

The **United States** is the best location because it is a country that does not have a solid plan in place for this issue, but does have the **ability to socially adapt** to these proposal ideas.



This is a **social issue**, and the solution can be thought about very differently depending on the culture or background. For example, the UN is urging people to utilize insects as a protein source in order to help the agriculture and pollution problems. Not only is that something that would not be widely accepted by Americans, scientists also believe "we risk creating an industry that replaces an environmental problem with another." (Win)

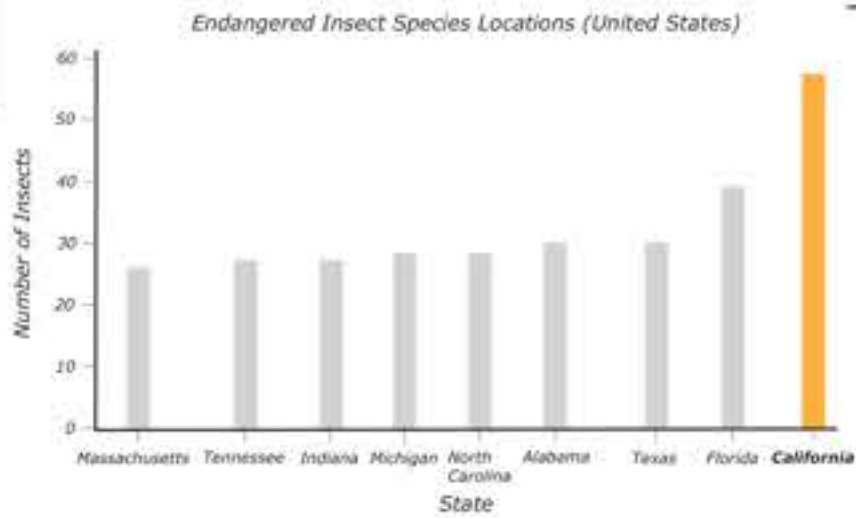
"The United States is the best location because it is a country that does not have a solid plan in place for this issue, but does have the ability to socially adapt to these proposal ideas."

California is the best place in the United States to locate because it **produces a great percentage of the nation's fruits, nuts and vegetables**, but it is the state with the **highest number of endangered insect species**, almost 30% more than Florida which is second.

There are **94 endangered insect species** in the United States; **California** is home to **57** of those species. California also "produces two-thirds of the nation's fruits and nuts and more than one-third of its vegetables" (Cornelisse), meaning in order to keep those foods in abundance, insects need to be present.

The insect population in California has seen a **decrease** in their insect population overtime; "The issue is that there are **multi-faceted reasons** for these declines: agriculture, pesticides, urban growth causing habitat loss, pollution, forest fires and extreme weather events – and in most cases it is not just one thing" (Wolterbeek). There were also a team of research members that "found warming minimum temperatures and nights that are not cooling off as much, which all **impacts biological processes**." (Wolterbeek)

"California is the best place in the United States to locate because it produces a great percentage of the nation's fruits, nuts and vegetables, but it is the state with the highest number of endangered insect species, almost 30% more than Florida which is second."



"Endangered Insect Species Locations (United States)"

An **inland city** would be the most appropriate place to reside because the population of insects that live on land are decreasing. **Sacramento** meets these guidelines, and is in the middle of these big focus parts of the state.

Insects that **live in on land** are seeing a **decrease in population** while the population of the insects living in the sea are increasing. "A meta-analysis has found that land-dwelling insect populations are decreasing by about 0.92% per year, which amounts to 50% fewer insects in 75 years. The numbers of insects that live in the water are on the rise by about 1.08% per year, a figure scientists attribute to effective water protection measures over the past 50 years." (Kimbrough)



"California's coastal zone generally extends 1,000 yards inland from the mean high tide line. **In developed urban areas, the boundary is generally less than 1,000 yards.**"

Many places in California have been studied when it comes to insect population and species, but most of the articles and studies seem to focus on the **San Francisco area** as well as the **Sierra Nevada area**.

"California's coastal zone generally extends 1,000 yards inland from the mean high tide line. In developed urban areas, the boundary is generally less than 1,000 yards."

1116 9th Street is the best location for the site because it is over **1,100 yards** from the river, it is **one block away** from the **Capital Building**, and there are **currently 3 buildings on the site**.

"In the City of Sacramento there are **223 parks and parkways** totaling 4,255.5 acres of land." (City of Sacramento). Sacramento is the **capital of California**, and the capital building which is located in the middle of downtown, sits on an **axis stretching out to the river**. The capital building also sits on one of the **largest areas of greenspace** in the city, so locating near by will give insects a better chance to populate throughout the city.

Sacramento is an inland city in California, but is **defined by the Sacramento River** running along the perimeter. Because of this, the chosen site could not be within **1,000 yards of the river**.

The goal is **not to demolish an existing building** or use an empty site in order to create a whole new design. The idea is to **redesign and rethink** some of the existing buildings in order to think about a mutualistic relationship between insects and humans. Because of this, the best site would be to locate a building that is **unoccupied but undisturbed**. There is a proposal submitted for this location; the Canopy by Hilton. It is supposed to be a 14 story mixed use building with ground floor restaurants and bars, with hotel rooms and apartments located above.

"1116 9th Street is the best location for the site because it is over 1,100 yards from the river, it is one block away from the Capital Building, and there are currently 3 buildings on the site."



Program

The Canopy by Hilton, or also known as the Sacramento Hilton Capitol Hotel is the proposed development that should be starting construction on the chosen site in the upcoming years. This building was designed by WATG, an architecture firm based originally in Honolulu back in 1945 and is now located globally.

The decision to adopt the program, and provide this building as a starting point for my thesis was to help focus my attention on creating the mutualistic relationship between humans and insects. The goal of my thesis is not to create a new building that satisfies criteria of all species; the goal is to take existing conditions that already satisfy the needs of one or more species and include more species, specifically insects.

"Located within walking distance of both the California State Capitol and new Sacramento Kings Stadium, this 14-story urban mixed-use architecture project takes inspiration from its downtown surroundings and aims to generate a hive of activity from the ground up." (WATG)

"The Canopy by Hilton, or also known as the Sacramento Hilton Capitol Hotel is the proposed development that should be starting construction on the chosen site in the upcoming years. This building was designed by WATG, an architecture firm based originally in Honolulu back in 1945 and is now located globally."



"Steering away from bold, domineering design statements and instead incorporating subtle nods to the city in which it will stand, the project accents the corner of L and 9th streets with two fluted, illuminated vertical columns that extend to its rooftop, creating a dramatic statement that serves as a wayfinding signal for residents and business and leisure travelers alike. At the pinnacle, a bar and adjoining meeting space look out across an event lawn, pool and bar/restaurant." (WATG)



"At ground level, an open-air F&B space is positioned to leverage foot traffic, while also incorporating flexible features including collapsible glass pocket doors that seamlessly transform the space into an outdoor dining experience – designed with current and future California State restrictions in mind. Creating a 'maximum impact' guest arrival experience, parking is concealed below-ground, leading to a unique valet-only service." (WATG)



I can already start to point out parts of the current design that would have a difficult time providing a mutualistic relationship. There is not much vegetation on the site, and some of the areas are getting covered a majority of the day by the building



Squads

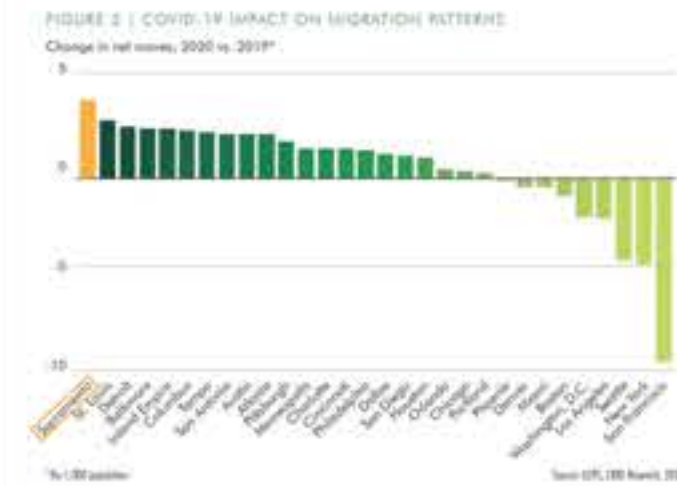
grouping of species who have similar qualities and use spaces or other species in similar ways.

Human Squad

This will include the human residents of the **apartment units**, the human visitors of the **hotel**, and the human visitors of the retail spaces like **restaurant, bar and cafe**.

Residents

Young professionals that are moving from tight spaces in big cities to larger spaces offering room to work remote.



Visitors
Any **member of the community** that would enjoy the amenities offered; these spaces might be cafe's or libraries, giving the residents a place to work or get coffee, but will also include spaces where insects and humans interact or share spaces or resources like plant nurseries or relaxing gardens.

This squad will interact with the

Insect Squad:
sharing spaces of relaxation

Example: Semaphore, humans and insects could gather in the same area based on particular materials and use of space



Vegetation Squad:
obtaining shade and food from

Example: On hotter or sunnier days, the vegetation could provide us with shade. We could also eat or use the berries in the trees as medicine



Built Squad:
obtaining protection from

Example: a building protects the human species from exterior forces. A barrier could also protect from an accident



Insect Squad

This will include the insect residents of the site; starting with the **primary species** and any other species that might aid in its existence.

Primary: The endangered species

Valley Elderberry Longhorn beetle



Secondary: Species needed by primary

Elderberry tree (Blue)



Tertiary: Species that use secondary

Forest flying butterfly



White-lined sphinx



Poliopterus moth



Salt Marsh Nuth



Green Lacewing



Yellow-faced bumble bee



This squad will interact with the

Human Squad:
sharing spaces of relaxation

Example: Singapore Pavilion, humans and insects could gather in the same area based on particular materials and use of space



Vegetation Squad:
obtaining protection from

Example: The VELB, it lives inside of the elderberry tree for years before maturing



Built Squad:
providing secondary places of protection

Example: insects are able to live on or inside of the built environment, creating architecture of their own



Vegetation Squad

This will include the vegetation on the site, the most important is the secondary species, the Blue Elderberry Tree. There are native tertiary species that also support the ecosystem.

Elderberry tree (Blue)

only included in vegetation squad, with insect squad to show relationship



Coast Live Oak



California Holly



This squad will interact with the

Human Squad:
helping with grooming/health

Example: humans are able to trim and maintain the health of vegetation to ensure longevity



Insect Squad:
providing food and shelter for

Example: A common example would be a honey bee, collecting pollen from flowers



Built Squad:
allowing enough sunlight and soil to grow

Example: Tree Farm, The built environment could easily get in the way of the vegetation; that must be given a closer look



Built Squad

This will include the built environment on the site. This could be the physical footprint of the building, the concrete going underground, or any building material on the site.



Examples: building material to create spaces of gathering, or parking garages



This squad will interact with the

Human Squad:
designing and maintaining structure

Example: humans are able to design and maintain the health of the built environment to ensure longevity



Insect Squad:
providing secondary shelter

Example: A common example would be a spider claiming an area of the house



Vegetation Squad:
bending to the needs of

Example: This could not always been in a negative way. Trees could help the built environment shade from the direct sunlight



Rhetorical Context
Lens of Insects Over Time
1850

California Governor's Mansion, Nathaniel Goodell
1877

As this might be smaller than the scale the thesis is aiming for, the intent was to capture a wider range of history from Sacramento. This mansion has been home to the last 14 governors of California, and seems like it might be a great home from insects as well. Because of ornament, different materials, and large overhangs, insects could easily reside in these spaces.



Screens and weaved materials make these areas easy for insects to get into and protect from larger predators

Larger overhangs and ornament create great spaces for insects to create homes

Trees and vegetation are perfect environments for hosting insects

If these were to be rethought:

This building at the time of being built was one of the tallest buildings in the city. With the height, it brought different areas for different habitats to start forming. If this were to be rethought, this design could learn from these vertical gardens to begins to properly create these habitats.

Architectural Context
Creating Ecosystems

Qiyi City Forest Garden

Was designed to be a green paradise, hoping to filter the city's air and noise pollution; but instead attracted way too many insects with the overgrown and poorly chosen family of plants.



"Mosquitoes love water, and Chengdu's humid climate and months-long monsoon seasons offer plenty of it...the plants are growing in containers on the balconies, which are collecting water. The balconies themselves likely don't have proper drainage, which means the water is pooling and standing stagnant. Meanwhile, the plants themselves, which were chosen for their noise-reducing and pollution-absorbing traits, are overgrown — providing lots of shade for the mosquitoes to thrive in."

If they were more cautious about the plants begin chosen and the ecosystems that were going to form, then this design could have been more successful.

Quelle: Stern: "Überscherson (Spring in Garden) Look Good" until the Mosquitoes Swarm." Current, 18 Sept. 2020. <https://www.zeitung-berlin.com/2020/09/18/180918qiyi-city-forest-garden-mosquitoes-chengdu/>

1900

Sacramento City Library, Loring P. Rixford
1918

This building was built in 1918, but it kept most of west facade of the building that was previously here from 1872. As it may still not be the scale, it is interesting to see the modern approach directly next to a more classical to see how they affect insects differently. In the classical approach there are more places for insects to reside because of the decoration and larger insets. But, as glass begins to get added to the other portion of the building, the clean facade is providing less space for the insects. The trees and vegetation is also beginning to become scarce and pushed away from the building.



Trees and vegetation are pushed back from building, making it harder for insects to get into or onto the facade.

The overhang size can change whether an insect can reside or get protection there

Glass is not a friendly material for insects

This building, similarly to the one previously, also can begin to see spaces for insects to thrive from a few feet above grade, to a few stories up. If this project got rethought, not only would different levels of habitats be considered, but the incorporation of different plants and nonhumans species into the building would be successful.

Elks Tower, Leonard J. Starks
1926

This is starting to represent the scale a bit better because of the time that it was built. The ornament and larger overhangs seem to be getting smaller, providing smaller areas for insects to reside. The color also could start to become a problem for insects; because insects are attracted to lighter colors, those who are flying could become attracted to building and get hurt.



Insects are attracted to light colors, with this being so tall this could hurt insects

The insets on the windows are starting to get smaller, meaning less room for insects

This area seems to get very dark, making it a great space for insects

Barely any trees or vegetation is found around the building

This building was focused on height when it was built, and there are not many places for insects to create spaces. If this project were to be rethought, this project could think about adding a similar mechanism to the Villa M; where a green lattice structure is placed onto the main structural system, creating habitats along the facade.

1950

Capitol Towers Apart., William Wurster
1965

This balconies on the building provide for large overhangs for insects to reside, but begins to really pull away from any inset windows or any decoration on the building. There are still areas on the facade for insects as well as the landscaping surrounding. This building begins to show potential for insects to reside by including more vegetation, more individual spots of vegetation and texture in the walls.



Water is a great addition for insects to thrive

Balconies provide areas on facade for insects; besides those the building seems to flat to house them

The texture of the wall creates areas that would let insects thrive

A decent amount of trees and vegetation

This building starts to create spaces under the balconies for insects to thrive, but if this building was rethought it could also adapt a similar mechanism to the Villa M that would attach to the already existing balconies to then purposefully give insects their own area. Something smaller could be adapted for the wall.

Vertical Forest, Stefano Boeri Architects

"The Vertical Forest is the prototype building for a new format of architectural biodiversity which focuses not only on human beings but also on the relationship between humans and other living species." (Boeri)



"In total the green area will exceed 3,600 square metres, an area equivalent to the building's total ground area and it is expected that the new Vertical Forests will be able to absorb about 7 tons of carbon dioxide per year and produce 8 tons of oxygen, contributing substantially to counteracting the pollution and the effects of climate change." (Boeri)



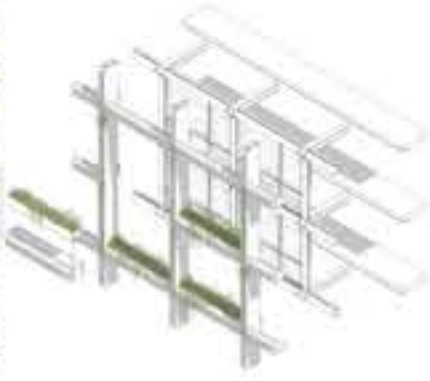
"The contrast with a series of elements in white stoneware — the stringcourses of the balconies and some modules on the front of the windowsills — introduces a syncopated rhythm in the composition which breaks up and "dematerializes" the visual compactness of the architectural bodies and amplifies the presence of the plants even more." (Boeri)



"More than just surfaces, the façades can be viewed as three-dimensional spaces not only because of the denseness and function of the green curtain but also in aesthetic-temporal terms, due to the multi-coloured cyclical and morphological changes in the size of the plants" (Boeri)

Villa M, Triptyque Architecture

This mixed use project "aims to create a new pact between city, nature, and health. The edifice itself is the support for this vertical garden, which will grow and occupy the entire façade, turning the building into a vertical, medicinal forest and becoming the main architecture" (Moreira)

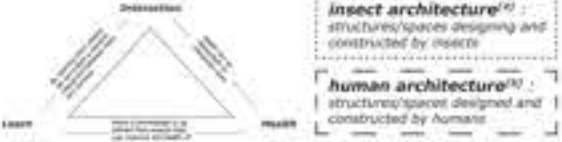


"Villa M's design wants the architecture to bring back the nature to the city and has the main goal of providing citizens with a new urbane experience with the advent of a "nature-city". "Breathing, sunbathing and connecting to nature are vital needs that the urban lifestyle is no longer able to guarantee", states partner Olivier Rafaelli. "To resist the urban expansion — unsustainable by nature — the city must provide this experience in addition to stimulate the correlation between external and internal spaces in built areas". (Moreira)



Mutualistic Relationship Classification System

All of the research and information provided before was collected in order to create a classification system for the type of mutualistic⁽¹⁾ relationship⁽²⁾ between humans and insects through architecture that the thesis is trying to achieve. The three main topics of discussion are the interaction⁽³⁾ between species, the health⁽⁴⁾ of both species, and the knowledge⁽⁵⁾ to be gained from either species. This scoring system will help in the evolution of my own project, being able to go back and test as the design develops to ensure that I am staying consistent with my findings.



Process
Each category is set up in a hierarchical way, where if an answer results in a "0", then the points for the rest of the category are unobtainable.

In this instance the project scored a "10" in the first question, but a "0" in the second. This means the project had to end the category with the points already obtained.

If an answer results in a zero, then the category is stopped and the next category is started.
The process is repeated through all categories and the final number is a representation of the mutualistic relationship obtained in that project.

If the project was insect architecture⁽¹⁾ then it is placed below the spectrum, if its human architecture⁽²⁾ it is placed above.

Parasitic⁽²⁾ -50

Parasitic⁽²⁾
one species benefits off of the expense of the other

Interaction		
<input type="checkbox"/> Providing interactions between species	(-10) Negative	(0) No Interaction
<input type="checkbox"/> Benefiting one species	(-12) At the others expense	(0) Benefiting neither
<input type="checkbox"/> Benefiting both species	(-140)	(0) Only benefiting one
Health		
<input type="checkbox"/> Provides physically healthy space	(-6) Hurts physical health	(0) Nothing for physical health
<input type="checkbox"/> Provides mentally healthy space	(-12) At the others expense	(0) Nothing for mental health
Learning		
<input type="checkbox"/> Demonstrates knowledge gained from other species	(-2) Knowledge used against other species	(0) No knowledge demonstrated
<input type="checkbox"/> Knowledge gained from other species improves relationship	(-4) Negative relationship	(0) No effect on relationship
<input type="checkbox"/> Knowledge gained from other species improves health of one species	(-6) At the others expense	(0) Improve health of neither
<input type="checkbox"/> Knowledge gained from other species improves health of both species	(-140)	

Botfly Larva Living in Human		
Interaction		
<input checked="" type="checkbox"/> Providing interactions between species	(-23/40)	
<input checked="" type="checkbox"/> Benefiting one species		
<input checked="" type="checkbox"/> Benefiting both species		
Health		
<input checked="" type="checkbox"/> Provides physically healthy space	(-4)	
<input checked="" type="checkbox"/> Provides mentally healthy space		
<input checked="" type="checkbox"/> Provides physically healthy space		
<input checked="" type="checkbox"/> Provides mentally healthy space		
Learning		
<input checked="" type="checkbox"/> Demonstrates knowledge gained from other species	(-17/30)	
<input checked="" type="checkbox"/> Knowledge gained from other species improves relationship		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of one species		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of both species		
Final Rating		
-50		



Cricket Shelter, Terreform ONE		
Interaction		
<input checked="" type="checkbox"/> Providing interactions between species	(-23/40)	
<input checked="" type="checkbox"/> Benefiting one species		
<input checked="" type="checkbox"/> Benefiting both species		
Health		
<input checked="" type="checkbox"/> Provides physically healthy space	(-4)	
<input checked="" type="checkbox"/> Provides mentally healthy space		
<input checked="" type="checkbox"/> Provides physically healthy space		
<input checked="" type="checkbox"/> Provides mentally healthy space		
Learning		
<input checked="" type="checkbox"/> Demonstrates knowledge gained from other species	(-13/30)	
<input checked="" type="checkbox"/> Knowledge gained from other species improves relationship		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of one species		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of both species		
Final Rating		
-36		

Guatemalan Long-jawed Spider		
Interaction		
<input checked="" type="checkbox"/> Providing interactions between species	(-23/40)	
<input checked="" type="checkbox"/> Benefiting one species		
<input checked="" type="checkbox"/> Benefiting both species		
Health		
<input checked="" type="checkbox"/> Provides physically healthy space	(-4)	
<input checked="" type="checkbox"/> Provides mentally healthy space		
<input checked="" type="checkbox"/> Provides physically healthy space		
<input checked="" type="checkbox"/> Provides mentally healthy space		
Learning		
<input checked="" type="checkbox"/> Demonstrates knowledge gained from other species	(-13/30)	
<input checked="" type="checkbox"/> Knowledge gained from other species improves relationship		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of one species		
<input checked="" type="checkbox"/> Knowledge gained from other species improves health of both species		
Final Rating		
-23		

CalPERS Headquarters Complex, Pickard Chilton
2005

This building is becoming a lot more minimalist design approach, the overhangs are becoming a lot less frequent and dramatic, providing less room for insects. Most of the building is glass, making it difficult for insects to see. The vegetation space is beginning to interact with the building a bit more in this precedent, but is not ideal placement for new insects to begin to move into the space.



Building design intent was to blend in with the surrounding landscape, but this means that insects could be hurt because it is blending in

Green spaces are added to the roofs of the building, this could attract any flying insects

Green space at grade level is a great incorporation, but with the rest of the green being so far away, it seems hard for insects to get into this space

This building's design intent was to blend into the natural landscape. If this building were to be rethought, it could begin to adopt aspects from the Singapore Pavilion. This space blends in with the surrounding landscape and tries to eliminate the boundaries between interior and exterior. It also designs spaces for different habitats to thrive, the green space in the middle of the current design could use some tactics.

Bank of the West Tower, E.M. Kado Associates
2007

This building is almost all glass, meaning that it would be extremely hard for insects to fly past without hitting it. A vast majority of the facades are flat with no overhangs, inset windows, or areas for insects to thrive. There is also not a lot of vegetation, and the little amount that is on the site is pushed back away from the building, making it harder for insects to reside on or around the facade.



Yellow lighting is used for insect health; insects aren't as attracted to yellow light as they are white

Glass and clean facades make it hard for insects to reside on these places

Vegetation is pushed away from building to eliminate any insects from being near the building

This building uses a lot of glass, but in a way that does not help insects. If this building were to be rethought, it could begin to learn from the Singapore Pavilion. This building utilizes a lot of glass as well, but incorporates vegetation and different habitats into these spaces.

Sacramento Hilton Capitol Hotel, WATG
2023

This project is not built yet, but starts to incorporate downtown Sacramento's surroundings into the design. The design starts to break down some barriers between inside and outside by using large overhangs and using large sliding glass walls to break that barrier. This project could learn more from the city by incorporating more greenspace and places for insects to reside.



Overhangs are small, but still give insects some space

Vegetation is incorporated but still scarce

Textured facades and different natural materials make nice places for insects to reside

This building does a great job at beginning to incorporate different textured and materials into the facade, but could learn from the Semaphore about adding more greenspaces to the site while still having glass.

Yamane Project, CMS Architecture and Design
N/A

This project is not built yet, but begins to change how vegetation has been used in the previous buildings. There are vertical gardens that separate different exterior spaces as well as more vegetation on the roof. This project is mostly glass, still not providing spaces for insects, but with the addition of the vegetation, this could start to house insects.



Vertical gardens can house insects

Yellow lights are better to use for insect health

Areas of facade that aren't glass have inset windows, providing an area for insects

This building does a great job at beginning to incorporate green walls into spaces that could house insects. This building could learn from the Semaphore about utilizing the landscape to house more plants and green spaces, but overall a great start.

Singapore Pavilion, WOHA Architects

"The Singapore Pavilion for Expo 2020 Dubai illustrates the city's aspiration towards a sustainable future that merges architecture, nature, technology and culture. The multi-layered green space creates a self-sufficient ecosystem highlighting ideas of sustainability and resilience through the marriage of technology and nature." (Cutieru)



"Under the theme of 'Nature, Nurture, Future', the pavilion will aim to demonstrate Singapore's story of overcoming its physical limitations as a small island city-state and adapting itself to become a highly livable and sustainable city" (Cutieru)



"Featuring more than 170 varieties of plants from diverse habitats in Singapore and set within different layers of greenery, from hanging gardens to vertical walls, the pavilion creates a tridimensional green space, taking visitors through tropical rainforests, mangrove areas and forest streams." (Cutieru)

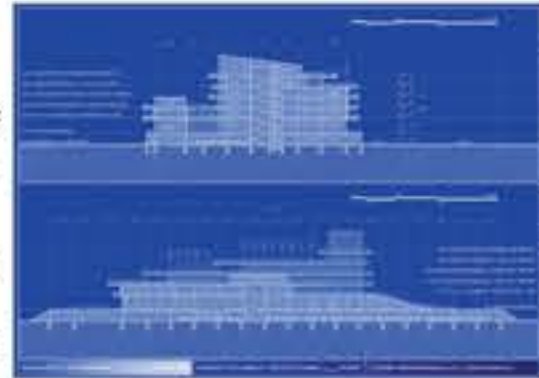


Semaphore, Vincent Callebaut Architects

This design proposal is described as being an ecological utopia. "The design is an ecological prototype of the green city of the future, working to achieve a symbiosis between humans and nature." (Schires)



"Beyond a surface 'greening' of the building, Semaphore incorporates multiple innovations to offset its energy consumption and carbon production. The design of Semaphore includes 10,000 plants, shrubs, and trees native to the Strasbourg region which will absorb carbon while producing oxygen." (Schires)



"The vertical circulation is designed to be naturally lit and ventilated, with recreational and relaxation areas grouped around it to accommodate employees' natural movement patterns." (Schires)



"The building takes advantage of its location on the water with a planned new marina and large, green, cascading terraces inspired by terraced rice fields where company employees can enjoy the sunshine and south-facing views." (Schires)

Vulkan Beehive, Snohetta

Interaction

- ☒ Providing interactions between species
- ☒ Benefiting one species
- ☒ Benefiting both species

(10/40)

Health

Spider

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

Termites

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

(15/30)

Learning

- ☒ Demonstrates knowledge gained from other species
- ☒ Knowledge gained from other species improves relationship
- ☒ Knowledge gained from other species improves health of one species
- ☒ Knowledge gained from other species improves health of both species

(12/30)

Final Rating

17



City Creatures, Joyce Hwang
31

Bug Dome, The WEAK!
32



Skyscraper for Bees, Hive City
40

Spiders in Human House

Interaction

- ☒ Providing interactions between species
- ☒ Benefiting one species
- ☒ Benefiting both species

(20/40)

Health

Spider

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

Termites

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

(20/30)

Learning

- ☒ Demonstrates knowledge gained from other species
- ☒ Knowledge gained from other species improves relationship
- ☒ Knowledge gained from other species improves health of one species
- ☒ Knowledge gained from other species improves health of both species

(10/30)

Final Rating

40

Hidden in Plain Sight, Joyce Hwang

Interaction

- ☒ Providing interactions between species
- ☒ Benefiting one species
- ☒ Benefiting both species

(40/40)

Health

Spider

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

Termites

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

(20/30)

Learning

- ☒ Demonstrates knowledge gained from other species
- ☒ Knowledge gained from other species improves relationship
- ☒ Knowledge gained from other species improves health of one species
- ☒ Knowledge gained from other species improves health of both species

(10/30)

Final Rating

70

The Butterfly Effect, VenhoevenCS

Interaction

- ☒ Providing interactions between species
- ☒ Benefiting one species
- ☒ Benefiting both species

(40/40)

Health

Spider

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

Termites

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

(20/30)

Learning

- ☒ Demonstrates knowledge gained from other species
- ☒ Knowledge gained from other species improves relationship
- ☒ Knowledge gained from other species improves health of one species
- ☒ Knowledge gained from other species improves health of both species

(15/30)

Final Rating

77

Domesticated Honey Bees

Interaction

- ☒ Providing interactions between species
- ☒ Benefiting one species
- ☒ Benefiting both species

(40/40)

Health

Spider

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

Termites

- ☒ Provides physically healthy space
- ☒ Provides mentally healthy space

(15/30)

Learning

- ☒ Demonstrates knowledge gained from other species
- ☒ Knowledge gained from other species improves relationship
- ☒ Knowledge gained from other species improves health of one species
- ☒ Knowledge gained from other species improves health of both species

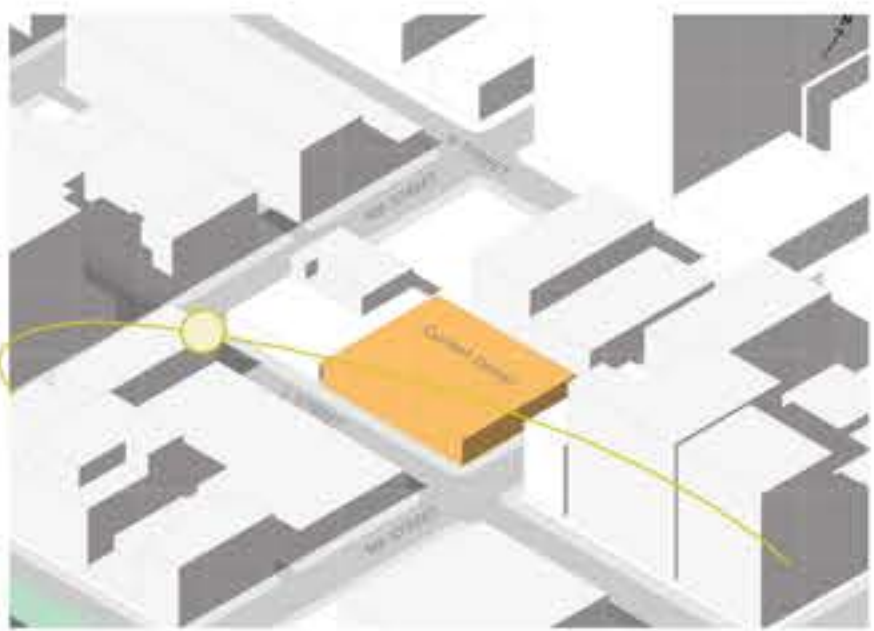
(10/30)

Final Rating

85

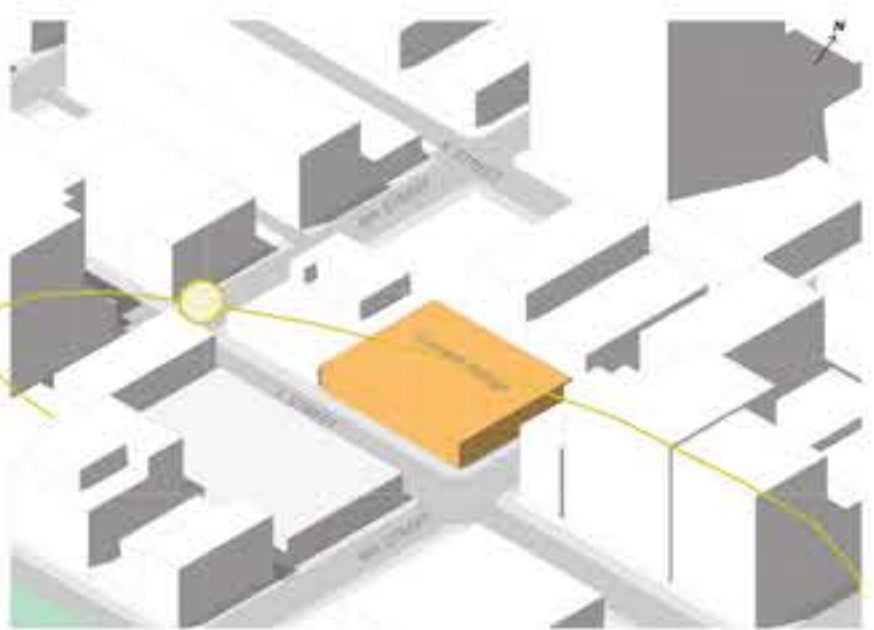
Most Mutualistic^[3]

Can we design spaces where we are faithful to insect and human architecture but overlap them?



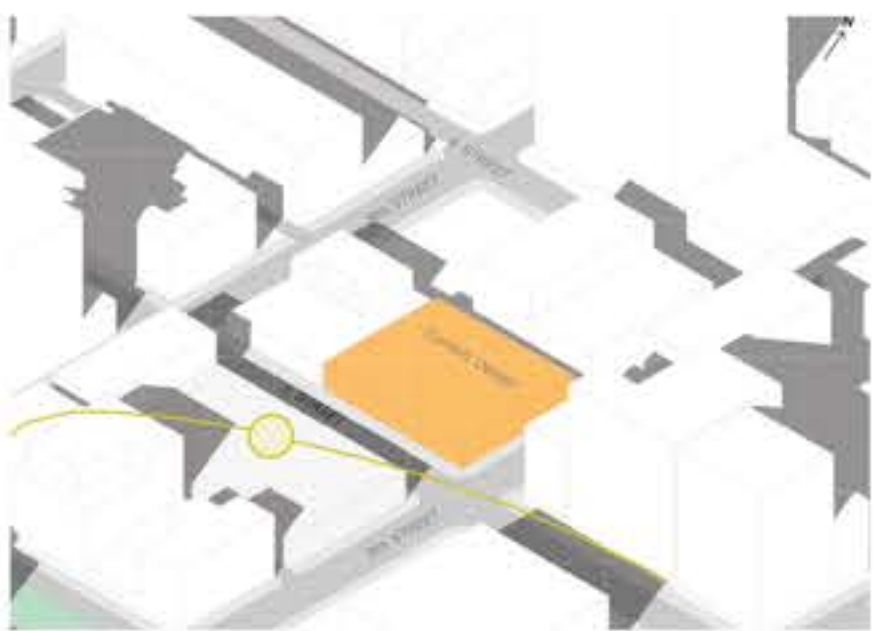
Spring Equinox
March 20th
1:15pm

Highest Altitude: 51.61°
Azimuth: 179.48°



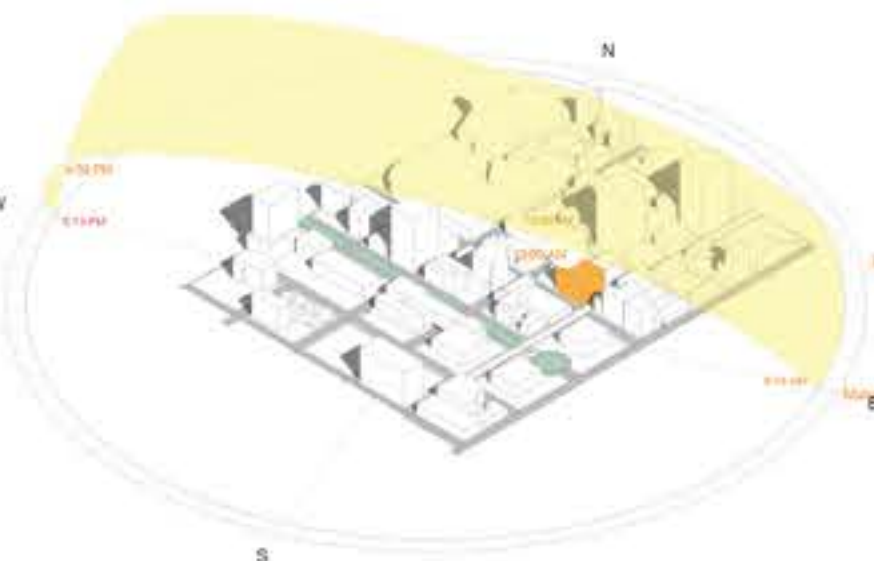
Summer Solstice
June 20th 2021
1:10pm

Highest Altitude: 74.77°
Azimuth: 181.76°



Winter Solstice
December 21st 2021
12:10pm

Highest Altitude: 27.92°
Azimuth: 179.84°



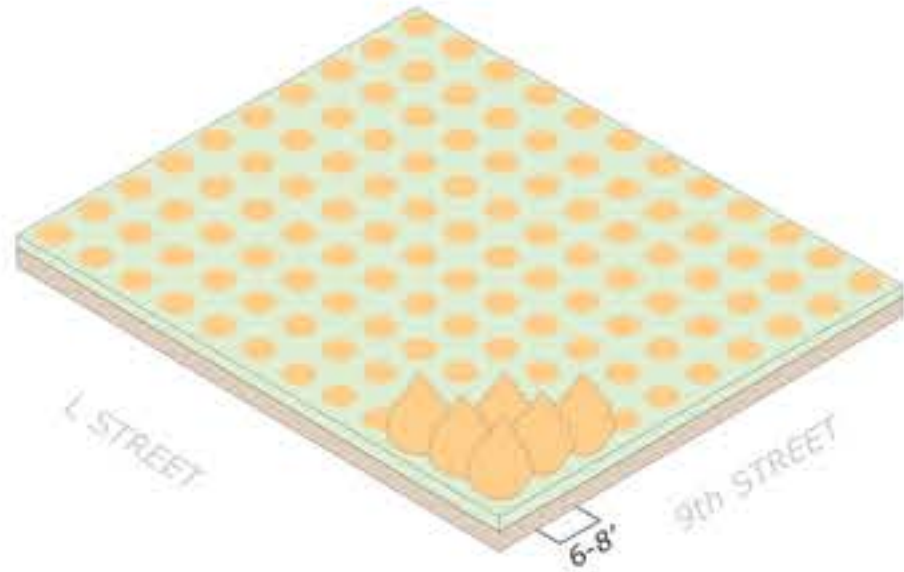
Spring Solar Study: Most Critical Time for Most Species
Proposed Height ~140'

Vegetation Squad

Insect Squad

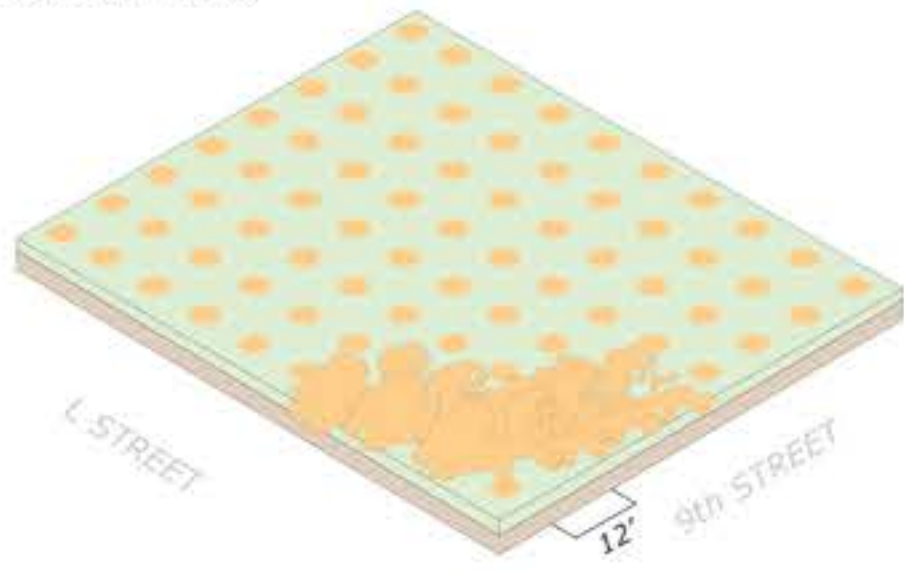
Human Squad

Tertiary Species: California Holly



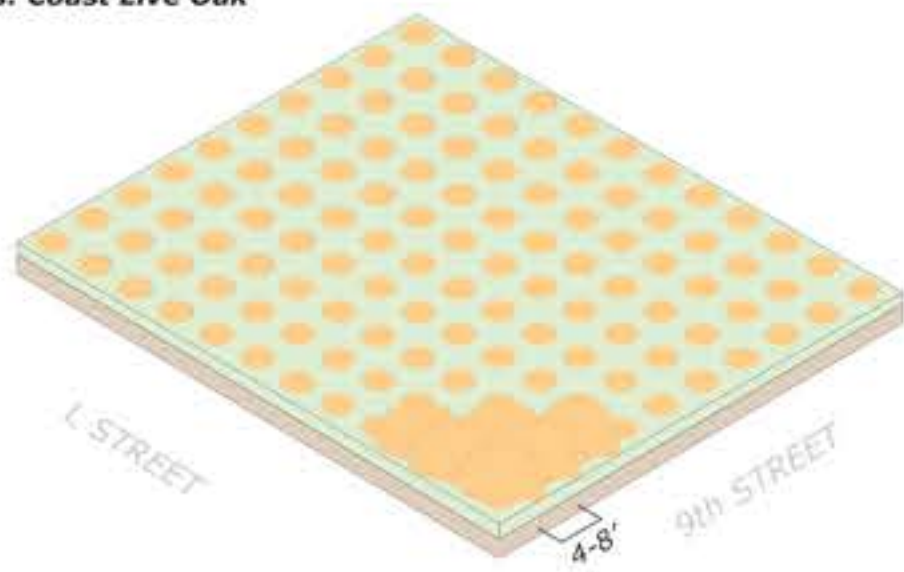
Characteristics and living conditions of **California Holly**
Exposure: Full sun to part shade
Water needs: Low
"Host to myriad insects including pollinating butterflies and moths."
"These majestic evergreen beauties are best incorporated into habitat gardens and restoration zones. Supreme slope stabilizers, they provide robust forage and habitat for California wildlife."
"Cultivating toyon can lead to all sorts of connections with wildlife, including mockingbirds, American robins, and cedar waxwings - just a handful of the birds that like to feast on the red California holly fruit."
Wells, Eleanor. "How to Grow and Care for Toyon (California Holly)." Gardeners' Path, 6 Nov. 2021, <https://gardenerspath.com/plants/california-holly/>.
mediabiz/grow-toyon/.

Tertiary Species: Coast Live Oak



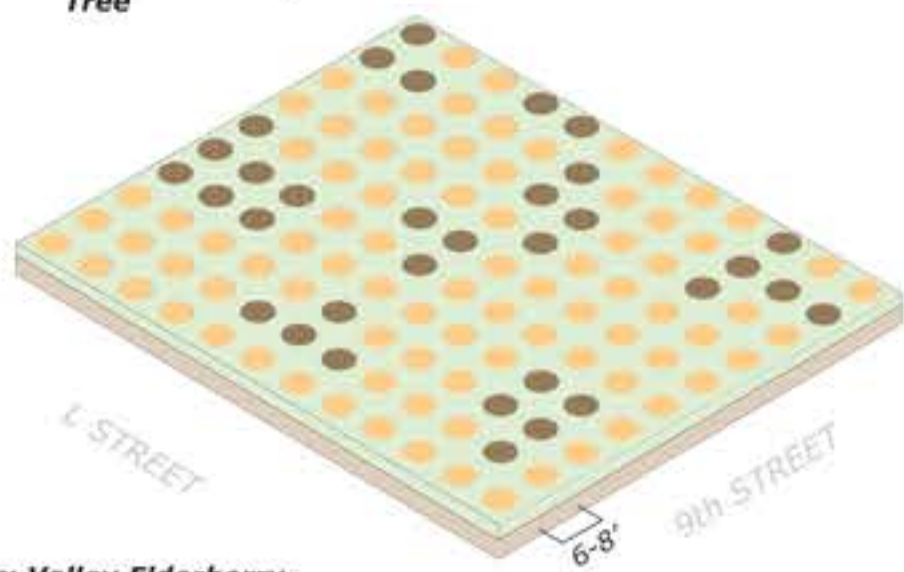
Characteristics and living conditions of **Coast Live Oak**
Diameter(trunk): 1-4"
Exposure: All day sun
Water needs: Low
"Young Coast live oak trees have proven to be highly adaptable to ornamental landscapes and will grow relatively quick when planted in well-drained soils with low to moderate amounts of supplemental water."
"This tree combines well with many California native species described in the Coast Live Oak Palette and needs ample space to mature when planted in residential gardens."
"Coast Live Oak." Island Valley Garden Planner, 15 Dec. 2020, <https://islandvalleygardenplanner.org/plants/coast-live-oak/>.

Secondary Species: Blue Elderberry Tree



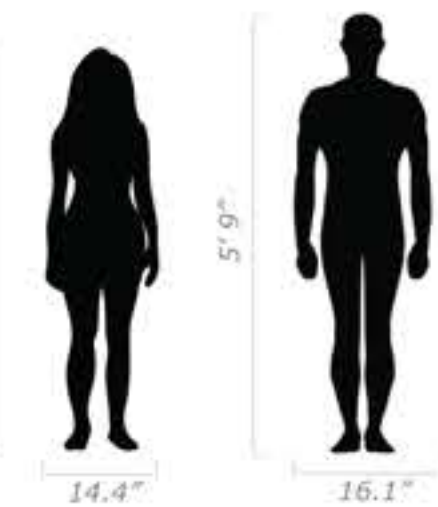
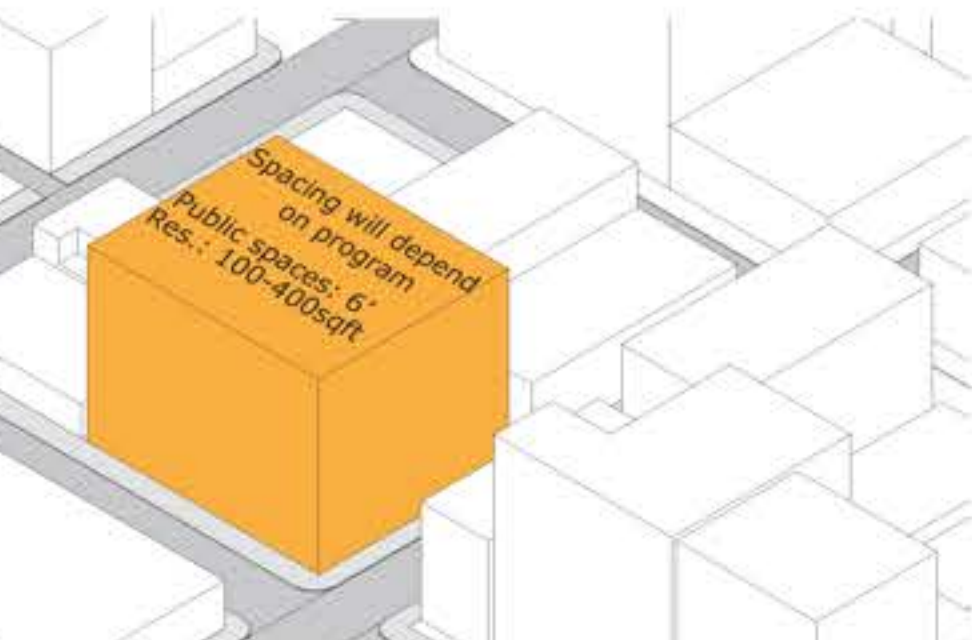
Characteristics and living conditions of **Blue Elderberry Tree**
Diameter(trunk): 1-4"
Exposure: "Plant in sun or partial shade with at least 6 hours of sun per day."
Water needs: Moderate; can adapt to drier conditions
Single Species/Multiple:
Min. Bush spacing: 4'-8"
Max. Bush size: Min. of 15'
Multi-Species Hedgerow design
Min. Bush spacing: 10'-15'
Maintaining 10' between rows
The Blue Elderberry Tree not only has a mutualistic relationship with the VELB, it also provides a lot of benefits for other species. Humans are able to use the berries as food or medicine and the leaves can help wounded animals.
"Site Selection, Preparation Ramp, Planting." University of California, Agriculture and Natural Resources, 2021, <https://ucanr.edu/sites/Eldeberry/Growing/Site/>.

Primary Species: Valley Elderberry Longhorn Beetle



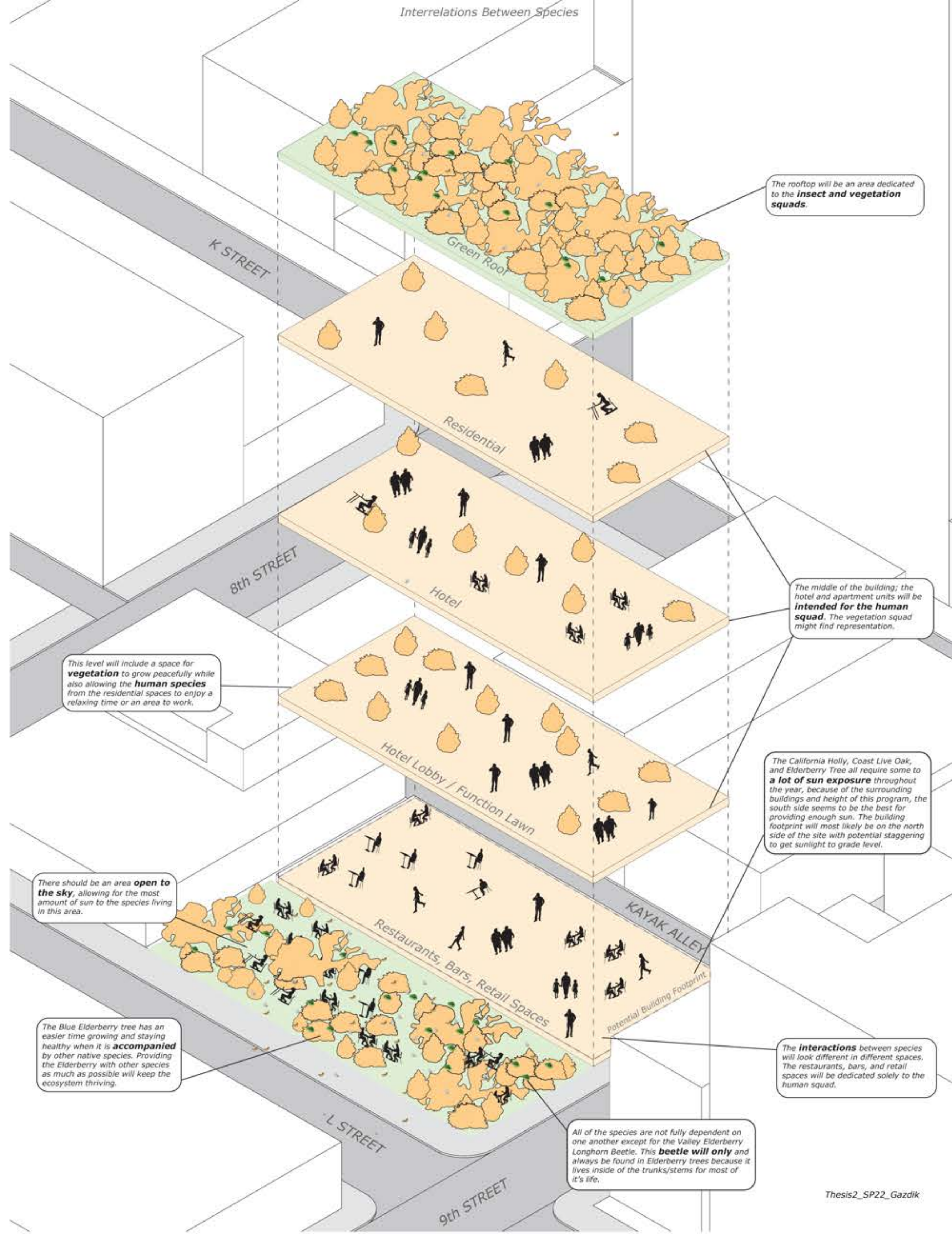
Characteristics and living conditions of **Valley Elderberry Longhorn Beetle**
Has a mutualistic relationship with the Blue Elderberry Tree, lives inside the tree as a larvae for 1-2 years until fully matured.
"Exit holes found in trunks or branches are at least 1.0 inch or greater in diameter at ground level, and in branches less than 1 meter off the ground."
"Surveys have found exit holes to more consistently occur in clumps of elderberry bushes rather than in isolated bushes. The structure of beetle populations within smaller scales were consistent with a metapopulation structure."
Wells, Eleanor. "How to Grow and Care for Toyon (California Holly)." Gardeners' Path, 6 Nov. 2021, <https://gardenerspath.com/plants/california-holly/>.
mediabiz/grow-toyon/.

Humans - Proposed Height



Characteristics and living conditions of **Resident**
Young professionals that are moving from tight spaces in big cities to larger spaces offering room to work remote.
Characteristics and living conditions of **Hotel Guest**
This could be a wide range of people; from families coming to see the museums or parks, couples coming to town for the breweries or wineries, or history junkies trying to see the old town.
Characteristics and living conditions of **Patron**
These could be any of the residents or hotel guests, plus any person that lives in the city that is looking for a restaurant, bar, or office and meeting spaces.

Interrelations Between Species



The rooftop will be an area dedicated to the **insect and vegetation squads**.

This level will include a space for **vegetation** to grow peacefully while also allowing the **human species** from the residential spaces to enjoy a relaxing time or an area to work.

The middle of the building; the hotel and apartment units will be **intended for the human squad**. The vegetation squad might find representation.

The California Holly, Coast Live Oak, and Elderberry Tree all require some to **a lot of sun exposure** throughout the year, because of the surrounding buildings and height of this program, the south side seems to be the best for providing enough sun. The building footprint will most likely be on the north side of the site with potential staggering to get sunlight to grade level.
















There should be an area **open to the sky**, allowing for the most amount of sun to the species living in this area.






The Blue Elderberry tree has an easier time growing and staying healthy when it is **accompanied** by other native species. Providing the Elderberry with other species as much as possible will keep the ecosystem thriving.
















All of the species are not fully dependent on one another except for the Valley Elderberry Longhorn Beetle. This **beetle will only** always be found in Elderberry trees because it lives inside of the trunks/stems for most of its life.



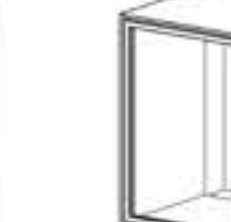
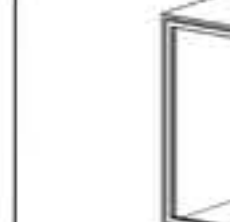
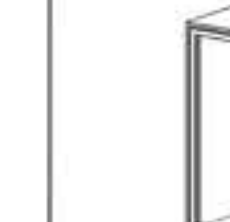










The **interactions** between species will look different in different spaces. The restaurants, bars, and retail spaces will be dedicated solely to the human squad.

Comparison Matrix

Form					
Topic	Current Proposal	Mutualism Level 1	Mutualism Level 2	Mutualism Level 3	Mutualism Level 4
Surface Area *ratio of square footage of the building footprint to total surface area of facade. The more amount of surface means a higher chance for insects to inhabit	 current design has a 3:1 ratio of surface area to building footprint	level 1 can be obtained if there is at least a 3:2 ratio of surface area to building footprint  ex: add height	level 2 can be obtained if there is at least a 3:3 ratio of surface area to building footprint  ex: add balconies	level 3 can be obtained if there is at least a 3:4 ratio of surface area to building footprint  ex: more protrusion	level 4 can be obtained if there is at least a 3:5 ratio of surface area to building footprint  ex: splitting building
Orientation *percentage of facade that gets direct sun at any point of the day. Vegetation and insects benefit from direct sunlight	 current design has 35% of the facade receiving direct sun	level 1 can be obtained if there is at least 40% of the facade receiving direct sun  ex: push south side in	level 2 can be obtained if there is at least 50% of the facade receiving direct sun  ex: angle facades toward sun	level 3 can be obtained if there is at least 60% of the facade receiving direct sun  ex: north side of facade gets smaller	level 4 can be obtained if there is at least 70% of the facade receiving direct sun  ex: building twists on site for optimal sun
Overhangs *building massing creates dark space for insects to reside. The more amount of dark space obtained, the higher the rating.	 current design has 5 separate overhangs.	level 1 can be obtained if there are at least 6 overhangs  ex: add at grade	level 2 can be obtained if there are at least 7 overhangs  ex: on roof	level 3 can be obtained if there are at least 8 overhangs  ex: on facade	level 4 can be obtained if there are at least 9 overhangs  ex: use building

Material					
Topic	Current Proposal	Mutualism Level 1	Mutualism Level 2	Mutualism Level 3	Mutualism Level 4
Opaque vs. Transparent *percentage of amount of opaque to transparent material. Opaque material has the ability to host, while transparent does not	 current design has 23% of opaque materials used	level 1 can be obtained if there is at least 40% of opaque material  ex: stacking materials	level 2 can be obtained if there is at least 50% of opaque material  ex: different materials/colors	level 3 can be obtained if there is at least 60% of opaque material  ex: glazing is used as accents	level 4 can be obtained if there is at least 70% of opaque material  ex: strategic openings
Color *the lighter the hue, the better the score. Insects are most attracted to lighter colors, making it easier for them to circulate	 current design has very little dark colors	level 1 can be obtained if building has no dark colors  ex: different materials/colors	level 2 can be obtained if building has is no darker than yellow  ex: different materials/colors	level 3 can be obtained if building has is no darker than beige  ex: different materials/colors	level 4 can be obtained if the building is white  ex: different materials/colors
Reflectivity *amount of reflective material on building/site. Reflective material can disorientate insects.	 current design has 80% of reflective material	level 1 can be obtained if there is at least 70% of material was reflective  ex: replace aluminum with other material	level 2 can be obtained if there is at least 60% of material was reflective  ex: wood	level 3 can be obtained if there is at least 50% of material was reflective  ex: brick	level 4 can be obtained if there is at least 40% of material was reflective  ex: concrete

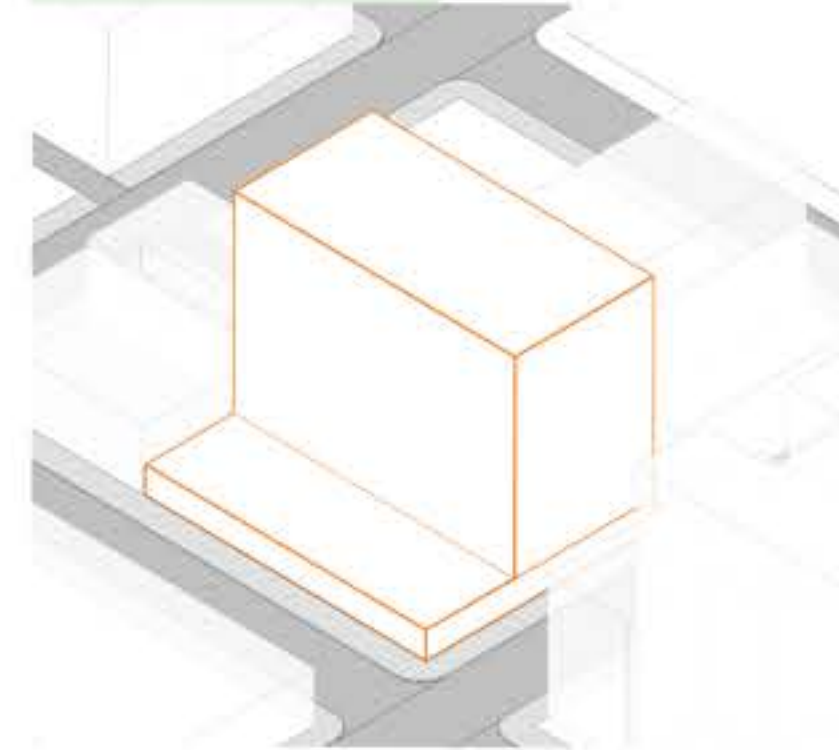
Greenspace					
Topic	Current Proposal	Mutualism Level 1	Mutualism Level 2	Mutualism Level 3	Mutualism Level 4
Gray vs. Green *ratio of gray infrastructure to green infrastructure	 current design has 33x the amount of gray infrastructure than green	level 1 can be obtained if there is at 30x the amount of gray to green infrastructure 	level 1 can be obtained if there is at 25x the amount of gray to green infrastructure 	level 1 can be obtained if there is at 20x the amount of gray to green infrastructure 	level 1 can be obtained if there is at 15x the amount of gray to green infrastructure 
Amount *number of green spaces on site. Having more can bring different habitats and more diversity.	 current design has 8 separate green spaces on the site	level 1 can be obtained if there is at least 9 separate greenspaces on the site  ex: more on grade	level 2 can be obtained if there is at least 10 separate greenspaces on the site  ex: add to roof	level 3 can be obtained if there is at least 11 separate greenspaces on the site  ex: green walls	level 4 can be obtained if there is at least 12 separate greenspaces on the site  ex: different levels
Proximity to building *distance of greenspace from building. Smaller the distance, the easier it will be for insects to utilize building facade as places to reside	 current design has a green space that is located on building, a few feet from an entrance	level 1 can be obtained if the greenspace is connected to the entrance from the exterior 	level 2 can be obtained if the greenspace is passing through the entrance from the exterior 	level 3 can be obtained if the greenspace is passing through the entrance from the exterior over 5' 	level 4 can be obtained if the difference between exterior and interior are not distinguishable  ex: Semaphore

Aesthetics					
Topic	Current Proposal	Mutualism Level 1	Mutualism Level 2	Mutualism Level 3	Mutualism Level 4
Window inset *square footage for insect; the more amount of dark space that is there is, the more space for residence	 current design has a slight inset, at the deepest being 1'	level 1 can be obtained if there is at least 2' of inset  2'	level 2 can be obtained if there is at least 3' of inset  3'	level 3 can be obtained if there is at least 4' of inset  4'	level 4 can be obtained if there is at least 5' of inset  5'
Texture *the more spaces embedded in the facade of the building for insects to live will gain higher rating	 current design uses 1 textured material out of 5	level 1 can be obtained if at least 2 materials used are textured  ex: Brick	level 2 can be obtained if at least 3 materials used are textured  ex: Stone	level 3 can be obtained if at least 4 materials used are textured  ex: Concrete	level 4 can be obtained if at least 5 materials used are textured  ex: Wood
Ecosystem *the number of different species are on the site. The higher the number, the higher the rating	 current design has 4 intended species on the site	level 1 can be obtained if there is at least 5 intended species on site  ex: Addition of Elderberry	level 2 can be obtained if there is at least 6 intended species on site  ex: Introduction of VELB	level 3 can be obtained if there is at least 7 intended species on site  ex: Addition of California Holly	level 4 can be obtained if there is at least 8 intended species on site  ex: Addition of Coast Live Oak

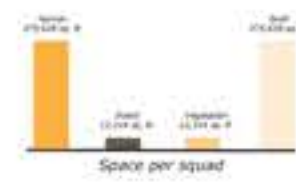
MASSING

ORIENTATION

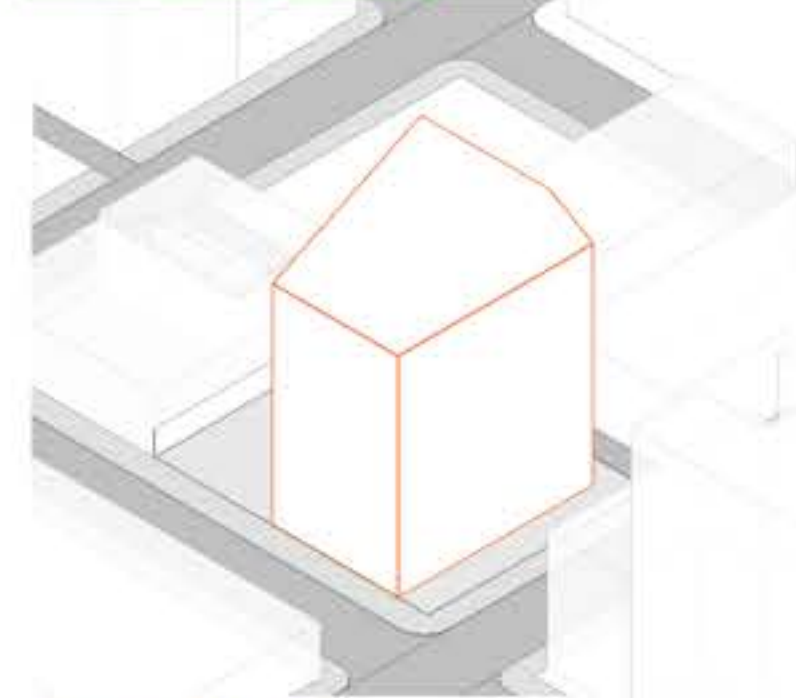
MUTUALISM LEVEL 1



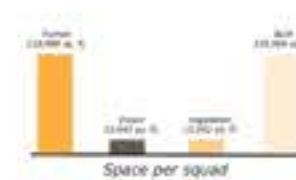
By getting rid of the "L" shape, the function lawn can get sunlight, as well as all of the south facade now.



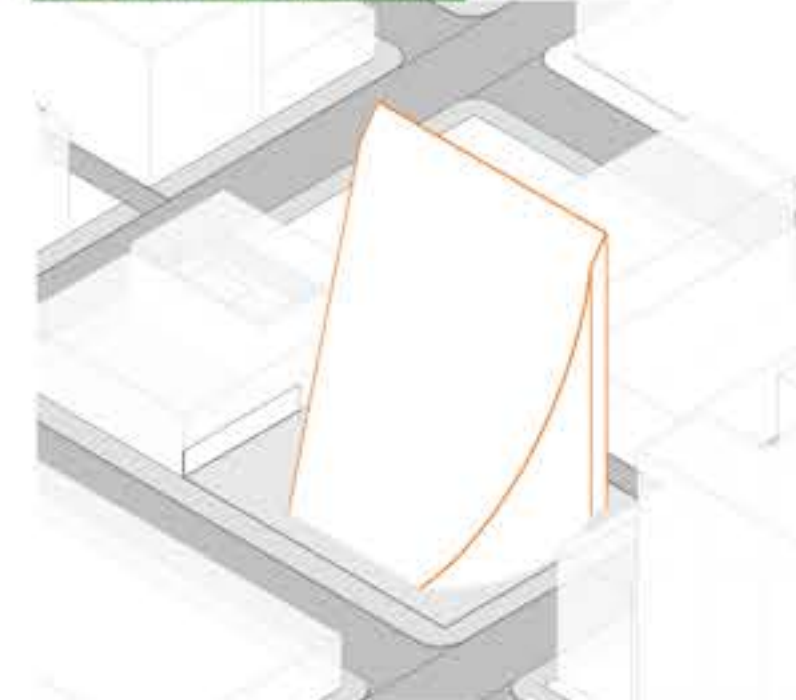
MUTUALISM LEVEL 4



By slanting the west wall, it becomes visible to direct sunlight; making the west, south, and east walls all receiving direct sunlight at some point during the day.



ULTIMATE MUTUALISM

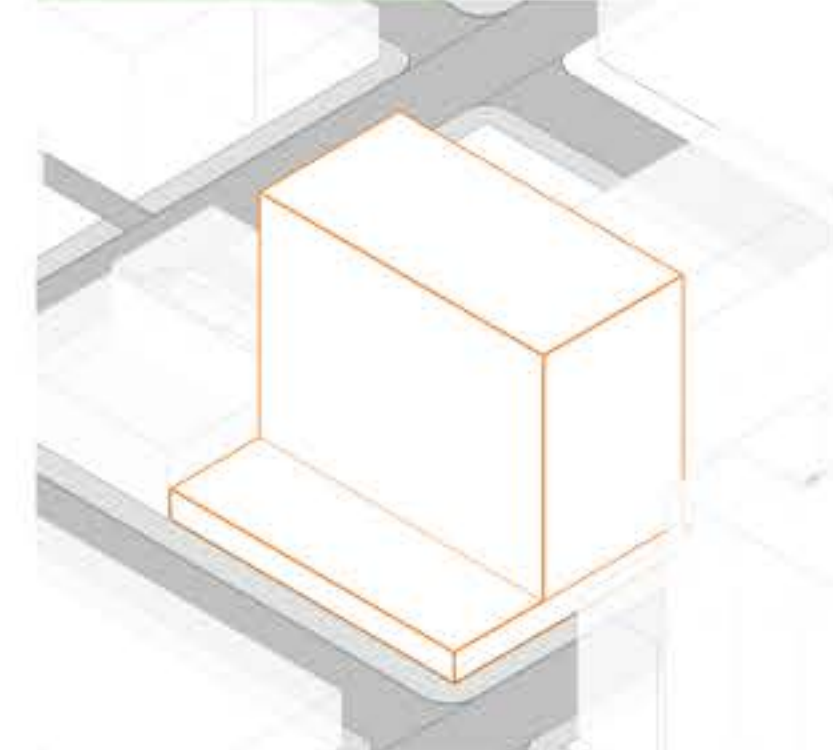


To achieve more direct sunlight the south facade will want to turn up to the sun. The footprint of the building is circular, following the sun path.

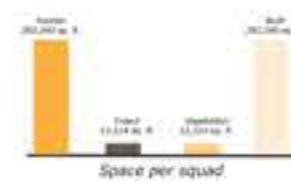


SURFACE AREA

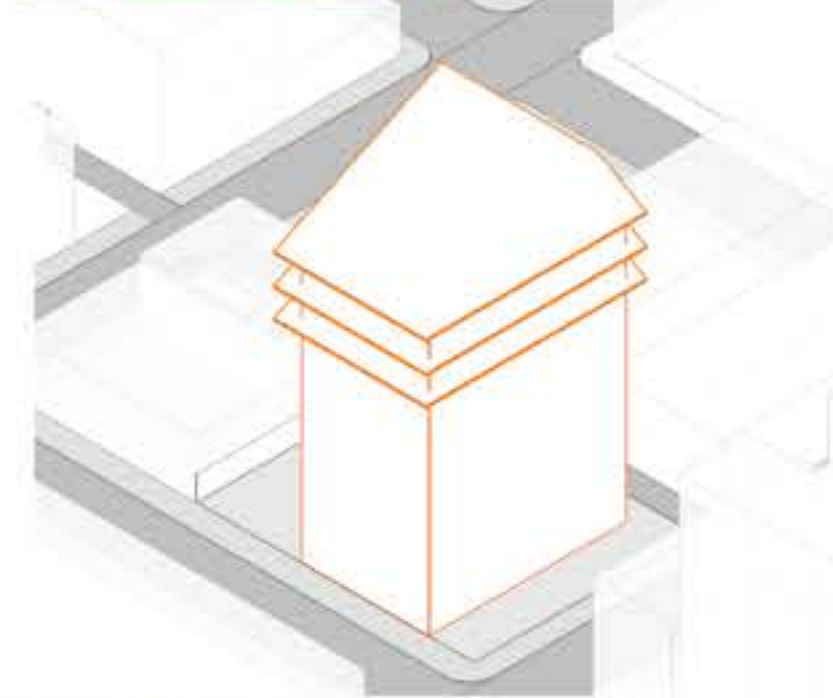
MUTUALISM LEVEL 1



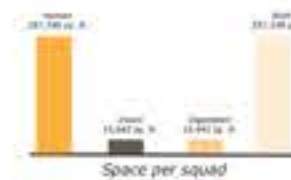
Increasing the height of the building will add more surface area.



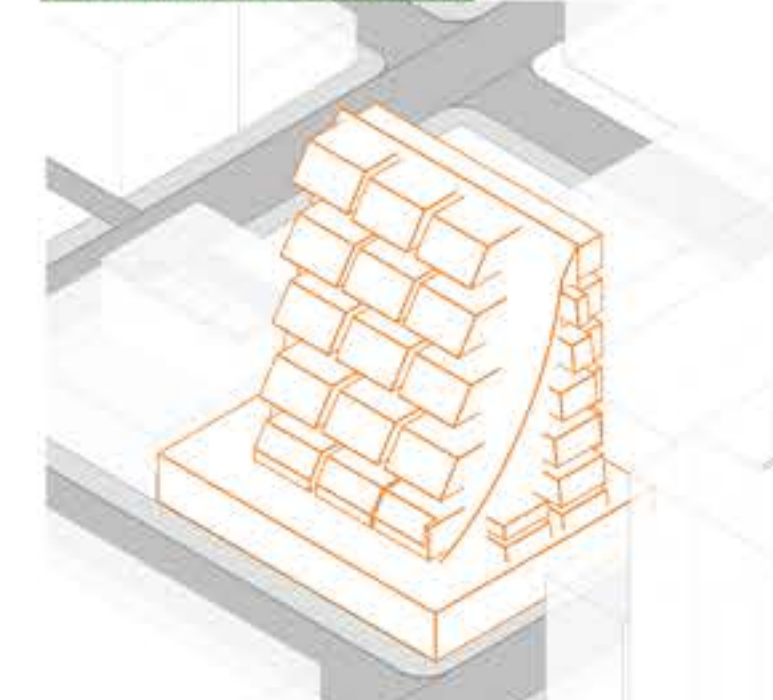
MUTUALISM LEVEL 4



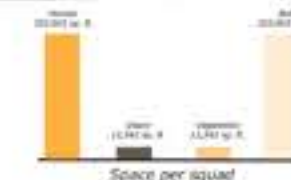
Increasing the height and creating a number of larger canopies will add more surface area.



ULTIMATE MUTUALISM

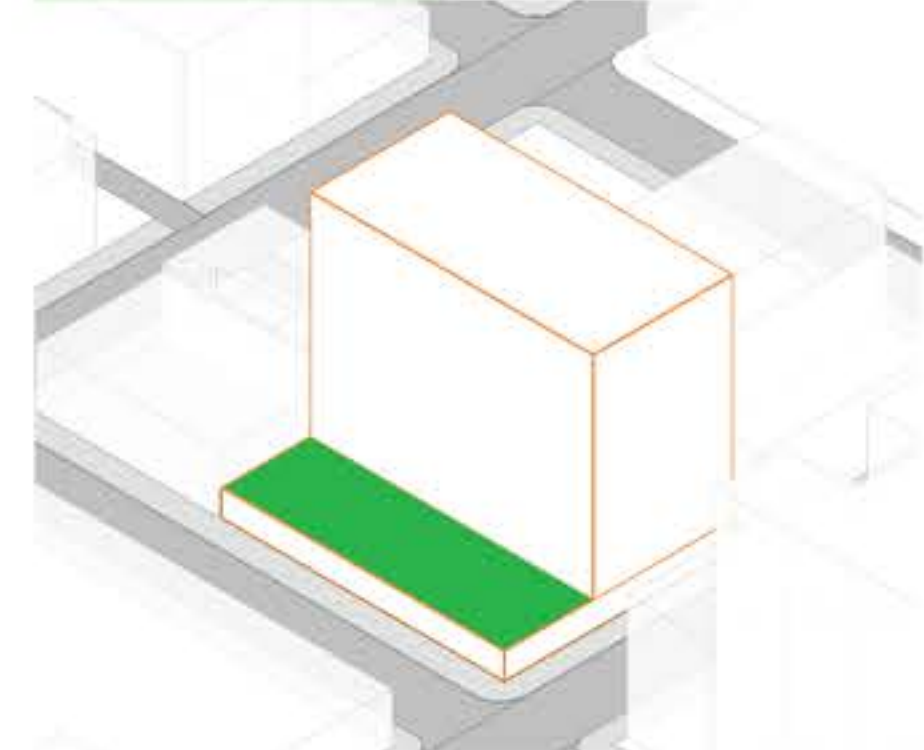


By adding extrusions off the facade and a base, it begins to add more surface area.

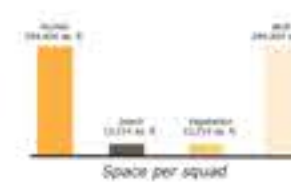


GRAY VS. GREEN

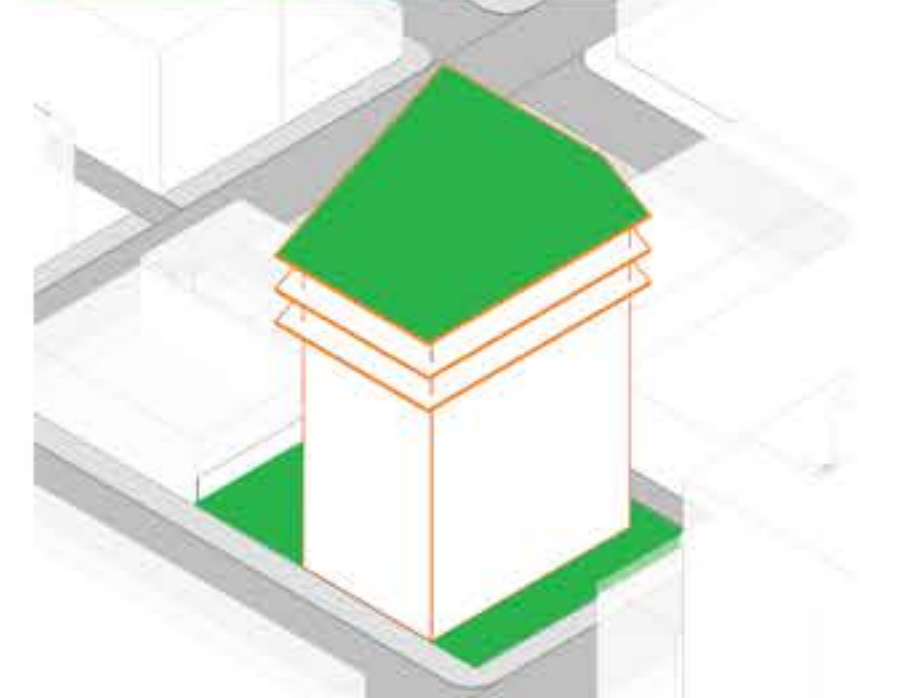
MUTUALISM LEVEL 1



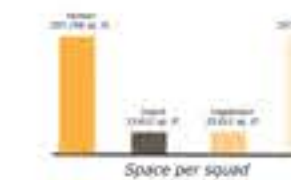
By changing the shape of the mass, the greenspace of the function lawn is able to become larger.



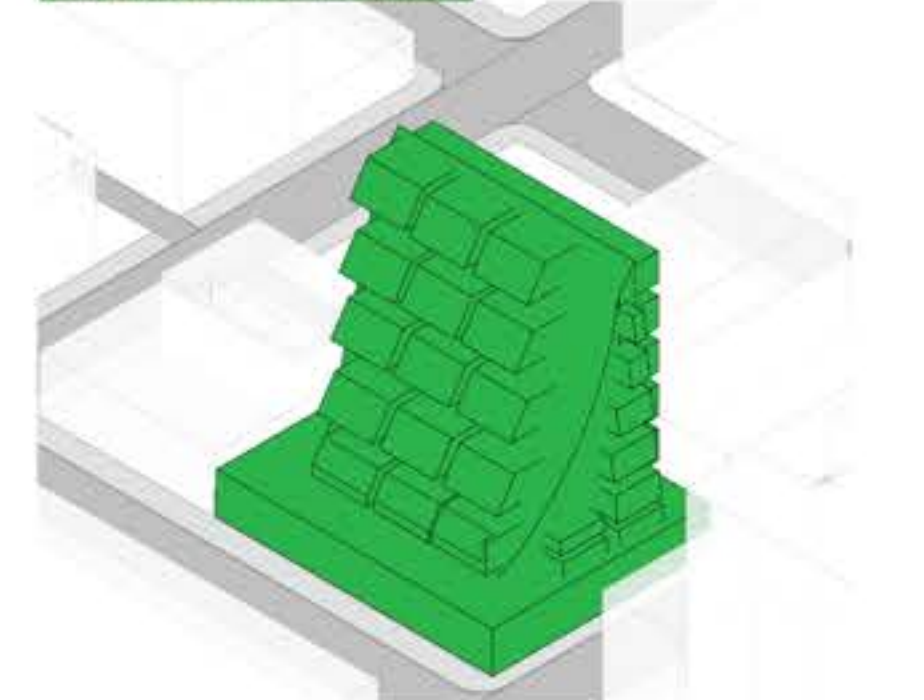
MUTUALISM LEVEL 4



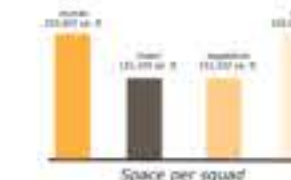
Utilizing the new extended canopy to house vegetation will create more greenspace.



ULTIMATE MUTUALISM

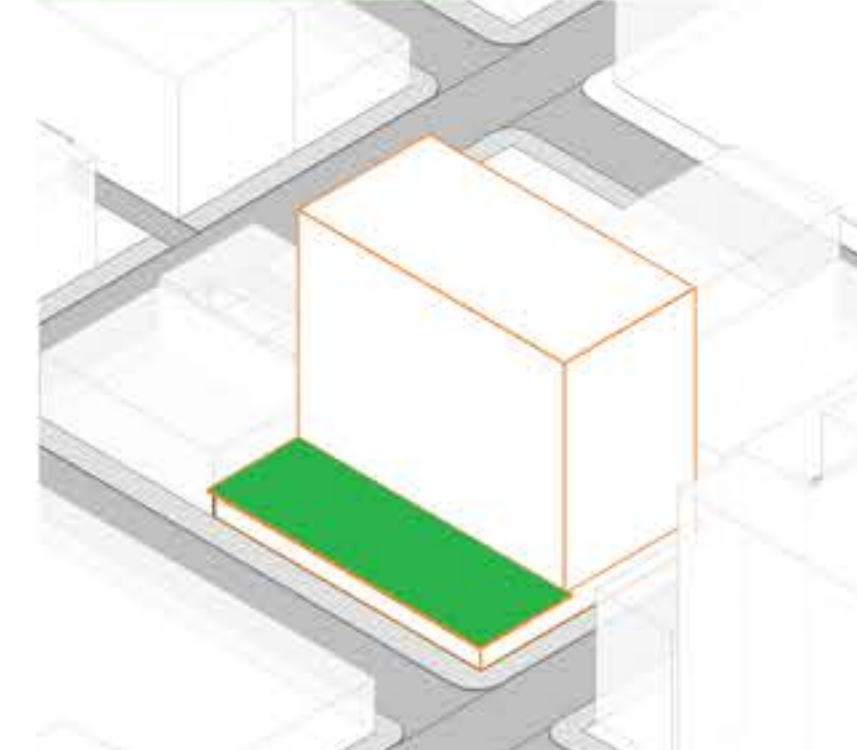


The whole facade could be covered in vertical gardens.

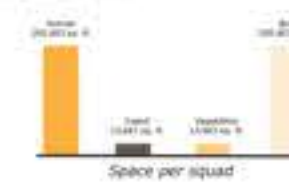


OVERHANGS

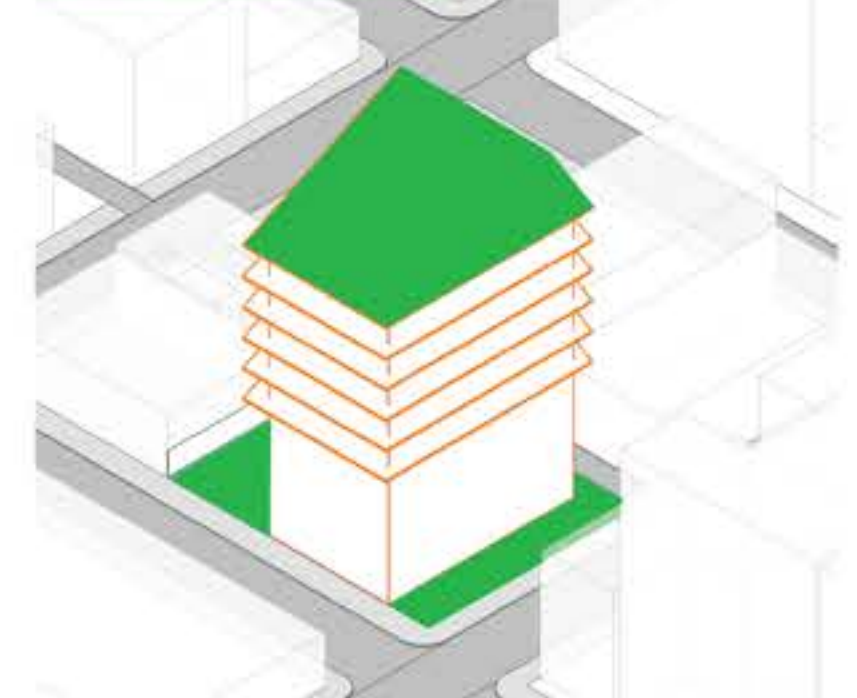
MUTUALISM LEVEL 1



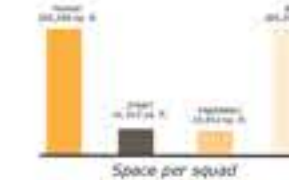
By creating a new overhang for the function lawn, a bigger lawn is made, and options for insects to reside under increases.



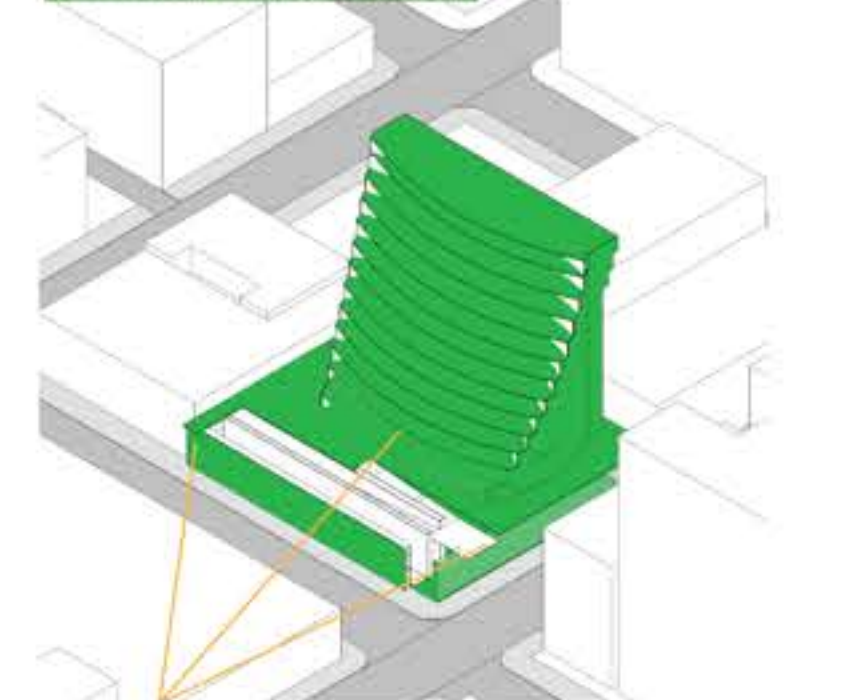
MUTUALISM LEVEL 4



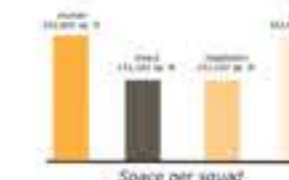
By creating more overhangs on the building, creates more places for insects to reside.



ULTIMATE MUTUALISM

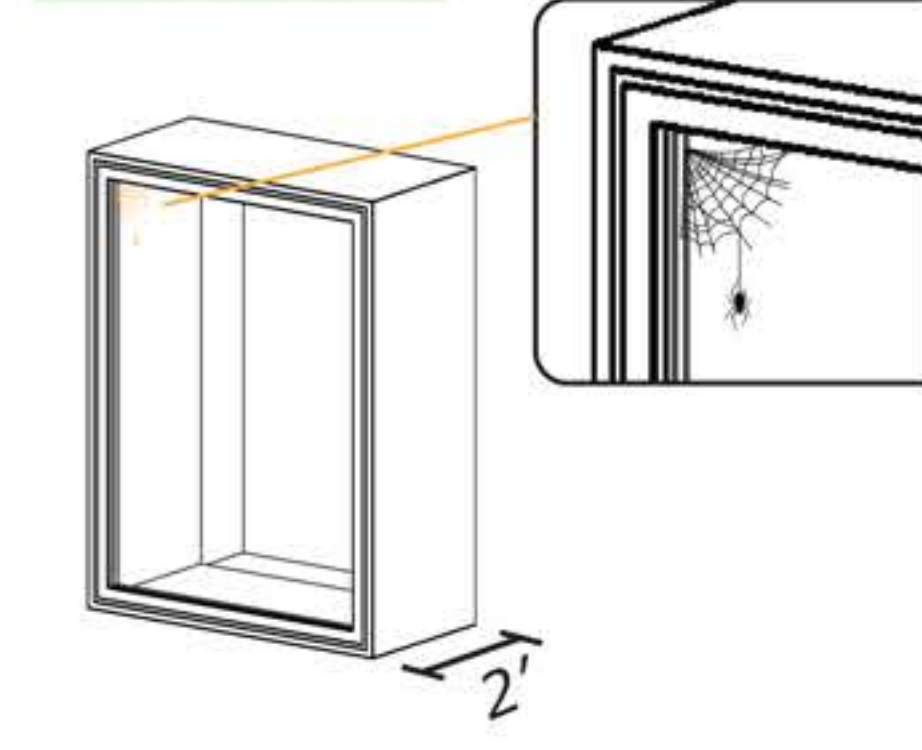


Overhangs begin to take over the south facade, and the function lawn begin to overhang where it can over the ramp.

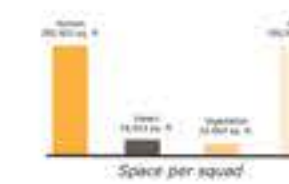


WINDOW INSET

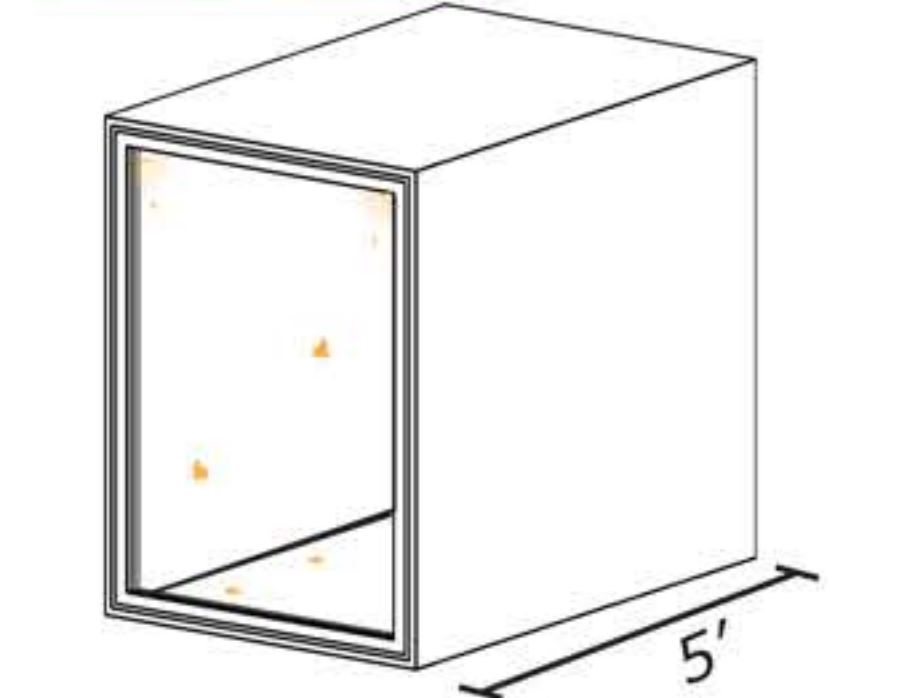
MUTUALISM LEVEL 1



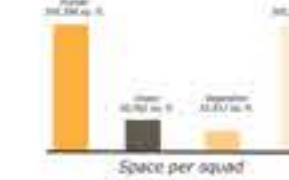
Whenever there is a window in the design, creating a 2' inset will allow for insects to reside in these dark spaces.



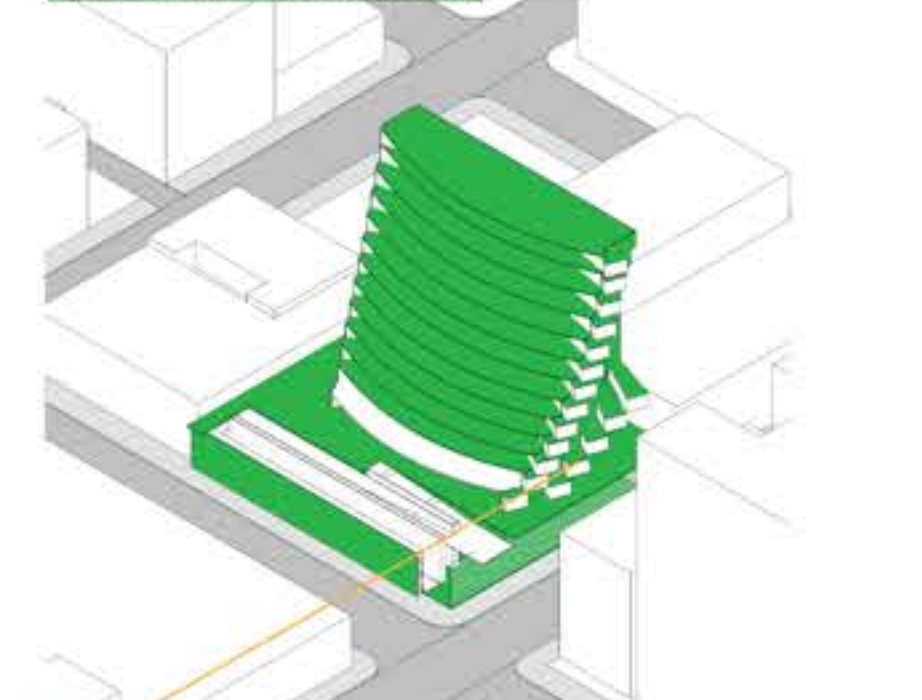
MUTUALISM LEVEL 4



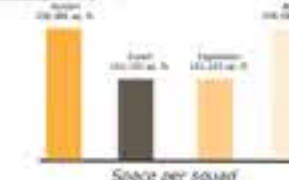
Whenever there is a window in the design, creating a 5' inset will allow for more insects to reside in these dark spaces.



ULTIMATE MUTUALISM

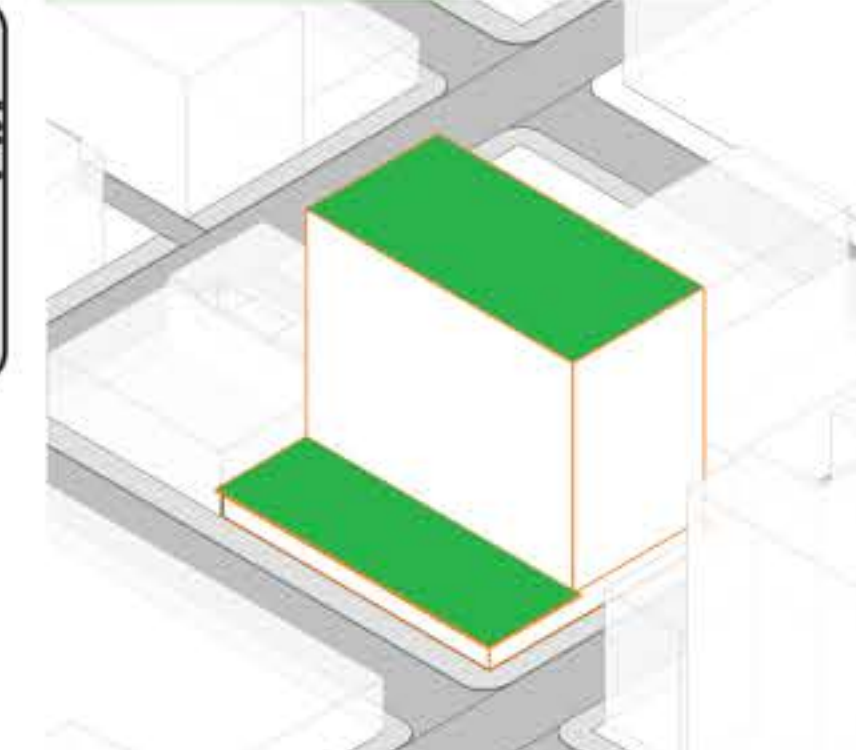


Balconies for the residents and hotel guests are added to the east, west, and south facade.

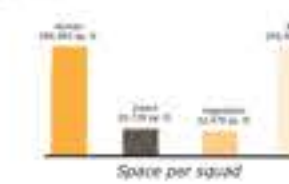


AMOUNT

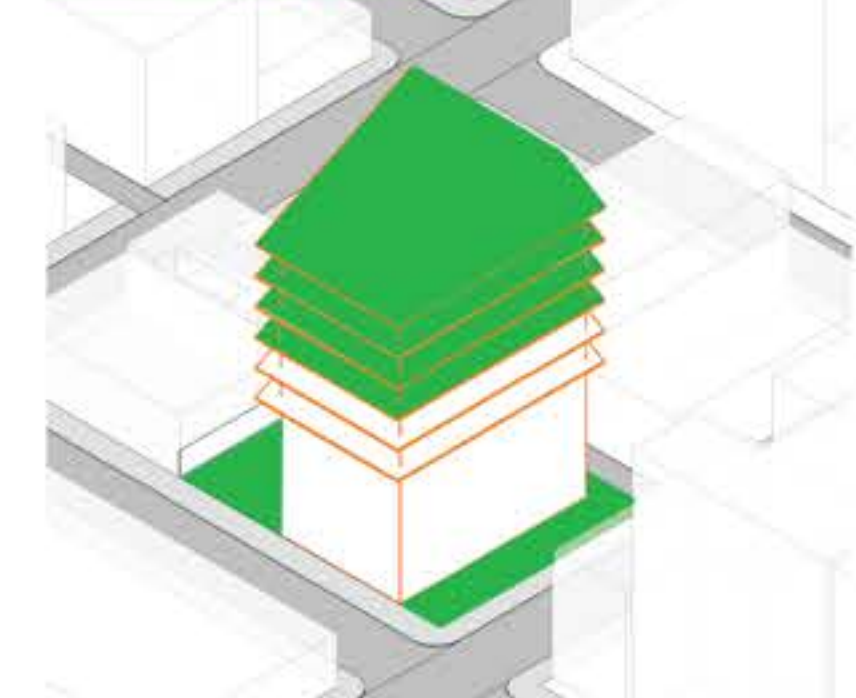
MUTUALISM LEVEL 1



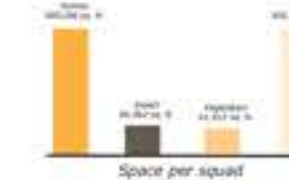
Creating a greenspace on the roof that is only dedicated to insects and vegetation.



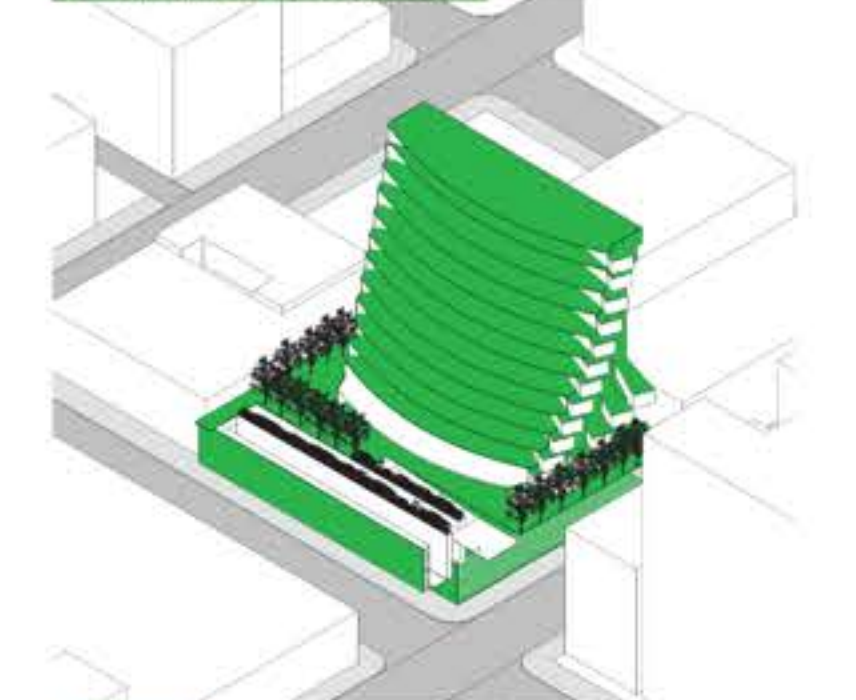
MUTUALISM LEVEL 4



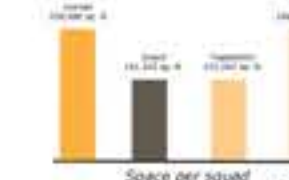
By adding more greenspace to the terraces on the apartment floors, provide more space for vegetation but also insects.



ULTIMATE MUTUALISM



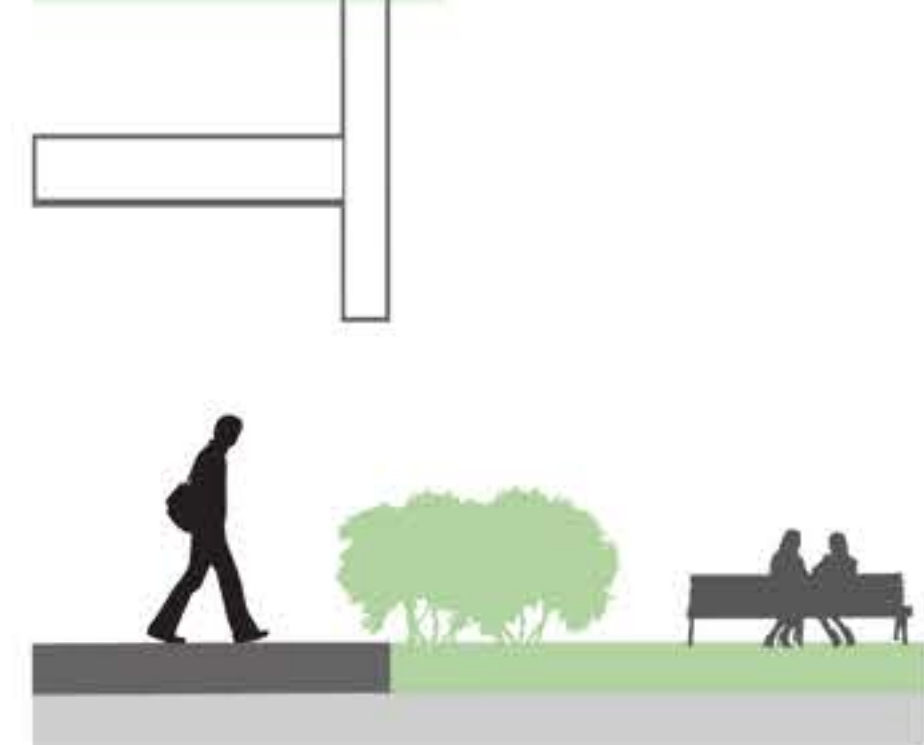
Vegetation is placed around all of site; most of it is there to protect the insects from the toxins. The trees act like a second layer before hitting the function lawn.



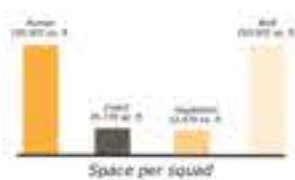
DETAILING

PROXIMITY TO BUILDING

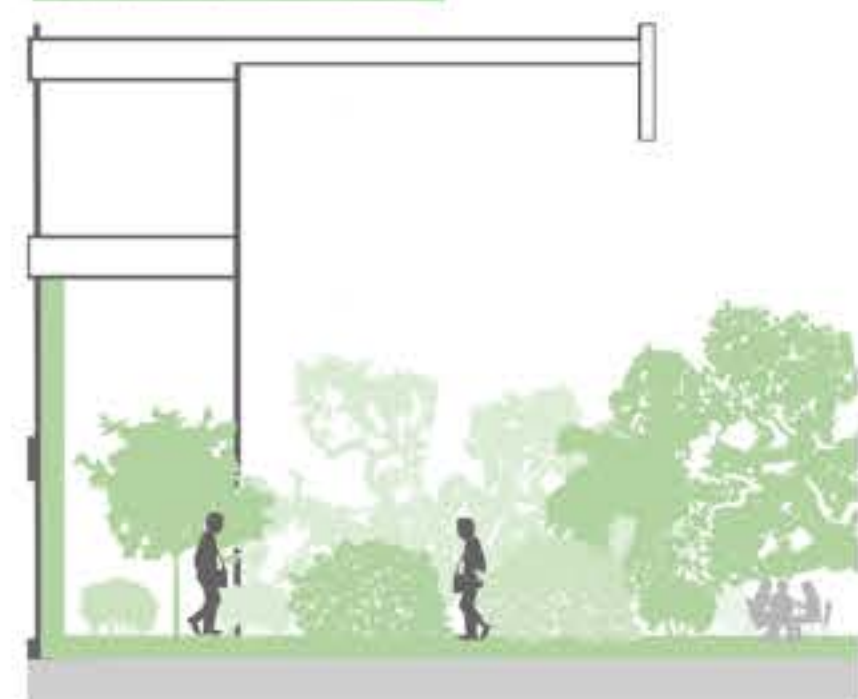
MUTUALISM LEVEL 1



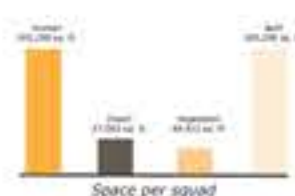
Opening up the wall to the function lawn will start to allow vegetation to come closer to the interior.



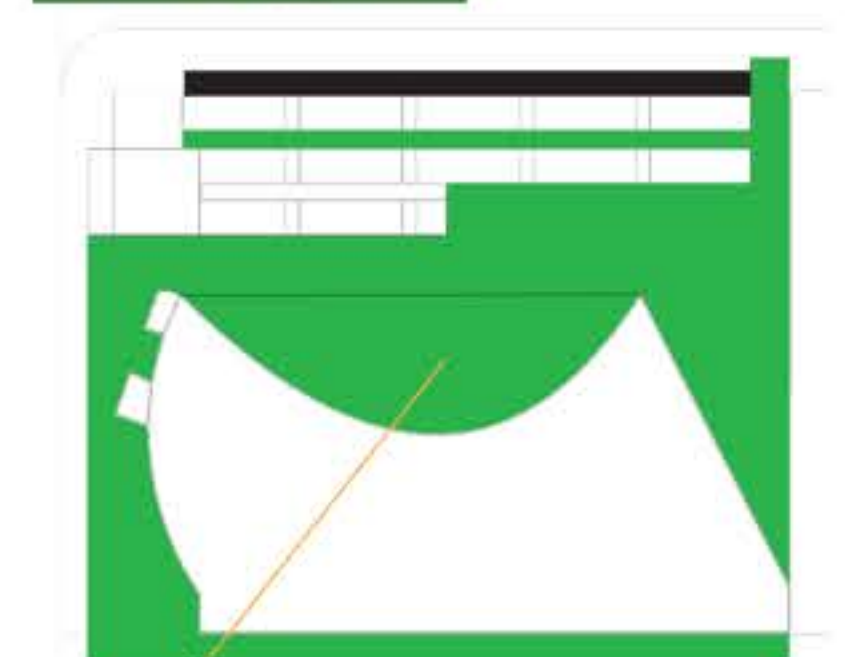
MUTUALISM LEVEL 4



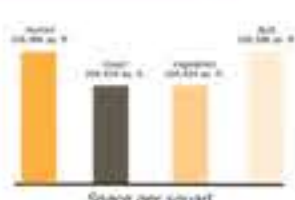
By bringing the greenspace into the first floor, it provides more space for vegetation and insects.



ULTIMATE MUTUALISM



On every floor there will be a plant nursery, this will have a glass wall facing the hotel rooms/apartments, while the area stretches into the exterior.

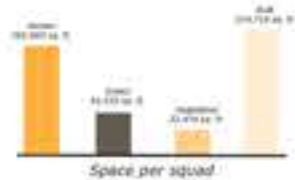


TEXTURE

MUTUALISM LEVEL 1



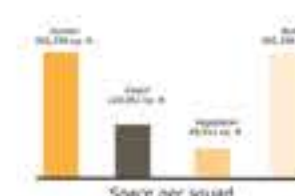
By creating a textured wall on around the rooftop, insects are able to start to reside in the wall.



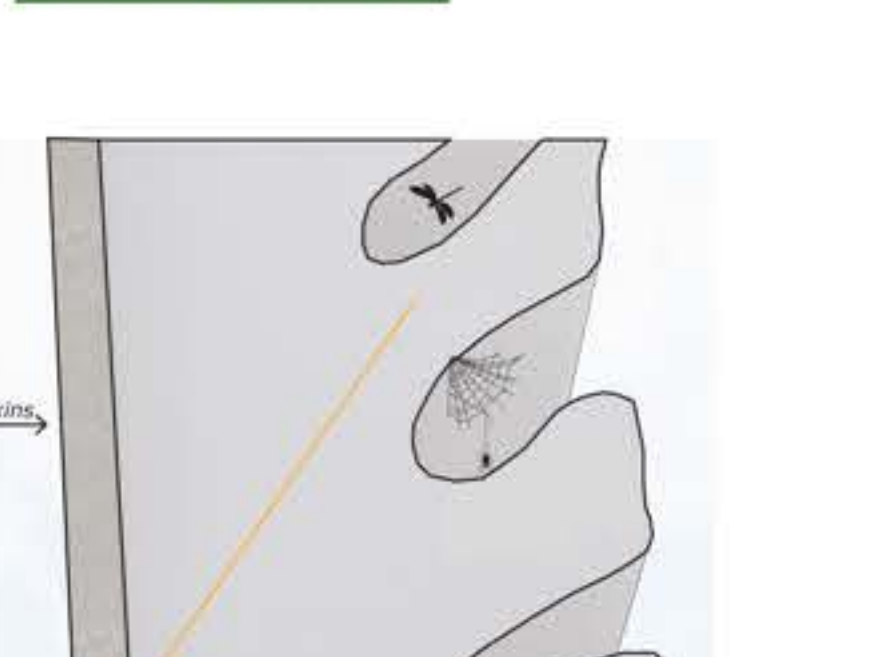
MUTUALISM LEVEL 4



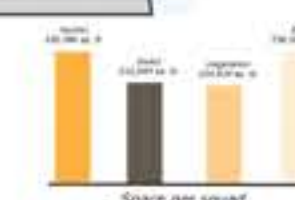
By replacing current cladding with materials that are more textured, it provides more space for insects.



ULTIMATE MUTUALISM



A textured wall will be placed to help eliminate toxins from cars to get onto site. Wall could house insects

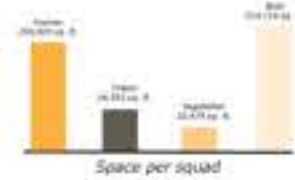


ECOSYSTEM

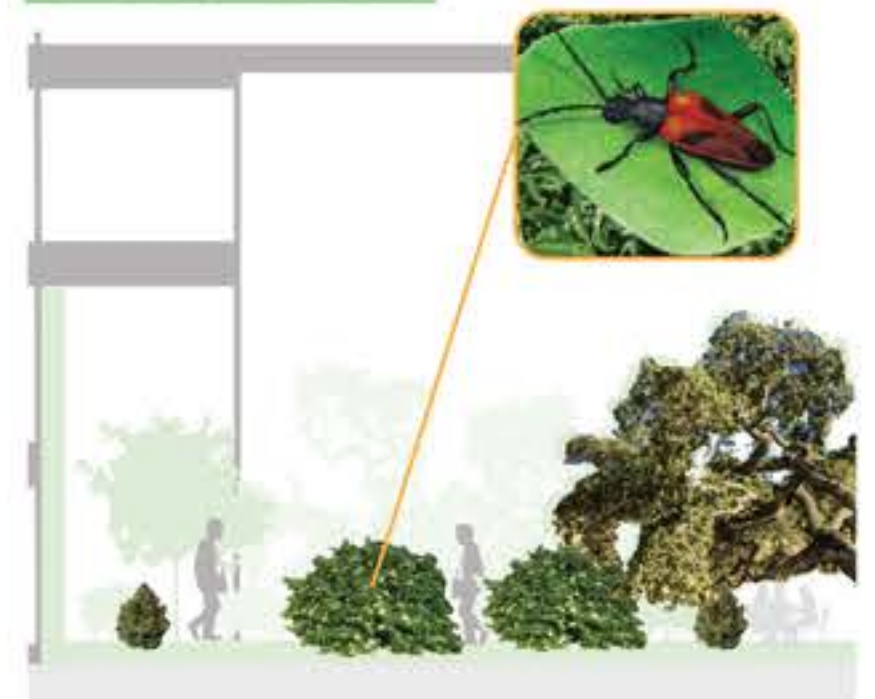
MUTUALISM LEVEL 1



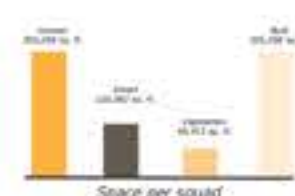
The addition of the Blue Elderberry tree, the secondary species will begin to grow the current ecosystem on the site.



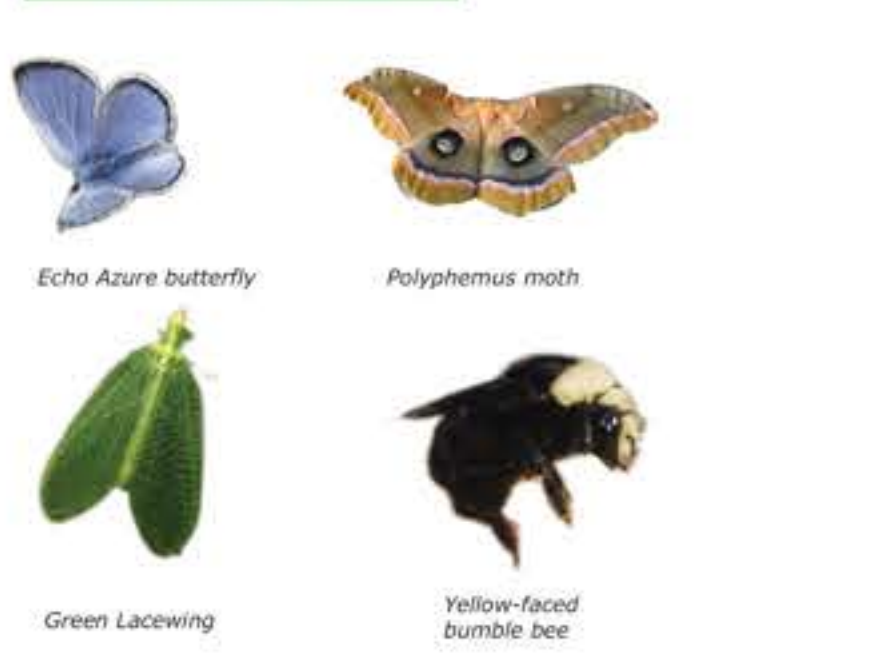
MUTUALISM LEVEL 4



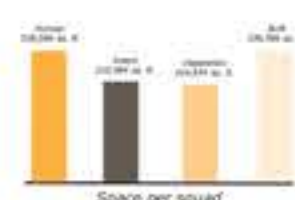
The addition of the VELB, primary species, the California Holly, and the Coast Live Oak, both tertiary species, will continue to build the ecosystem.



ULTIMATE MUTUALISM

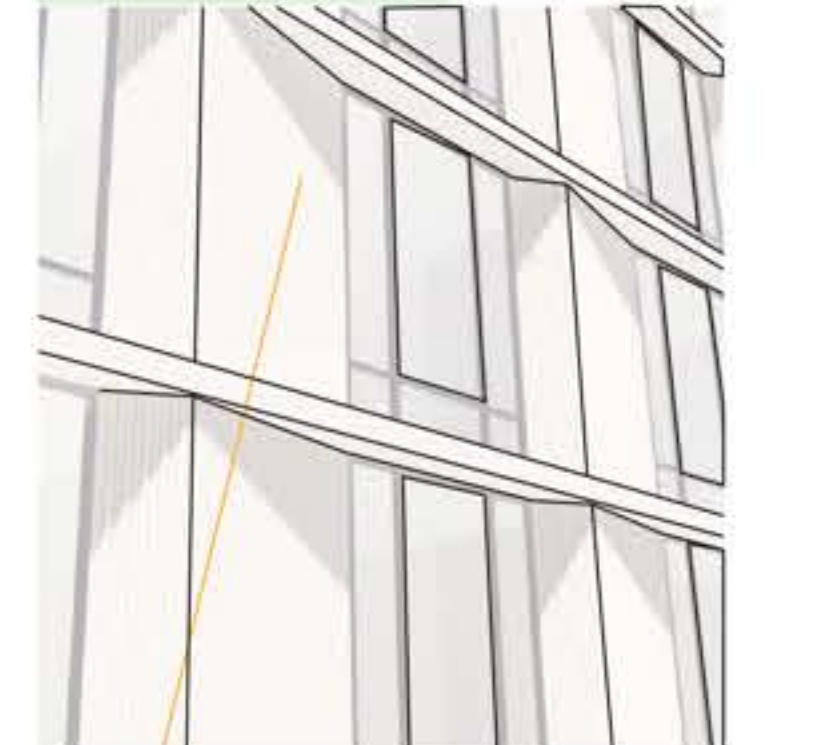


Other native species will populate the site; these species in particular are ones that will help the secondary and tertiary species.

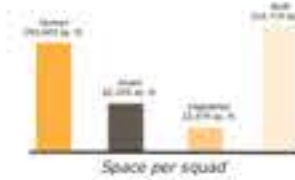


OPAQUE VS. TRANSLUCENT + REFLECTIVITY

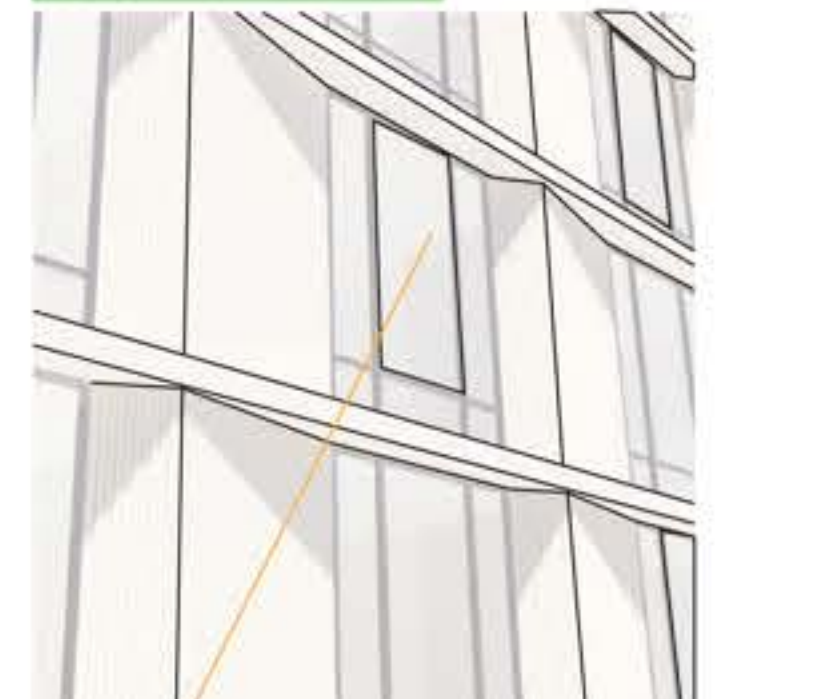
MUTUALISM LEVEL 1



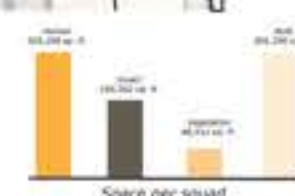
By decreasing the size of the windows, the amount of translucent material compared to opaque decreases.



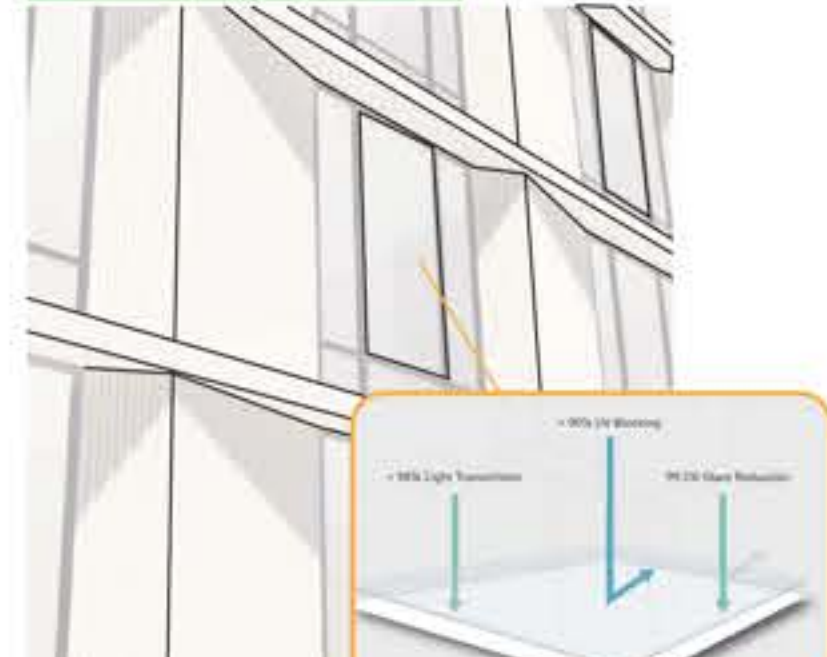
MUTUALISM LEVEL 4



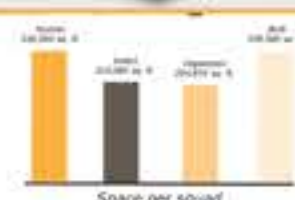
Taking away most of the windows in the hotel and apartment units, 1 window per room.



ULTIMATE MUTUALISM



Any glazing that is left on the building becomes anti reflective glass.

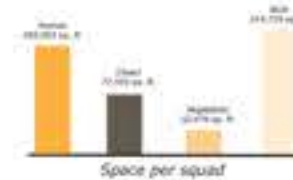


COLOR

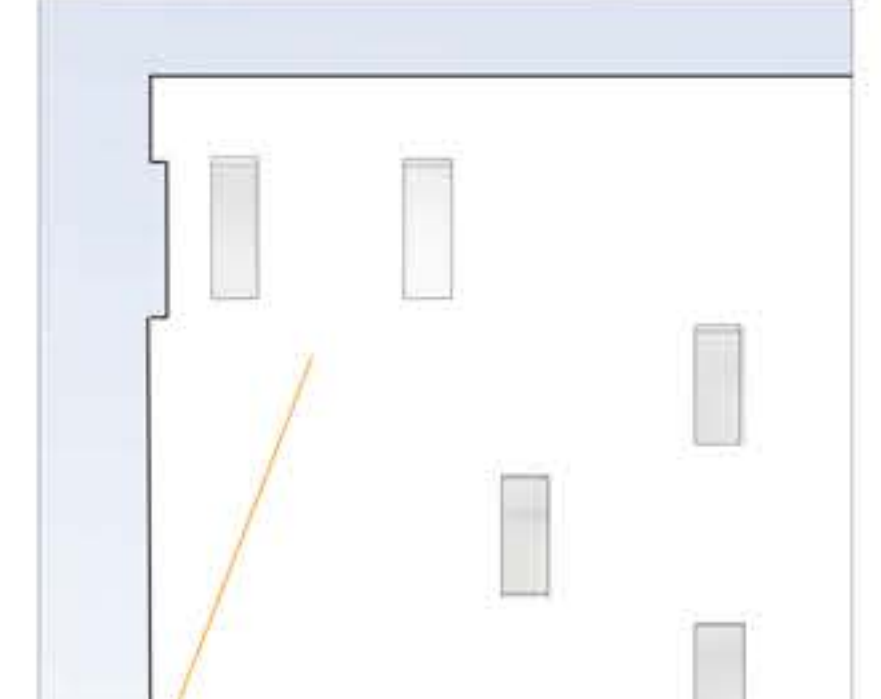
MUTUALISM LEVEL 1



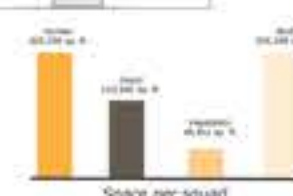
Changing the color of the dark gray metal to white, will attract more insects to the facade.



MUTUALISM LEVEL 4



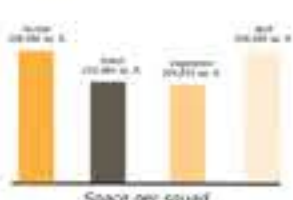
Changing the color of the dark gray metal to white, will attract more insects to the facade.



ULTIMATE MUTUALISM

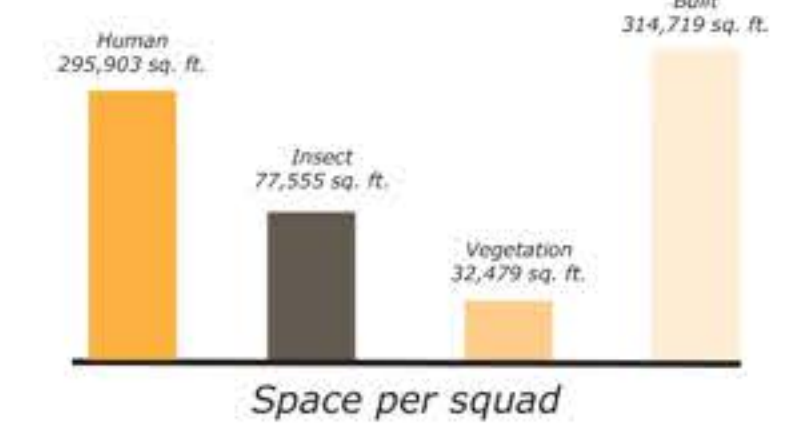


The colors of the facade become all natural, greens and browns.



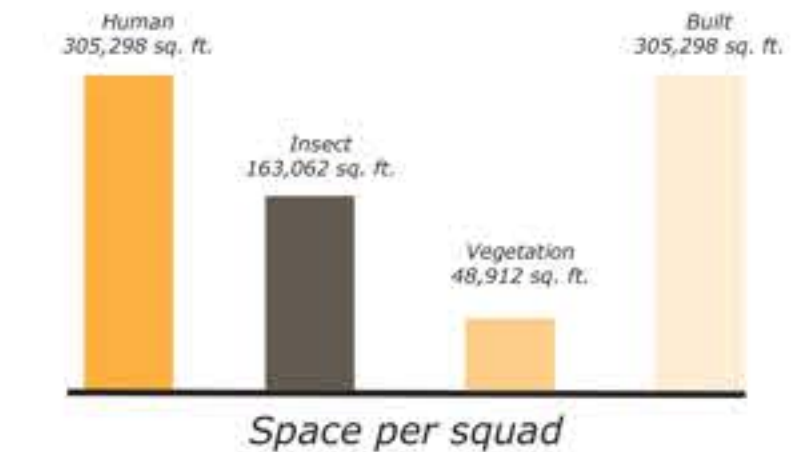
TOTAL SPACE PER SQUAD

MUTUALISM LEVEL 1



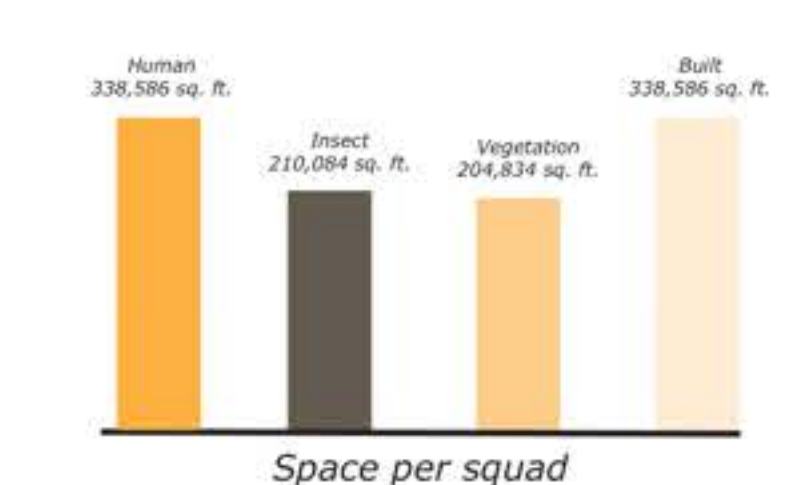
INSECT: 193 Valley Elderberry Longhorn Beetles
VEGETATION: 324 Blue Elderberry Trees
COST: 38 MILLION MORE : 25% COST INCREASE

MUTUALISM LEVEL 4



INSECT: 407 Valley Elderberry Longhorn Beetles
VEGETATION: 489 Blue Elderberry Trees
COST: 33 MILLION MORE : 22% COST INCREASE

ULTIMATE MUTUALISM



INSECT: 525 Valley Elderberry Longhorn Beetles
VEGETATION: 2,048 Blue Elderberry Trees
COST: 53 MILLION MORE : 35% COST INCREASE



RAMP



FUNCTION LAWN



PLANT NURSERY



RAMP: The ramp leads users on a path of mutualism; it begins with smaller, native vegetation and a filtration system wall that will start to eliminate toxins from cars on the nearby street. Moving up the ramp the user will begin to find more vegetation species beginning to emerge. The wall in the center of the ramp will have texture that will allow insects to reside in the wall. At the end of the ramp, the user will end at the function lawn.

FUNCTION LAWN: The function lawn is the area of most mutualism; allowing for the human squad to relax, read a book, mingle, or enjoy the weather, while the insect and vegetation squad get to thrive as well. Secondary and tertiary species will cover this area. A pond will be provided to allow for water collection, but also to provide species with water.

PLANT NURSERY: A plant nursery will be located on every floor. This will be an area where all squads are intended; the human squad is able to engage outside or able to look through glass areas to enjoy the other species.