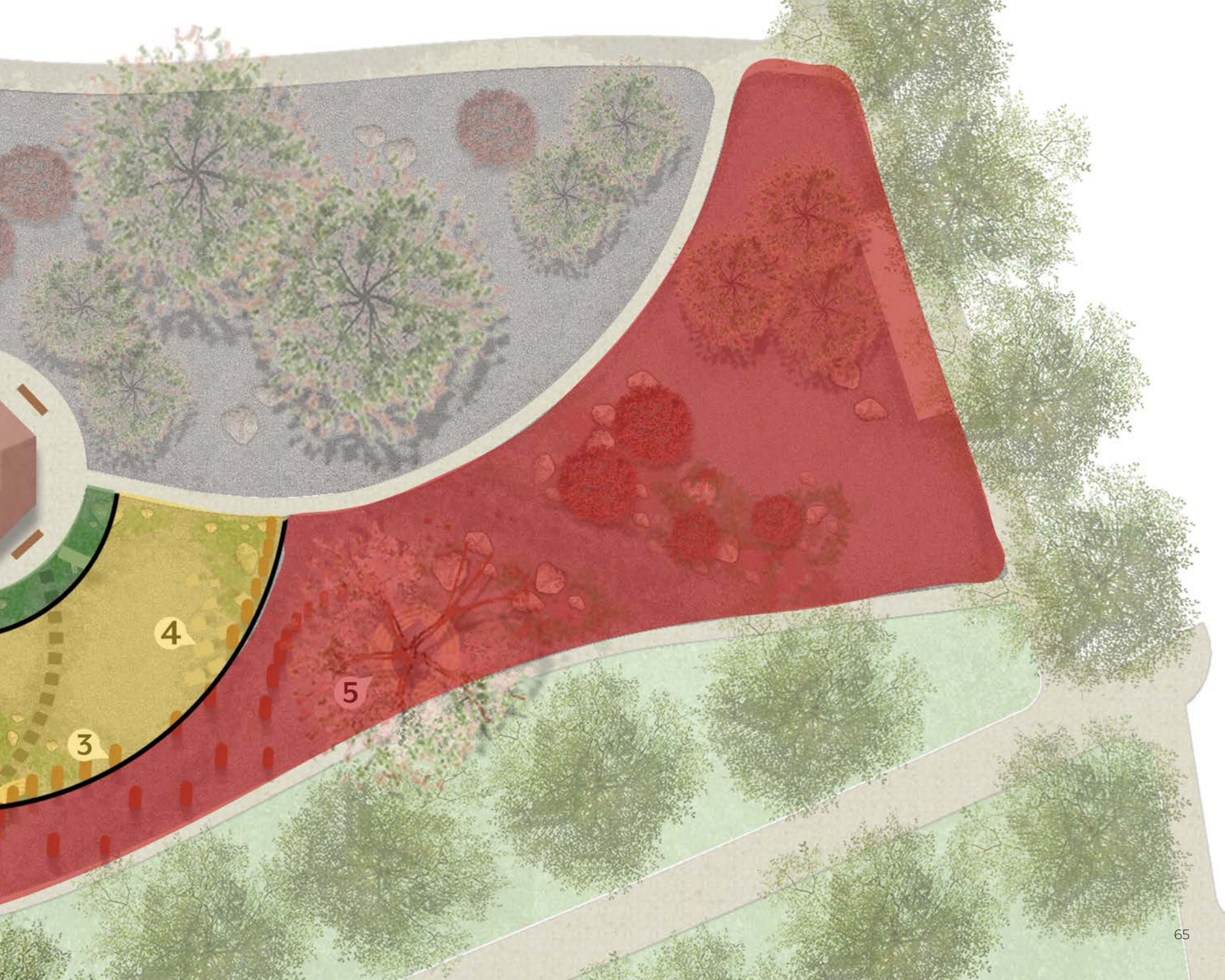


Divided Zones

Zone 1: 0 - 5'

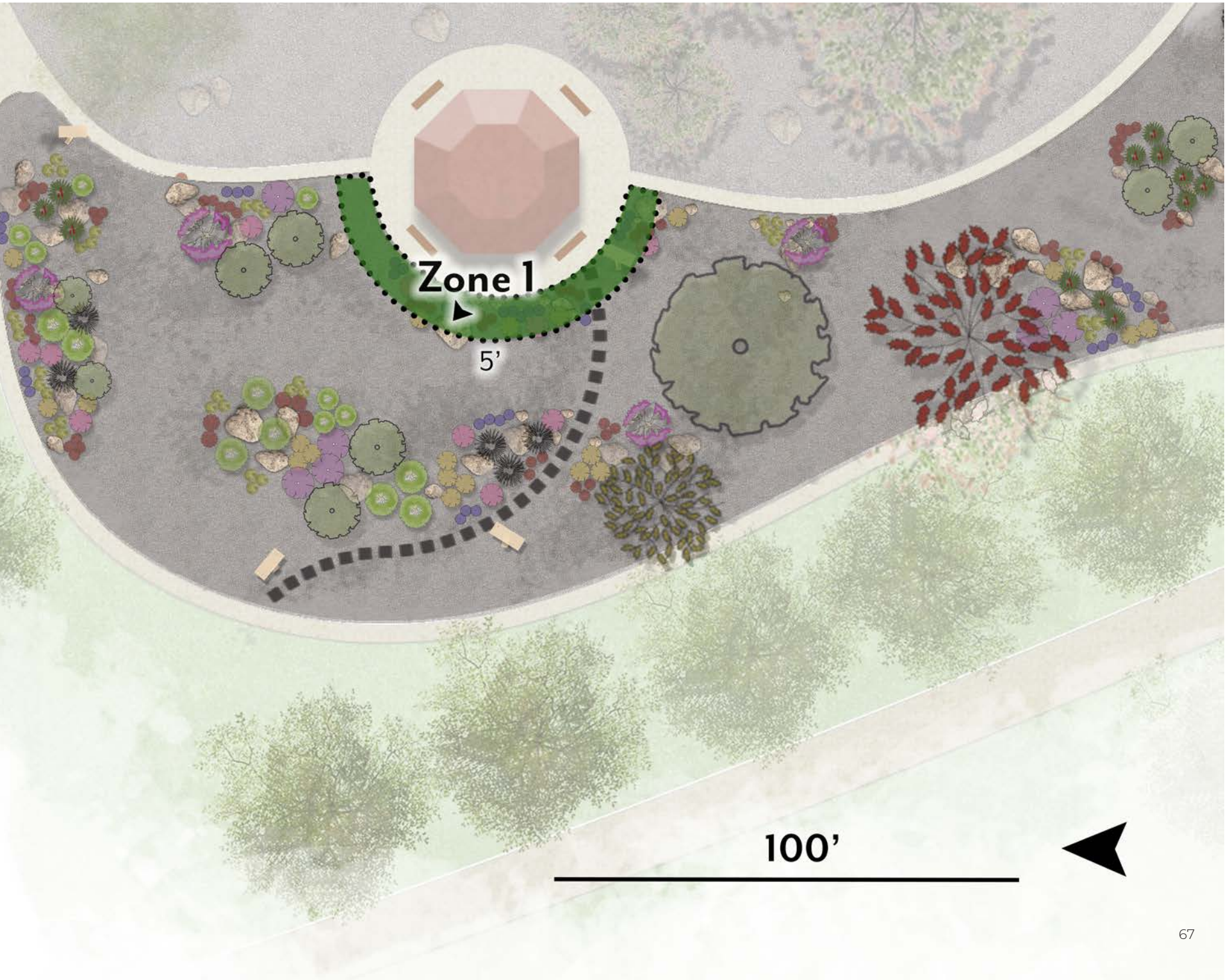
Zone 2: 5' - 30'

Zone 3: 30' - 100'


4
5
3

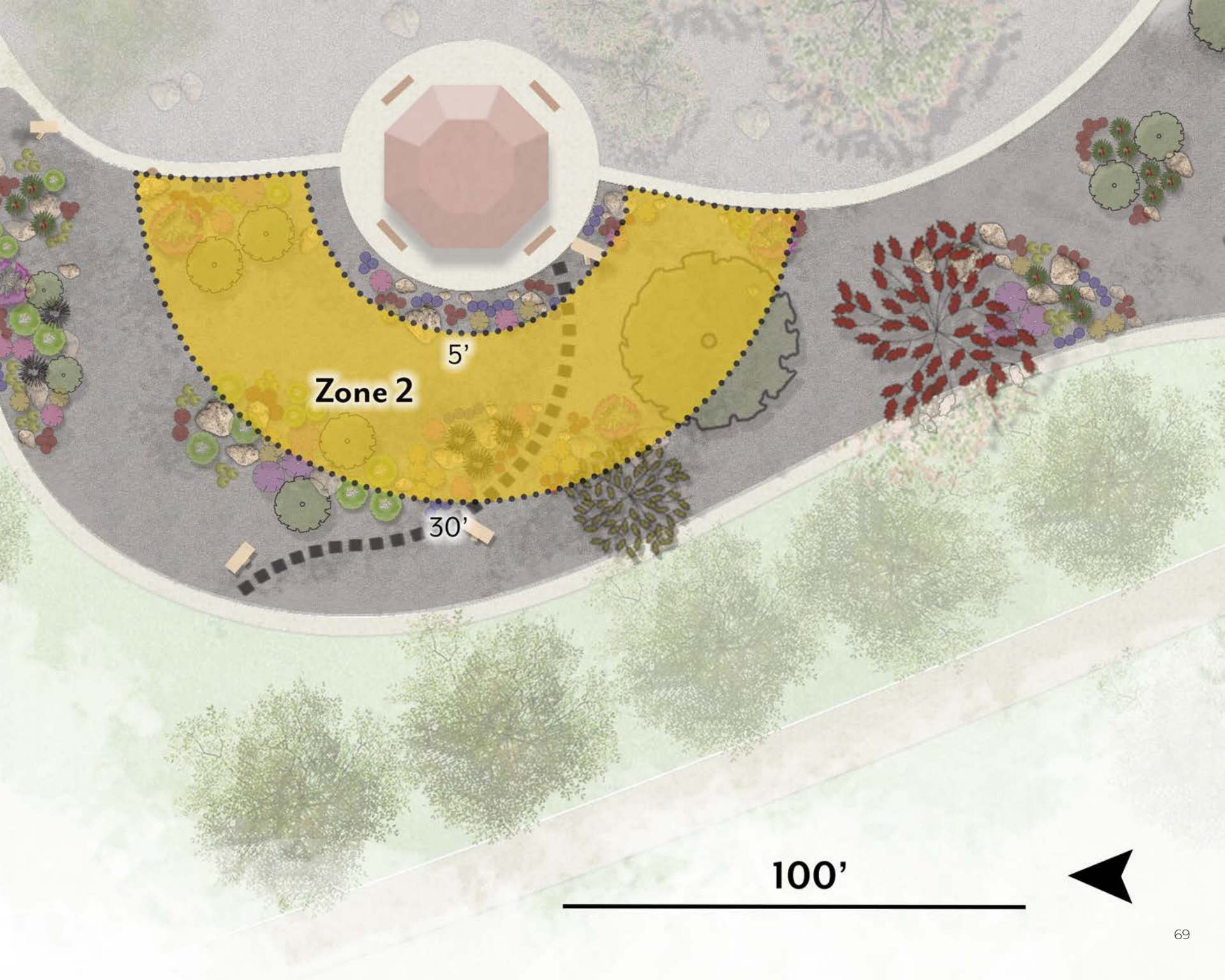
This area includes the first 5 feet around your home and the structure intself. Non-combustable material is recommended within this space. Rock, gravel, concrete, and low growing vegetation can be used here.

Zone 1: The Ember-Resistant Zone


Zone 1
5’
100’

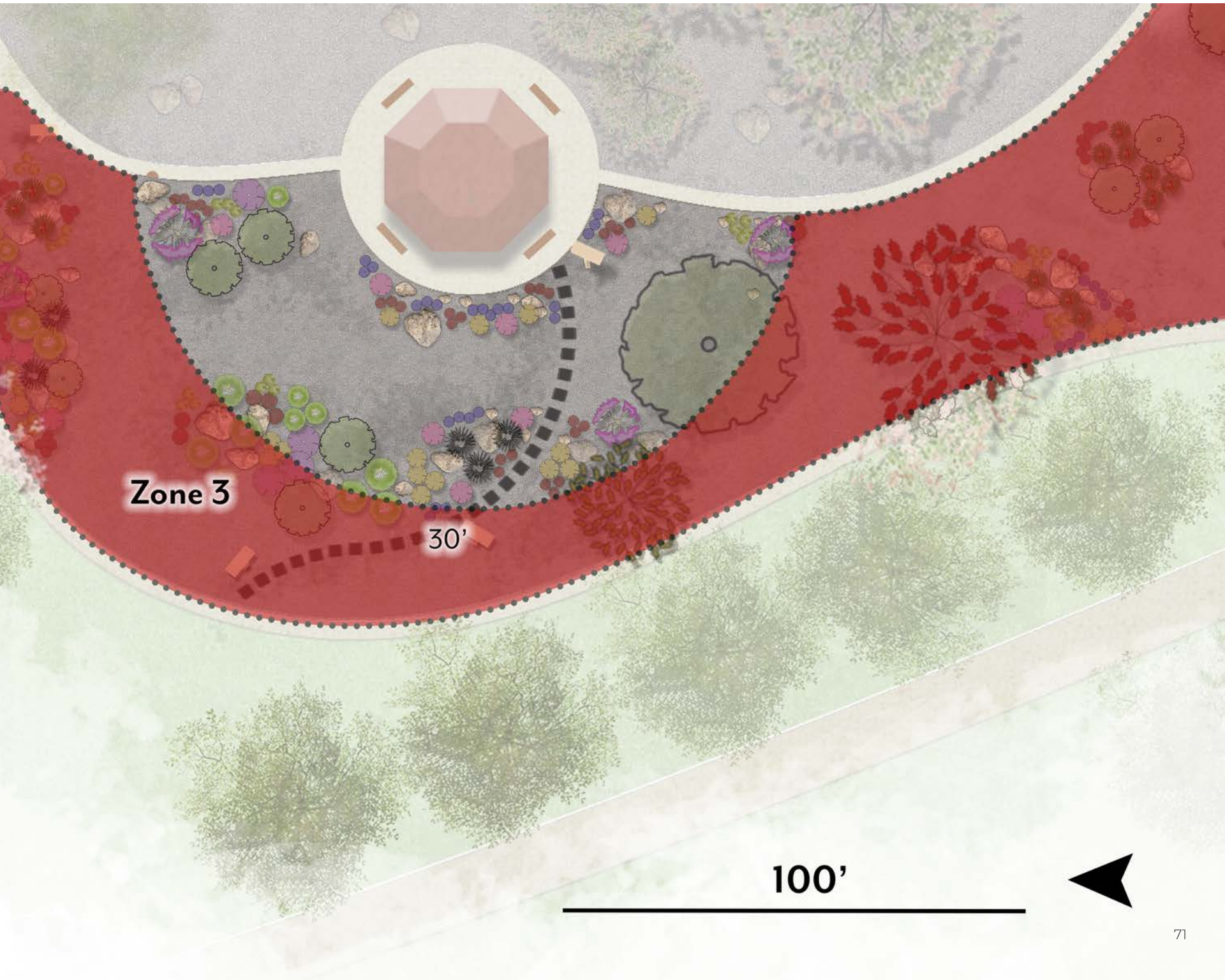
This zone should be designed to promote firewise landscaping and water conservation. The recommended minimum planting zone starts with low-density planting to medium -density planting as you move outward from the house.
The goal is to create a low-ignition landscape capable of slowing fire spread.

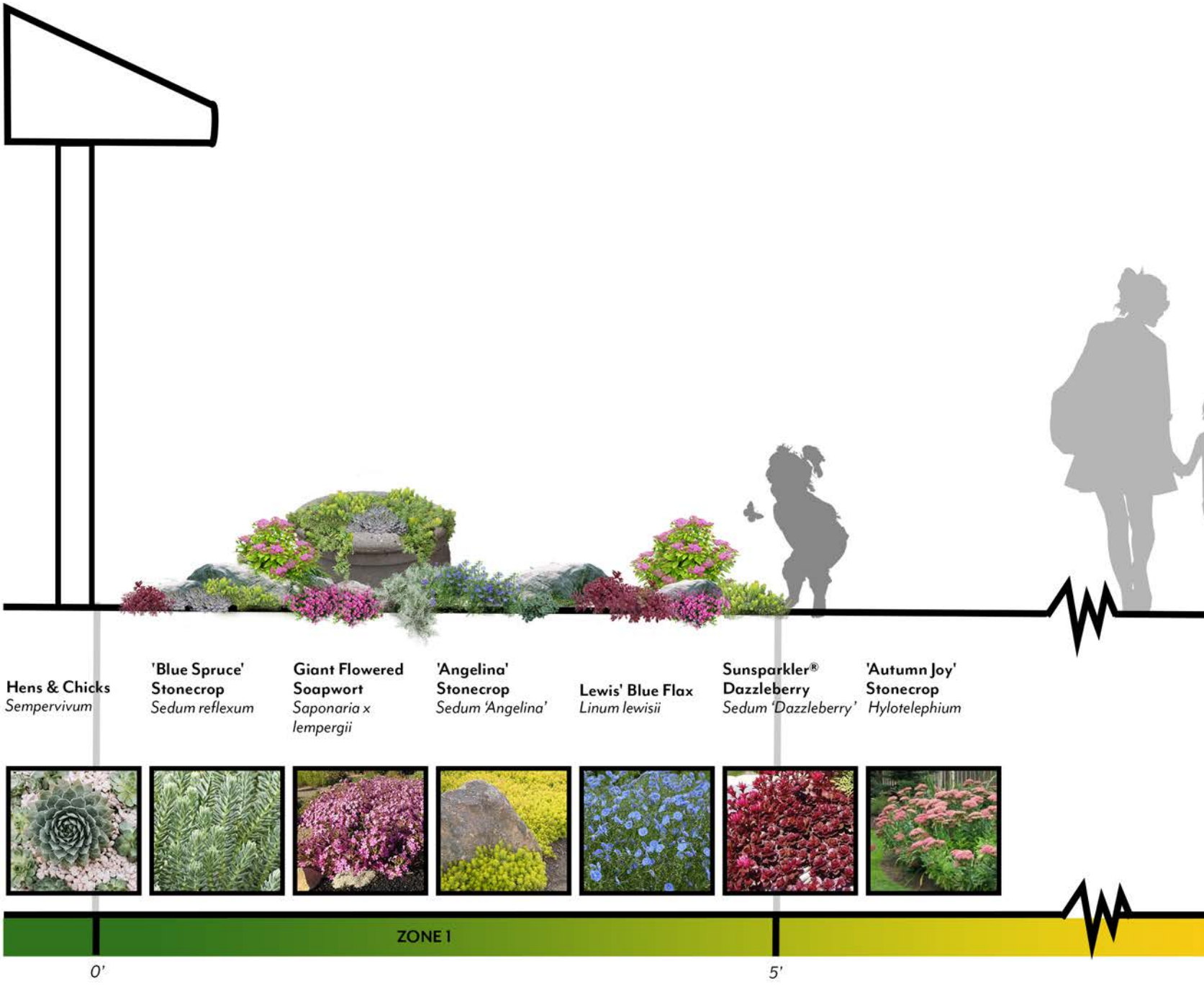
Zone 2: The Home Protection Zone


5’
Zone 2
30’
100’

This zone supports habitat connectivity and wildfire discontinuity, It serves as a connection with the natural enviroment promoting habitiat restoration while eliminating continuous, dense vegetation to decrease the energy and speed of wildfire.

Zone 3: Reduce Fuel and Thinning


Zone 3
30’
100’


Hens & Chicks
Sempervivum
'Blue Spruce' Stonecrop
Sedum reflexum
Giant Flowered Soapwort
Saponaria x lempergii
'Angelina' Stonecrop
Sedum 'Angelina'
Lewis' Blue Flax
Linum lewisii
Sunsparkler® Dazzleberry
Sedum 'Dazzleberry'
'Autumn Joy' Stonecrop
Hylotelephium
ZONE 1
0'
5'

Turkish Veronica
Veronica liwanensis

Evening Primrose
Oenothera macrocarpa

Blue Mountain Buckwheat
Eriogonum strictum

Bloomerang® Dark Purple Lilac
Syringa x

Red Yucca
Hesperaloe parviflora

Firecracker Penstemon
Penstemon eatonii

Buckley's Quill Mockorange
Philadelphus 'Buckley's Quill'

'Poker Face' Red Hot Poker
Kniphofia 'Poker Face'

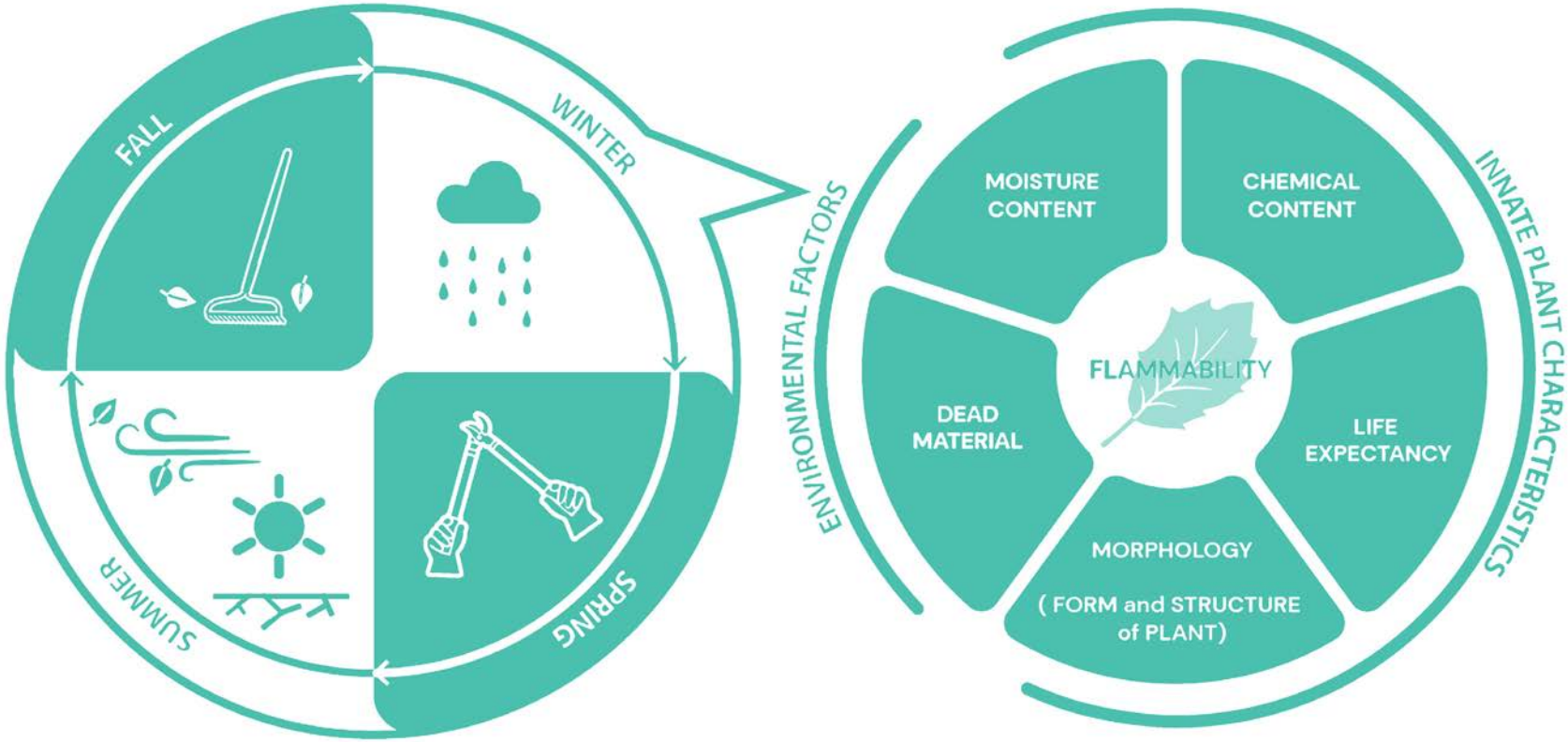
ZONE 2 **ZONE 3**

30'

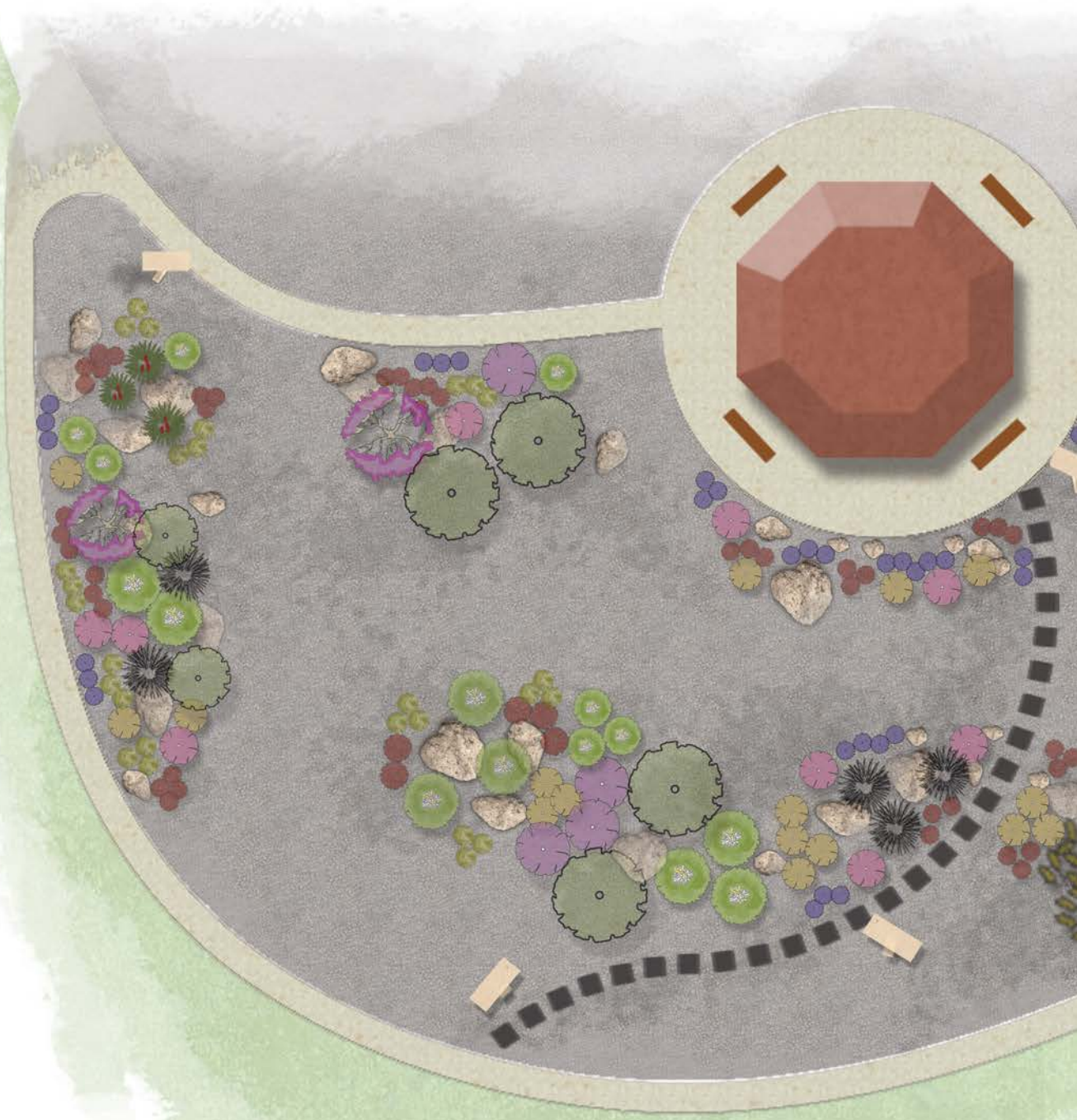
DESIGN CONCEPT 2: BEAUTIFUL AND AESTHETIC PLANT PALETTE

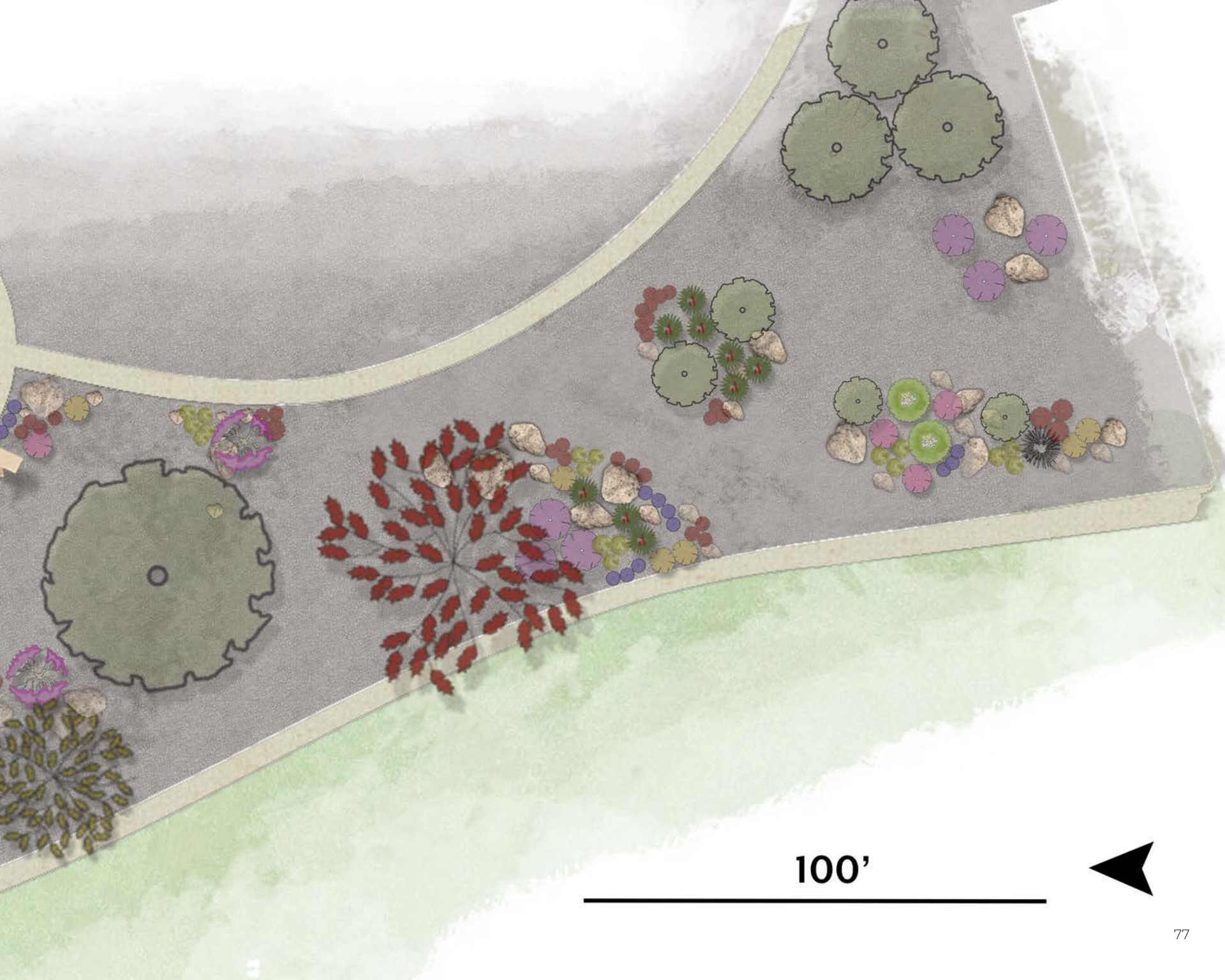
Another important concept expressed in the design was the idea that firewise landscape can be attractive and beautiful. Many individuals believe defensible landscape consists of clearing trees and replacing all vegetation with rock and concrete. Bernadine Park's Children's Firewise Garden proves that through proper planning, a firewise landscape contains a large variety of beautiful plants full of seasonal interest.

It is important to note what plants are considered 'firewise', as fire-resistant plants are those that do not readily ignite from a flame or other ignition source. These plants can be damaged or ever killed by fire; however, their foliage and stems do not contribute to the fuel or intensity of the fire. There are several factors that influence how the plant reacts to fire including plant moisture content, total volume, age, chemical content, and dead material.

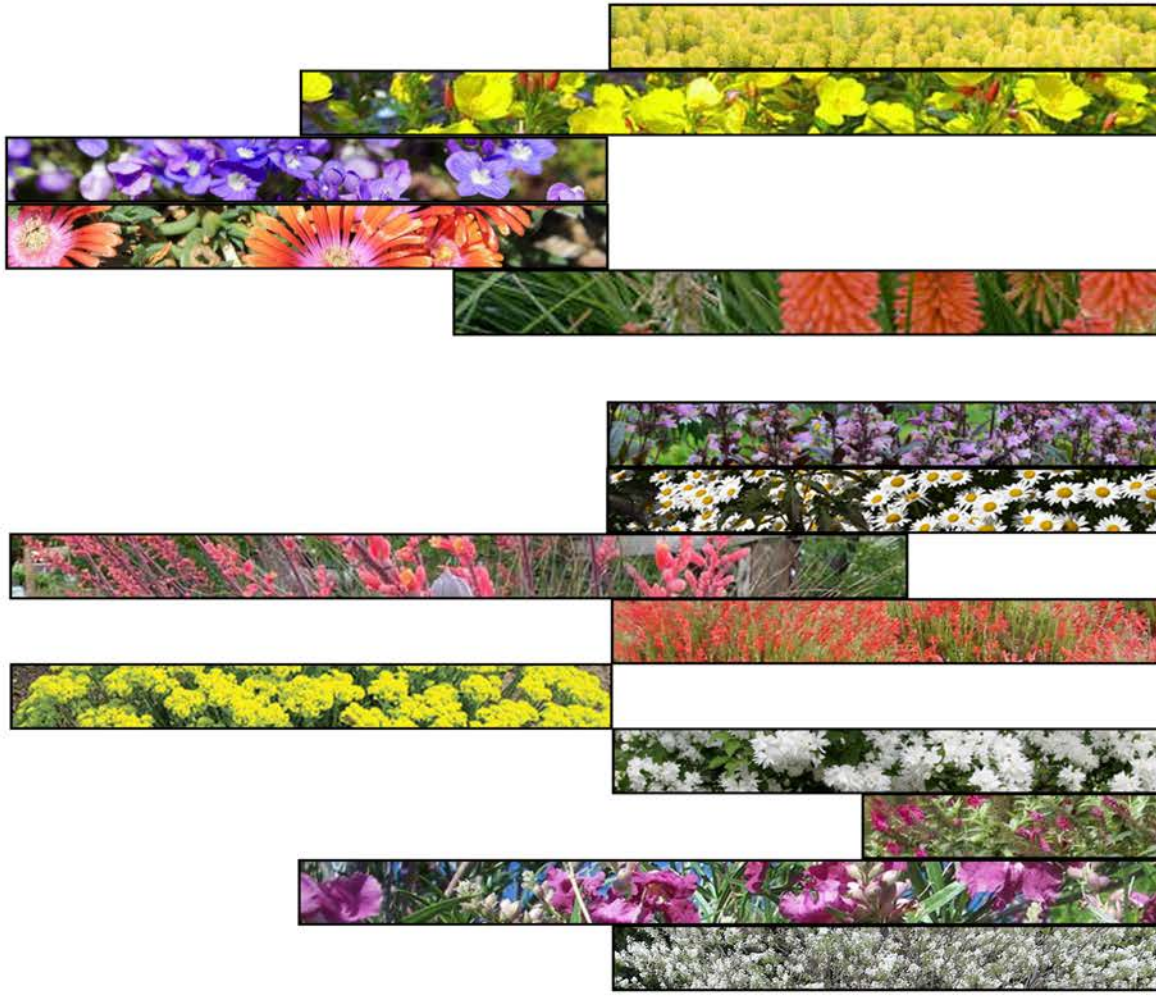

FALL
WINTER
SPRING
SUMMER
ENVIRONMENTAL FACTORS
INNATE PLANT CHARACTERISTICS
MOISTURE CONTENT
CHEMICAL CONTENT
DEAD MATERIAL
FLAMMABILITY
LIFE EXPECTANCY
MORPHOLOGY
(FORM and STRUCTURE of PLANT)

PLANTING PLAN




100’

BLOOM SEASON



The planting plan consists of a large variety of firewise plants that engage at least one of the five senses. Each plant was specifically selected based on its plant characteristic to reduce ignition risk. This arrangement offers interesting textures, bright colors, fragrant smells, and a long blooming season to cultivate a fun and playful plant palette.

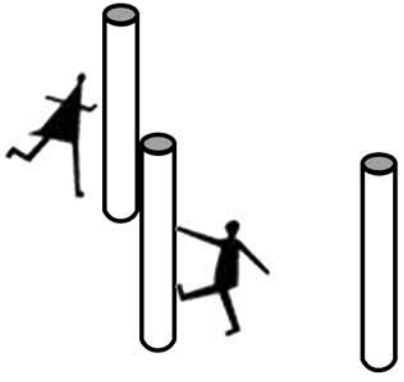
DESIGN CONCEPT 3: FUN, NATURAL AND EDUCATIONAL

One of the most important concepts highlighted in the design is the incorporation of **defensible space**. The key to protecting a home and property from fire in the wildland-urban interface (WUI) starts at the home itself. As mentioned in the literature review, up to 60% of ignitions from wildfires are caused by embers (Sustainable Defensible Space – RIOS, n.d). Fortifying or retrofitting a home can be the best defense against ember intrusion.

To create defensible space the homeowner must establish a series of zones. Zone 1 is located within 5 feet from the home. This area needs to be clear of any combustible material and trees. Only low growing and low flammability plants should be located here. Zone 2 is within 30 feet from the home. This area requires properly spaced trees and low growing plants and shrubs. Beyond the 30 feet is zone 3. This zone should be maintained as well, but more vegetation could be planted here.

"WHEN THINGS ARE NOT CONSIDERED STRUCTURED, THEY DON'T AUTOMATICALLY TELL YOU HOW TO USE THEM. YOU HAVE TO USE CREATIVITY, INTUITION AND ALL YOUR SKILLS TO DETERMINE HOW TO BEST USE IT."

-Sacha Coles

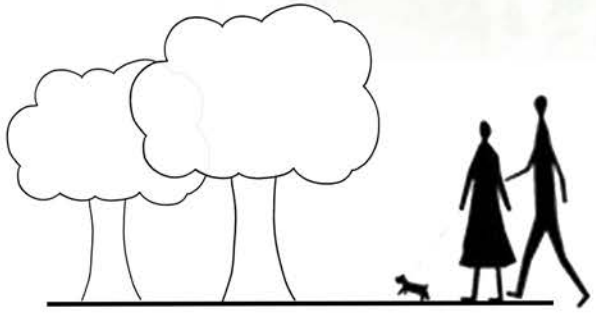


① Free Standing Logs

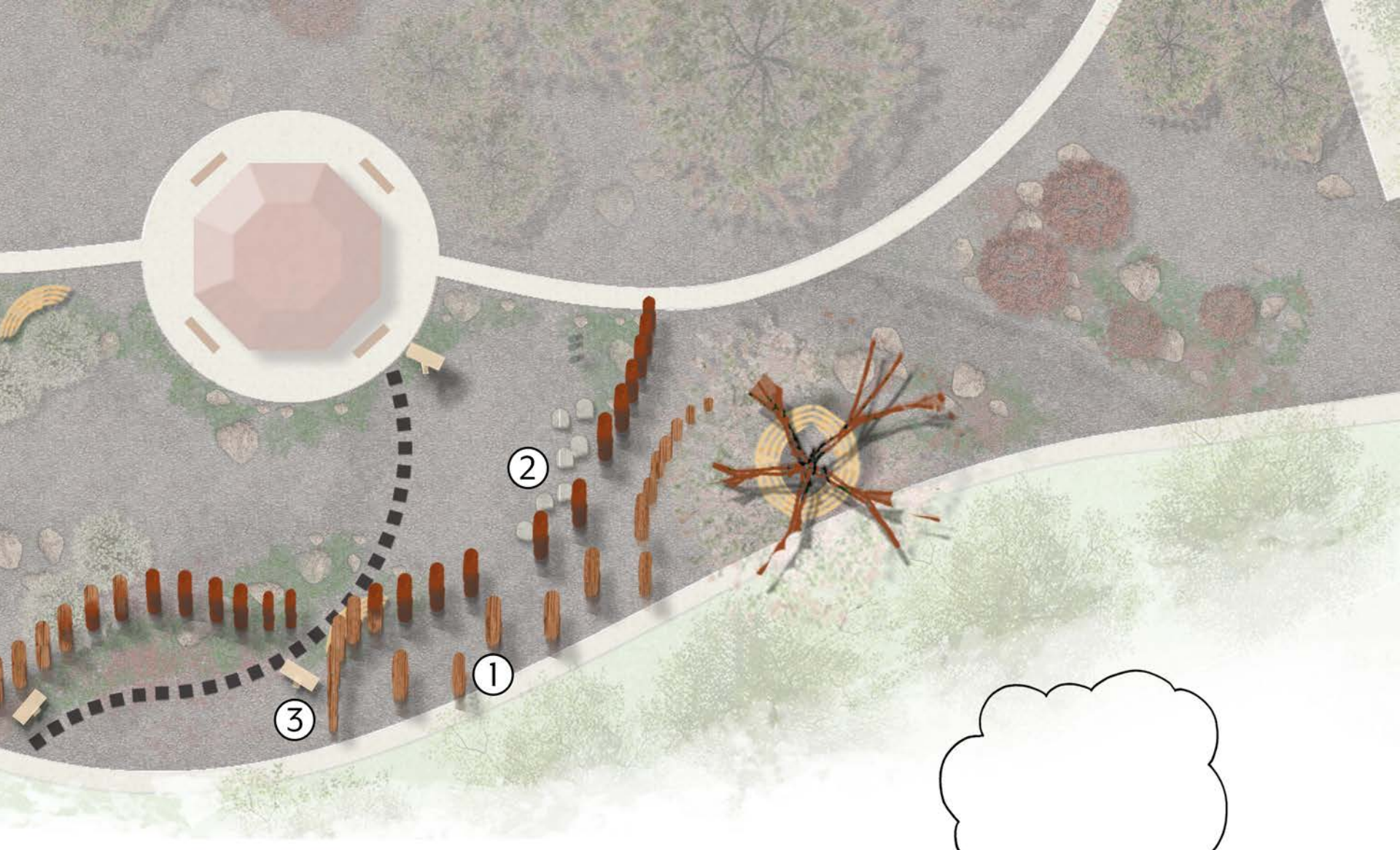
② Stepping Stones

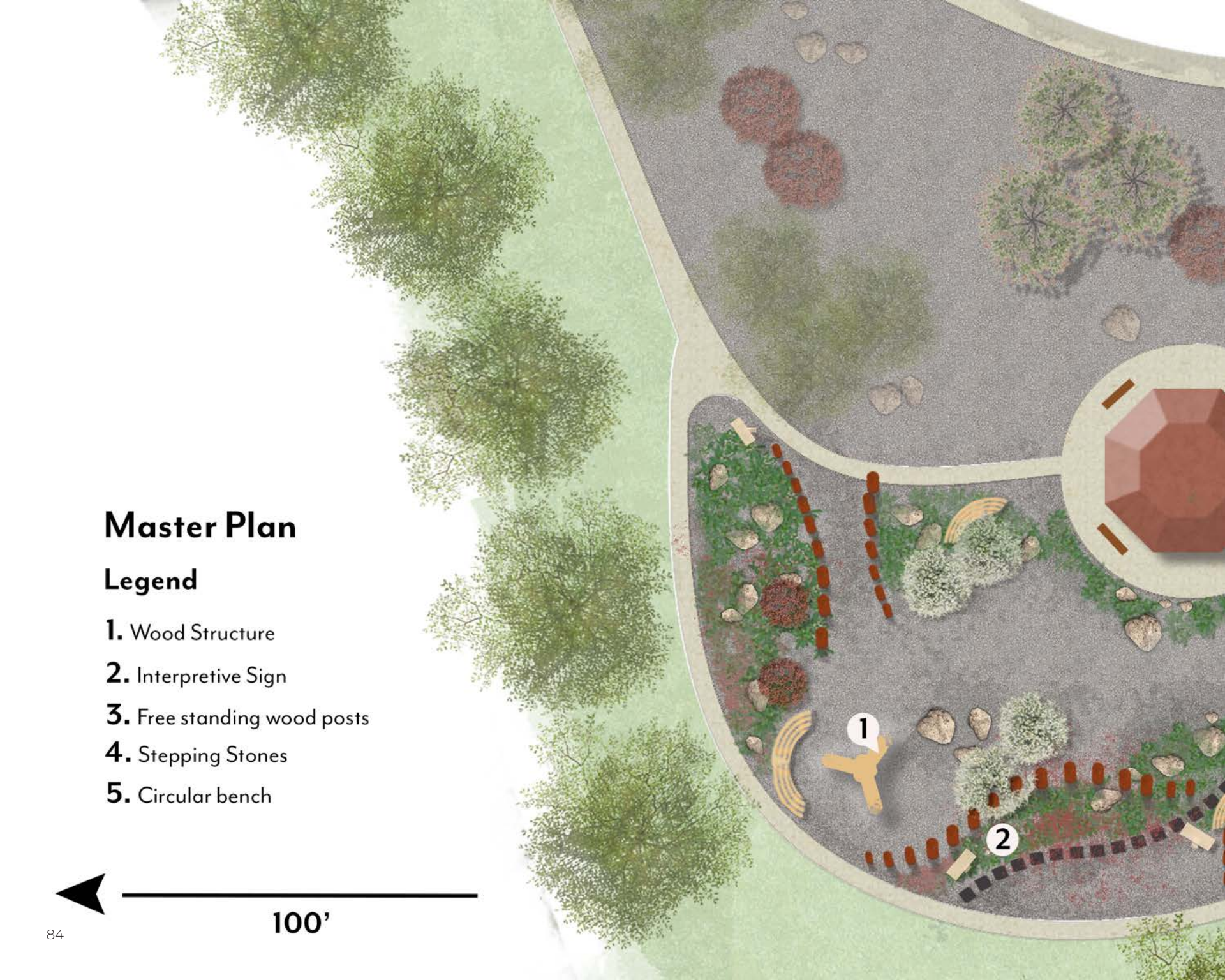
③ Informative Signage

④ Log Teepee Structure



Natural Play Elements


2
1
3



Master Plan

Legend

1. Wood Structure

2. Interpretive Sign

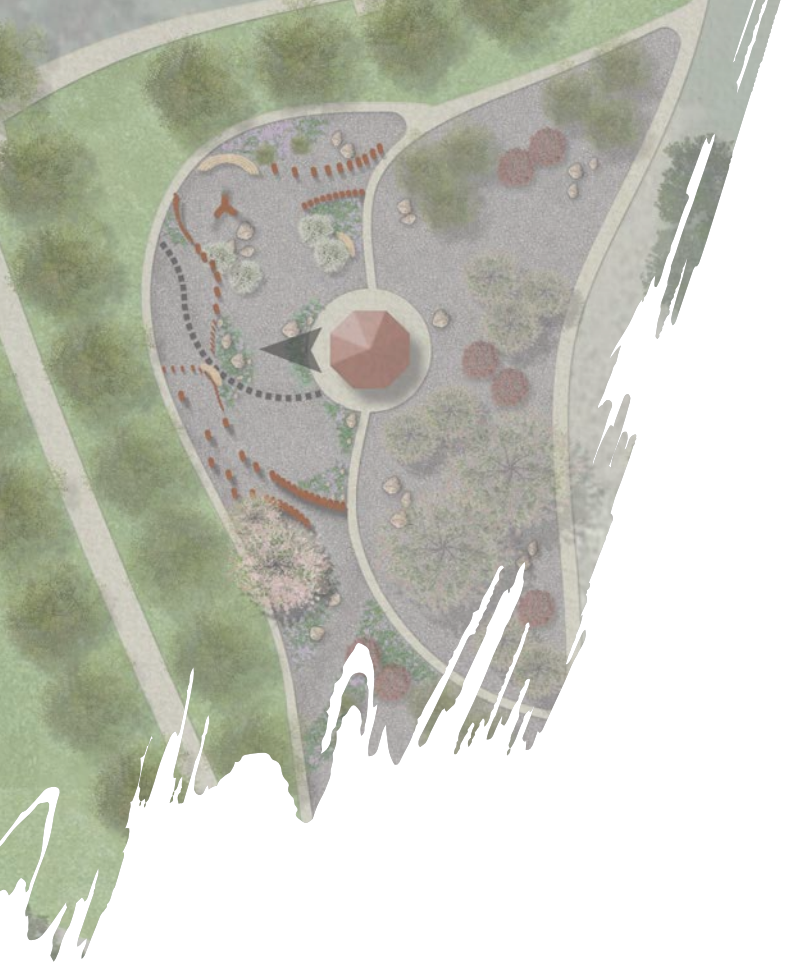
3. Free standing wood posts

4. Stepping Stones

5. Circular bench

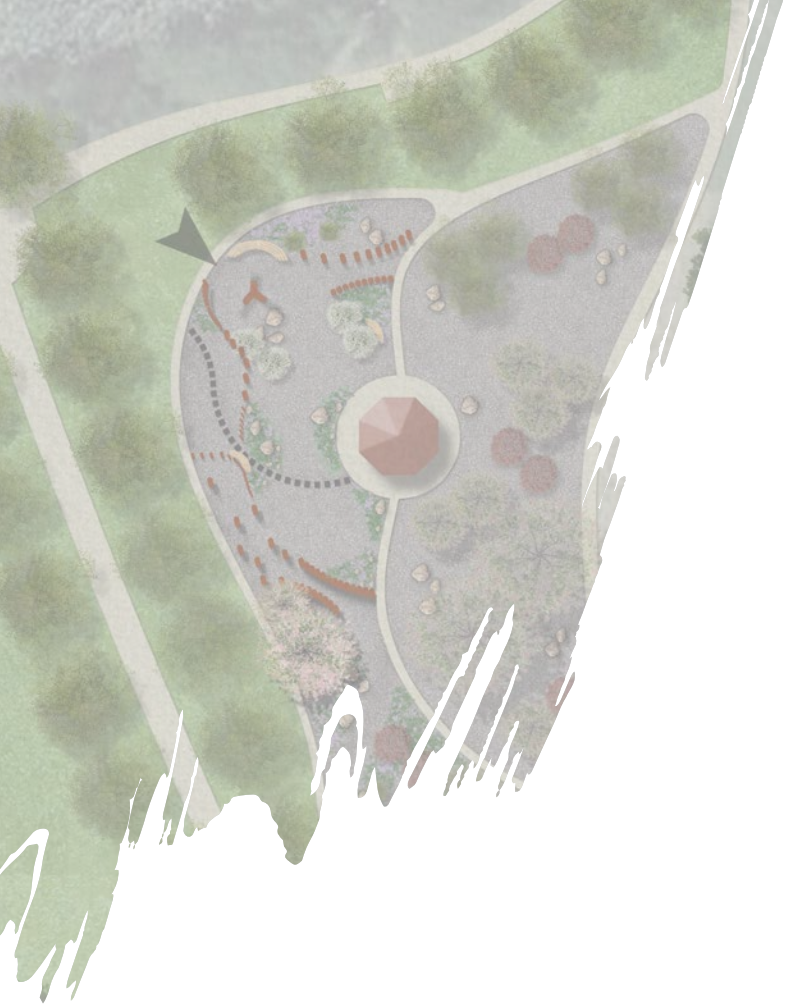
100’


4
5
3



CREATING A DEFENSIBLE BARRIER

The iron fence structure acts as a defensible space barrier. All vegetation within the barrier is considered firewise and helps protect the home from embers and low flames. The nearest rock garden gives a great example of what plants could be used within zone 1. A variation of sedums, ground cover, and low growing perennials are found here.



EDUCATION THROUGH INTERPRETATION

As visitors move through the site from zone 2 to zone 3 the iron posts begin to change from combustible material to noncombustible material. The further from the defensible space the more the wood burns. The wood posts also feature embedded light sources creating an overall burning effect. Interpretive wood structures and signs offer an educational element to the design.

NATURAL PLAY

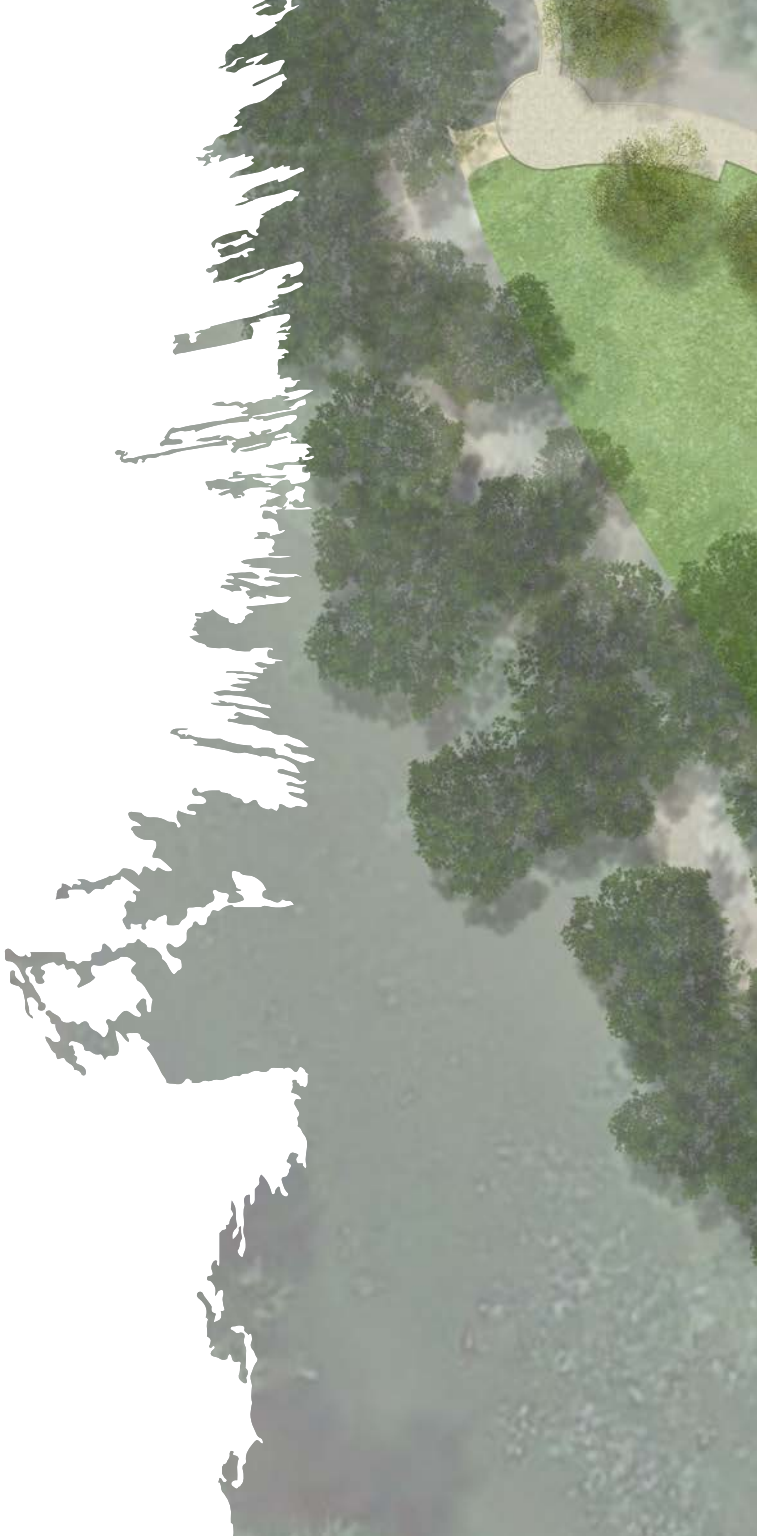
In this perspective, children immerse themselves in an area of the garden that features giant freestanding wood structures representing leftover tree stands from a wildfire. Within this space kids can explore, connect and learn from their natural play environment. Climbing over the various rock materials and engaging with the different materials.

CONCLUSION

Research Question:

How can landscape design demonstrate proper risk mitigation and increase public awareness of wildfire risk?

This project answered the research question by educating the public on fire mitigation tactics through Benadine Park's children's firewise demonstration garden. The proposed garden creates a unique learning experience that demonstrated proper wildfire mitigation solutions through interpretive and defensible design. Through various interviews and case studies the research concluded that the best way to educate the public on firewise practices is by targeting the younger generation. This research process was an important step as it provided information unavailable in written sources.



SPECIAL REPORT

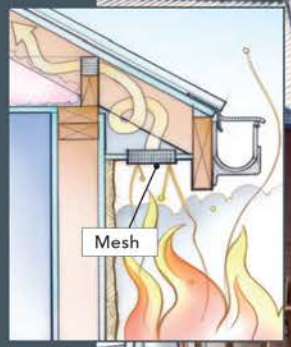
DEFENSIVE DETAILS

To design and build a house with the greatest chance of surv
materials, landscape details, and regular maintenance. Note
are prescribed by codes, all are considered best practice for

HOME

Roofs can either be protected by a material with a Class A fire-resistance rating—which includes clay, concrete, and slate, as well as many types of asphalt and metal—or by a fire-resistant assembly. For example, Class B wood roof shingles can be used over a Class A underlayment. If a roofing material is open at the eaves, as is the case with tile and some metal roofing, these gaps should be sealed. Valleys must be continuously covered by a Class A material, so with asphalt shingles a woven or cut valley is preferable to an open valley.

Eaves should be built with ignition-resistant or noncombustible material. Metal and fiber cement are viable options for soffit and fascia details. All exterior vents should be covered with ⅛-in. mesh to prevent embers from getting into the house. Another option is a commercially available product like the Vulcan Vent.

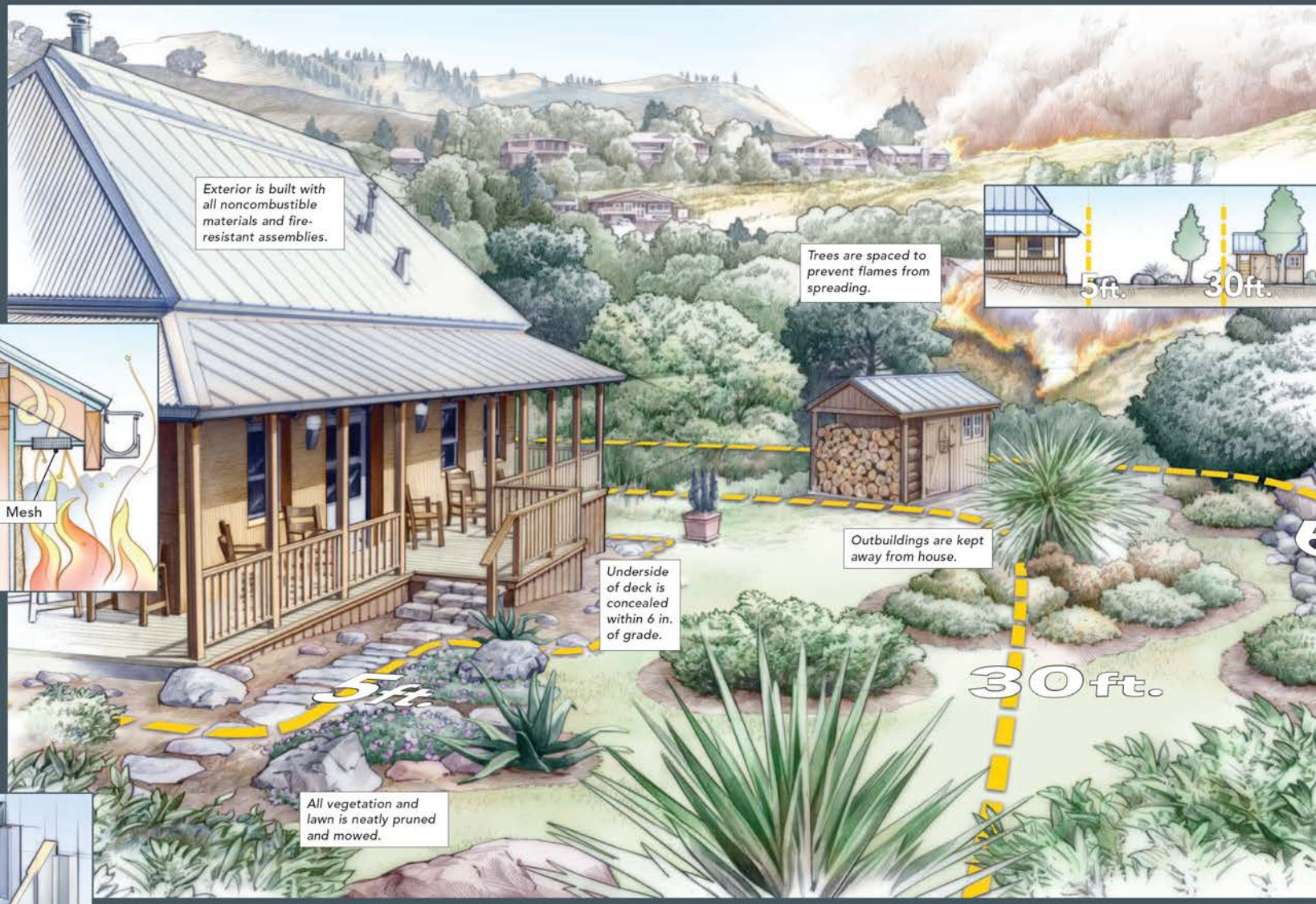


Siding should be noncombustible or ignition resistant and should cover the house from the foundation to the roof (some codes may allow heavy-timber exteriors, log construction, and other exceptions with slow burn rates). Approved fire-resistant siding materials include fiber cement, stucco, plaster, brick, and natural and manufactured stone.

Windows and all other glazing should be fire rated or multipane with at least one layer of tempered glass.

Doors should be fire rated or built from noncombustible or fire-resistant materials.

Decks are allowed to have wood framing, but should be finished with a fire-resistant material that extends down to within 6 in. of the ground. Cantilevers and other overhangs should be built and finished with noncombustible materials and details as well.



MAINTENANCE

Gutters should have leaf guards and be kept clean of combustible debris.

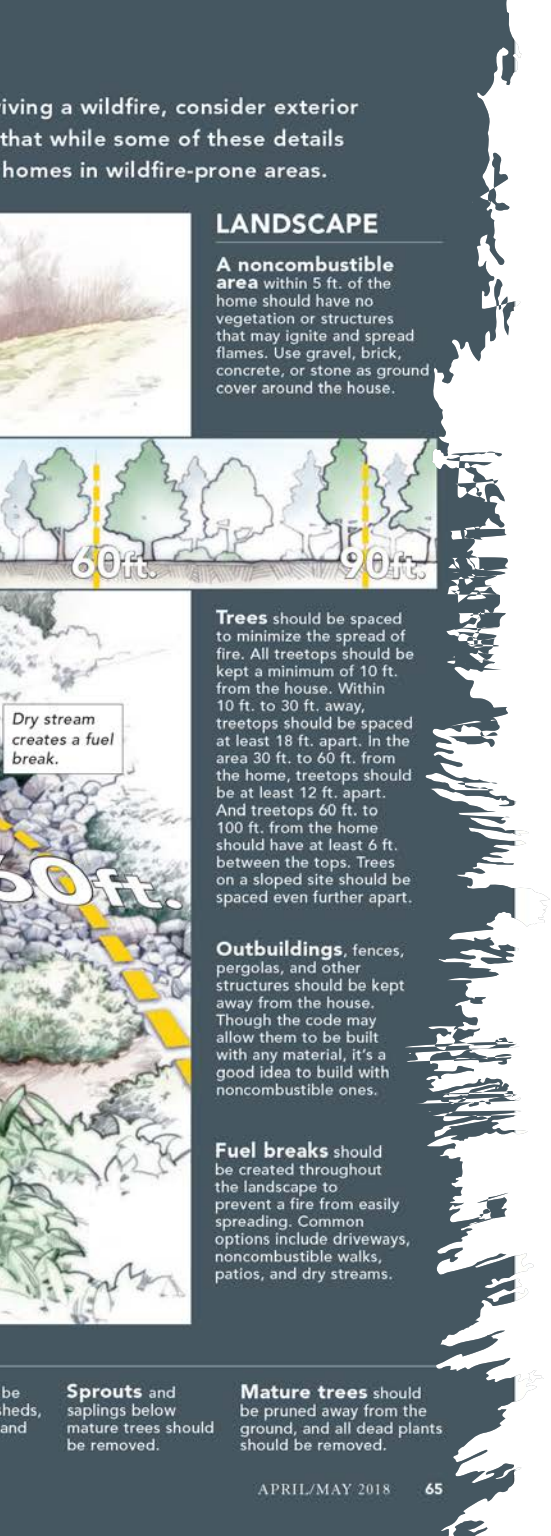
Roofs should be kept free of leaves, sticks, and other combustible debris.

Lawns should be neatly mowed to below 4 in.

Vegetation should kept trimmed around decks, propane tanks, other outdoor items.

Drawings: Bruce Morser

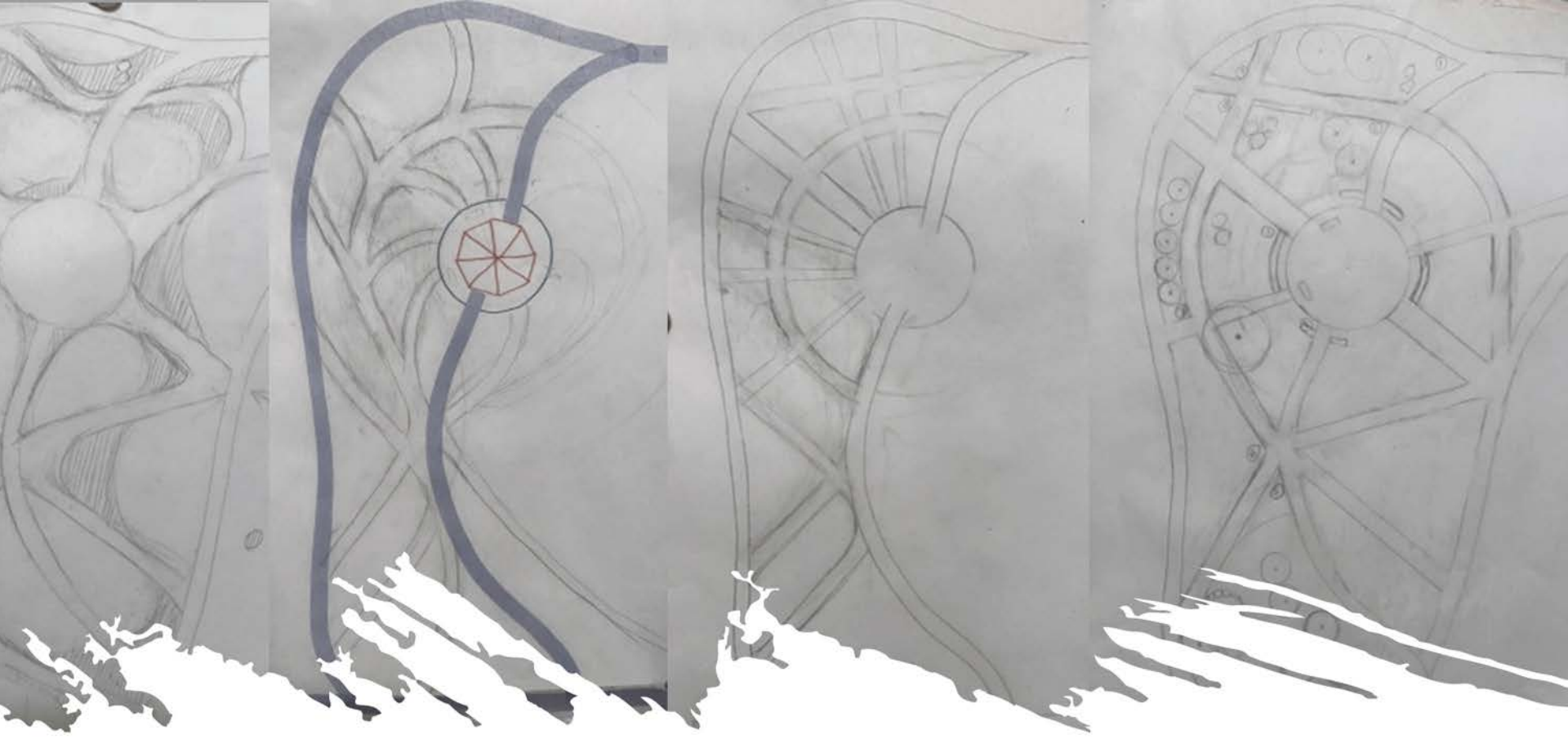
94



WHAT YOU CAN DO AS A HOMEOWNER?

It is important to note that there is still work left to be done in transferring this information to all home and property owners. Not only is firewise landscape necessary but designing a house with specific materials and regular maintenance can help it better survive a wildfire. Materials and design details of the structure can cause fire vulnerability. Various roofing materials, siding and windows help prevent embers from igniting the home. If this research were to continue, it would include implementing other defensive details surrounding the home materials within the children's demonstration garden.

Although the design has been implemented, there are still barriers of acceptance in the general public that Boise is at risk of wildfire and firewise mitigation needs to be implemented. Removing those barriers will take time and a potential disaster like Oregon and California are facing to create overall change. In addition, there needs to be more collaboration among community members and policy makers on all levels. As mentioned in the interviews "what's missing is the application, the policy, and the partnership." It's going to take a cultural shift in the way designers design, government officials dictate, and community members participate to create change.



ALTHOUGH, BY IMPLEMENTING BERNADINE PARKS FIREWISE CHILDREN'S GARDEN, BOISE IS ONE STEP CLOSER TO MAKING THAT CHANGE AND EDUCATING THE COMMUNITY ON WILDFIRE PREPAREDNESS.

THANK YOU!

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