

DISRUPTIVE STIMULI

RESITUATING THE MISPLACED

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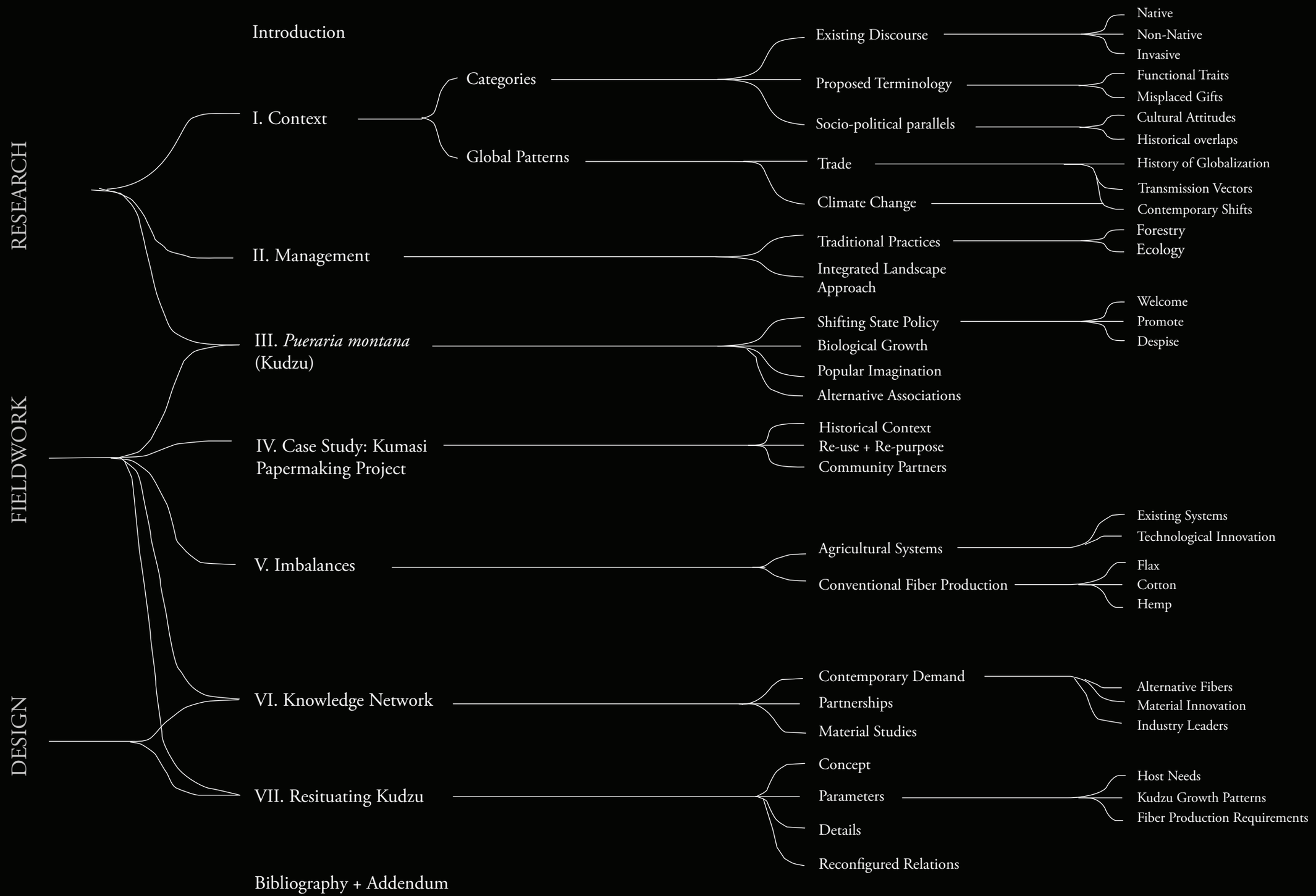
To Leena Cho and Teresa Gali-Izard for helping to guide my thinking and for always challenging me to take my work a step further.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INTRODUCTION

Cultural perceptions of invasive species are manifest in the landscape. The term invasive evokes combative management strategies that deny responsibility for the economic and political patterns that have shaped global plant migrations over time. This work calls for a shift in discourse towards understanding plants as a lineage of cultural construct and highlighting their generative potentials regardless of geographic origin. Through the proposal of a fiber-harvesting strategy for Pueraria montana (Kudzu), ecological and economic perspectives are resituated to transform what is considered a nuisance into a valued resource that supports ongoing management efforts. In doing so, the term misplaced gift replaces invasive, inviting new cultural associations that alter relationships between Kudzu and its host plants as well as humans and non-human species alike.

SITUATION:

INVASIVE SPECIES are estimated to cause over $1.4 TRILLION in damages globally per year, representing nearly 5% of the global economy.



Estimates for invasive species from Pimentel et. al, "Economic and environmental threats of alien plant, animal, and microbe invasions." World military expenditure for 2012 from SIPRI Yearbook. Global health expenditure for 2010 from WHO.

Yet only 10% of INTRODUCED SPECIES are likely to become successful invaders. In fact, introduced species now provide more than 98% OF THE US FOOD SYSTEM at a value of approximately $800 BILLION PER YEAR.

(Pimentel et. al, “Update on the environmental and economic costs associated with alien-invasive species in the United States,” and Marbuah et al, “Economics of Harmful Invasive Species: A Review.”)





CHALLENGE:

How can a management strategy for INVASIVE SPECIES transform biomass that is currently considered WASTE into a VALUED RESOURCE that supports future MANAGEMENT efforts?

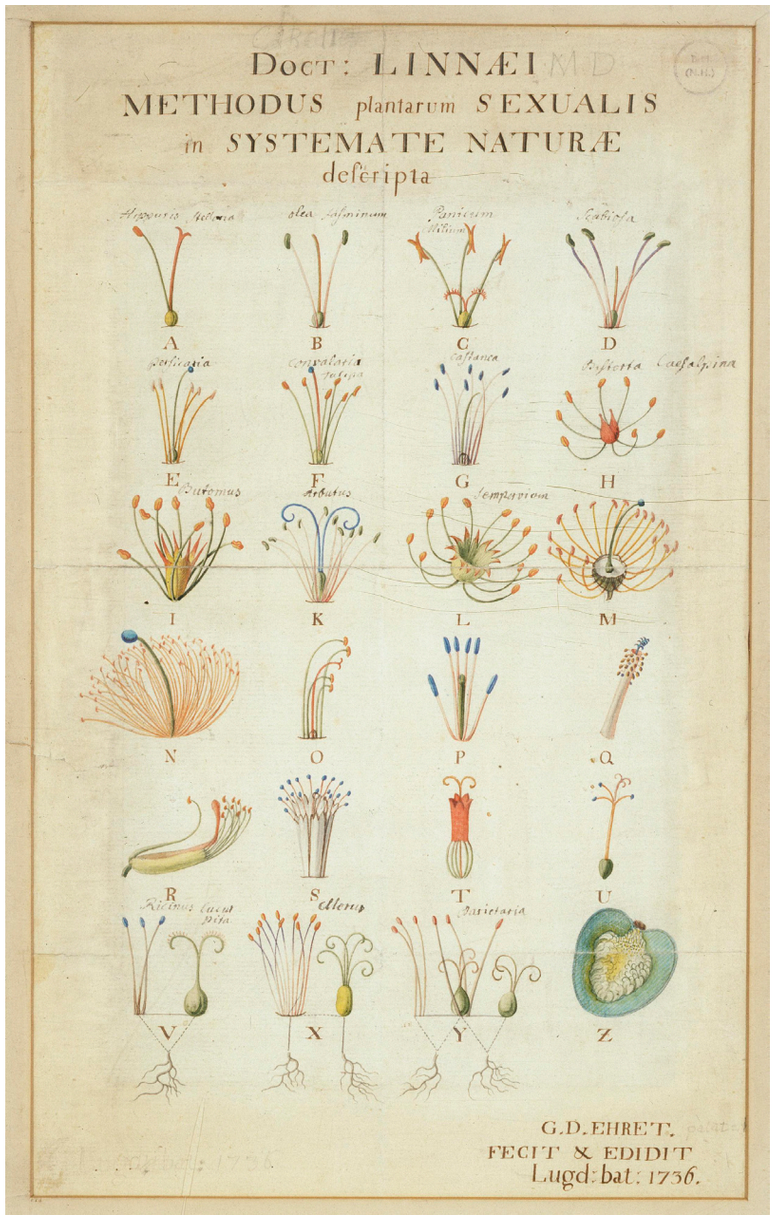


How can discourse be shifted so that invasive species are understood in terms of FUNCTIONAL TRAITS regardless of geographic origin?

PART I
RESEARCH

METHODOLOGY

Work was driven by a cross-cultural, interdisciplinary mode of inquiry, framed and expanded by historical and theoretical research, regular field visits, synthesis drawings, material sampling and processing, and interviews at various institutions. Research reviewed existing literature to understand the history of invasive species, particularly our role as humans in perpetuating their spread and the root of current management practices. Mapping, diagrams, study models and botanical samples served as a means to contextualize and synthesize the multi-scalar, multi-temporal extents of invasive species as well as to probe Kudzu's material, architectural and environmental potentials. Concurrently, a comparative study of Kudzu in its native and non-native habitats was carried out to situate the impact of cultural, environmental and ecological dynamics.



I. CATEGORIES

Domestication transforms terror into pathos and biological farce. Disconnected from the sublime, domesticated creatures lack signs of spiritual power and leave us vulnerable to the meaninglessness and unfocused fear that haunt the human triumph over wild nature. .. They are the chief biological instruments of human appetites, dreams and destructiveness.

- George Gessert, *Green Light: Toward an Art of Evolution*, 45.

Our desire to understand and control creates a need for categories. Such categories become inscribed and normalized, demarcating that which promises to bring change and heightening attitudes of exclusion, extremism and fear. By focusing on plants and problematizing the category of invasive species, I attempt to offer an alternative framework for talking about these ultra-competitive, ambitious species. In fact, such traits may prove to be crucial as the rate of climate change increases and our attempts to dominate and control are overshadowed by new understandings of domestication, balance and change.



The OXFORD ENGLISH DICTIONARY provides broad definitions of several terms that are central to my research. Such terms are fluid, applied in both ecological and socio-political contexts, with agendas showing disturbing parallels at certain moments in history. Numbers indicate the order in which the definition appears.

NATIVE, adj.
1. “Inherent, innate; belonging to or connected with something by nature or natural constitution.”

NON-NATIVE, adj.
1. “Not native; (of an animal or plant) alien, introduced.”

INVASIVE, adj.
1. “Of, pertaining to, or of the nature of, invasion or attack; offensive.”
3. “Tending to intrude upon the domain or to infringe the rights of another; intrusive, encroaching.”

It might even be said that, in biology, many if not most stimuli that bring about change are usually intruders in some sense.

- John Eastman, *The Book of Field and Roadside*



U.S. LEGISLATION

INTERNATIONAL POLICY

1898

David Fairchild established the SECTION OF FOREIGN SEED AND PLANT INTRODUCTION within the US Department of Agriculture. He traveled for 37 years, bringing back new plants, most of them for agricultural use but some for use as ornamentals.

1900

LACEY ACT becomes first federal law to protect wildlife. The act made it a crime to poach game in one state and sell the bounty in another in an effort to prevent the spread of non-native and exotic species into native ecosystems.

1939

FEDERAL SEED ACT states that imported seeds must be free of listed weed seeds.

1952

INTERNATIONAL PLANT PROTECTION CONVENTION (IPPC) is a treaty that aims to prevent the introduction of plant pests in international trade.

1969

LACEY ACT AMMENDEMENT expands act to include amphibians, reptiles, mollusks, and crustaceans.

1982

UN CONVENTION ON THE LAW OF THE SEA requires states to take all measures necessary to prevent, reduce and control the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.

1988

LACEY ACT AMMENDEMENT make it possible to persecute guides and outfitters who aid in the facilitation of illegal, big game hunts and to prevent the falsification of documents.

1992

ALIEN SPECIES PREVENTION AND ENFORCEMENT ACT makes it illegal to ship certain plant and animal species through the U.S. mail.

1993

CONVENTION ON BIOLOGICAL DIVERSITY includes section on invasive species that states that each party must attempt to "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species."

1999

EXECUTIVE ORDER 13112 directs federal agencies to "authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species" and establishes National Invasive Species Council. Defines invasive species as, "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."

2002

PUBLIC HEALTH SECURITY AND BIOTERRORISM PREPAREDNESS AND RESPONSE ACT improves the ability of the United States to prevent, prepare for, and respond to bioterrorism and other public health emergencies. Targets invasive pests and pathogens affecting livestock.

2003

CARTAGENA PROTOCOL ON BIOSAFETY includes section on avoiding adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health. Requires that each "Party take necessary measures to require that living modified organisms that are subject to intentional transboundary movement within the scope of the Protocol are handled, packaged and transported under conditions of safety, taking into consideration relevant international rules and standards."

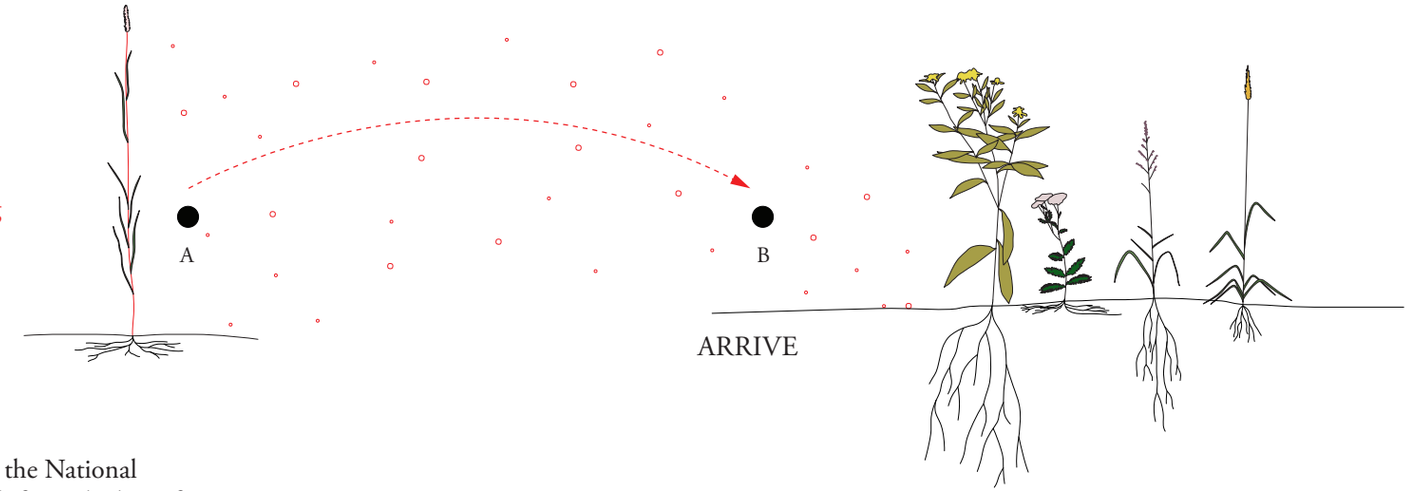
2004

NOXIOUS WEED CONTROL AND ERADICATION ACT establishes programs to provide financial and technical assistance to control or eradicate noxious weeds.

INSCRIBED CATEGORIES

'Invasive' as a term first appeared in the French language in the 1520s. According to the Oxford English Dictionary, it was defined in relation to military actions as, "Of, pertaining to, or of the nature of, invasion or attack; offensive." However, by the 1930s, the term extended to include plants characterized by, "[their tendency] to spread prolifically or uncontrollably; encroaching upon or replacing other vegetation." Timeline shows major shifts in policy related to invasive species and the plant trade in general.

Exotic plant and animal species form the basis for agricultural productivity throughout the world, but those that are able to out-compete local species quickly earn the title of “invasives”. Invasive species are particularly insidious if they challenge the existing ecological balance, narrowing the diversity of native species that are a source of resilience and adaptability in the face of contingency.



In 1999, the U.S. Executive Order 13112 established the National Invasive Species Council. It provides definitions which form the basis for how plant species are classified in the U.S.

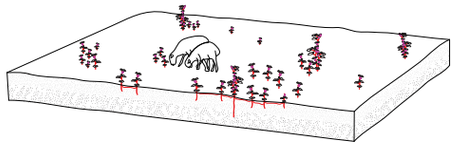
NATIVE SPECIES: “A species that, other than as a result of an introduction, historically occurs/occurred in that particular habitat.”

NON-NATIVE, EXOTIC, NON-INDIGENOUS, ALIEN SPECIES: “Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that habitat.”

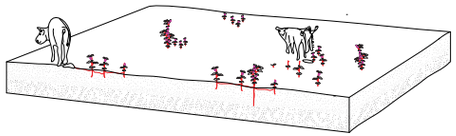
INVASIVE SPECIES: “An exotic species whose introduction into an ecosystem in which the species is not native causes or is likely to cause environmental or economic harm or harm to human health.”

NATURALIZED SPECIES: An invasive species that has established a new, self-perpetuating population and is relatively stable and integrated into the plant community.

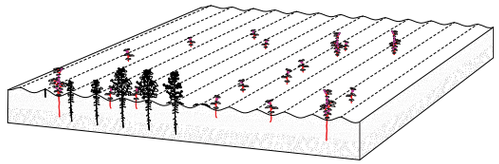
For purposes of consistency, I will use the terms native, exotic and invasive species to distinguish these categories. Labeling species as ‘non-’ immediately situates them in opposition to a defined entity and attaches negative connotations. Throughout time, species have migrated, inter-bred and evolved, making such clear distinctions inappropriate.



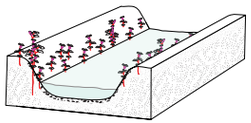
Overgrazed land



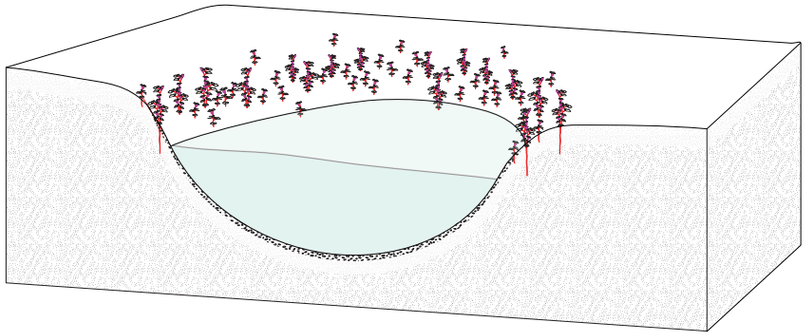
Fertlized land



Cropland



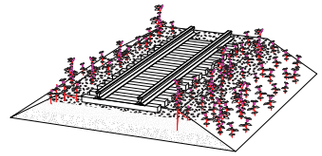
Irrigation ditches



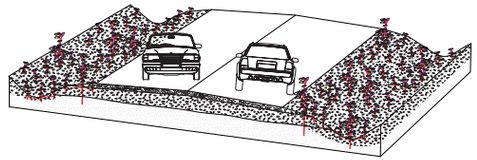
Constructed ponds, reservoirs, lakes

INVASIVE HABITAT TYPOLOGIES

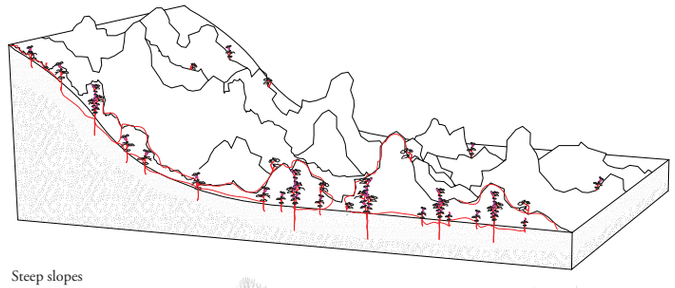
Disturbed environments and those in transition are particularly susceptible to the introduction of new species.



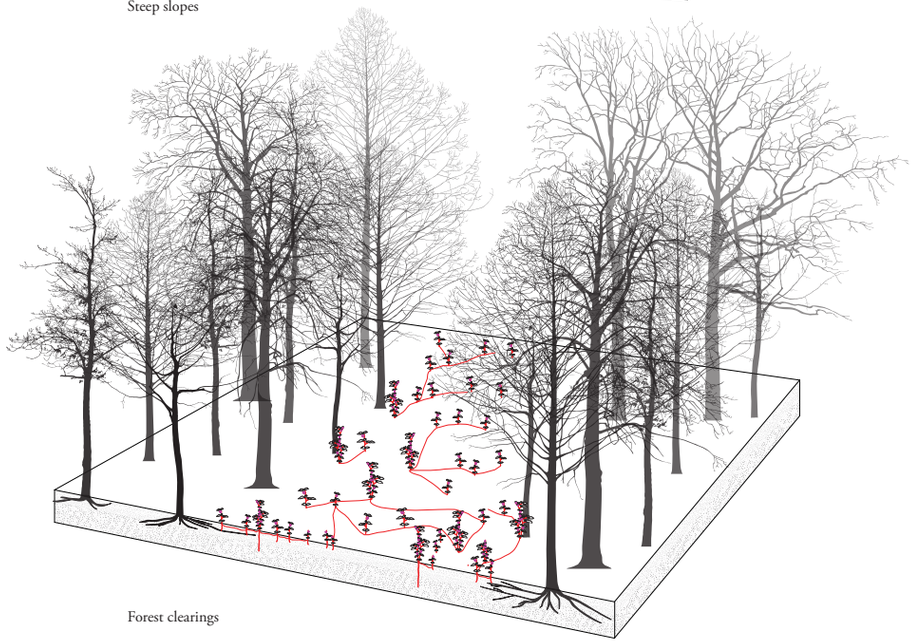
Railroad edges



Roadsides



Steep slopes



Forest clearings

CHARACTERISTICS OF INVASIVE SPECIES

Pioneer species
Generalists- Can survive in a wide variety of habitat conditions
Rapid growth rate
Few natural enemies- predators, competitors, parasites and diseases
High reproductive rate
Reproduce via multiple pathways- Roots, stems, seeds, offspring
Long-lived
Good hitch-hikers

Not all exotic species become invasive. Those that do must:
1. Be non-native to a new country.
2. Be transported to a new location.
3. Be able to survive and reproduce in the new environment, naturalizing over time.



FRIEND OR FOE?

While often feared, in certain contexts, invasive species may offer important ecosystem services in places where other plants cannot survive. For instance, invasives may be some of the few that can thrive in disturbed urban areas or that can adapt to the drastic changes brought about by climate change.

Peter del Tredici's *Wild Urban Plants of the Northeast* pays homage to a plethora of exotics and "weeds" that fill the cracks in neglected urban spaces. He lists the following ecosystem services that these plant species can provide:

Temperature reduction
Food and/or habitat for wildlife
Erosion control on slopes and disturbed ground
Stream and river bank stabilization
Nutrient absorption (mainly nitrogen and phosphorous) in wetlands
Soil building on degraded land
Tolerance of pollution or contaminated soil
Disturbance-adapted colonizer of bare ground

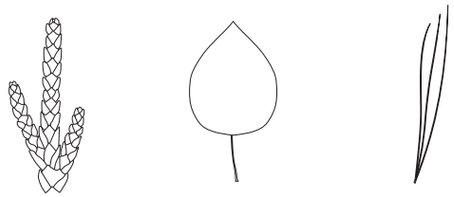
While his is not necessarily an argument in favor of invasive species, he offers a way of talking about plant species in terms of their traits, resource capture methods and contributions to the local ecosystem.

I propose a method which builds on del Tredici's technique. By examining plants' functional traits and resource capture methods, more fruitful dialogue unfolds as we assess the pros and cons of plant species in the environments they inhabit regardless of geographic origin. Perhaps the term "gifts of the land," a term used by French geographer and philosopher Augustin Berque, could provide a necessary conceptual shift.

PLANT FUNCTIONAL TRAITS

Morphological, physiological and phenological traits that indirectly impact individual fitness through their effects on growth, reproduction and survival of the plant. (Violle et al, 2007)

Leaf Type



Scaled | Broad | Needle

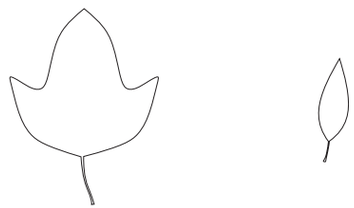
Leaf Density



Thin
Poorly protected
Less lignin
Rapid growth
Rapid resource capture

Thick
Well protected
More lignin
Reduced plant growth
Reduced resource capture rates- plants conserve the resources they capture

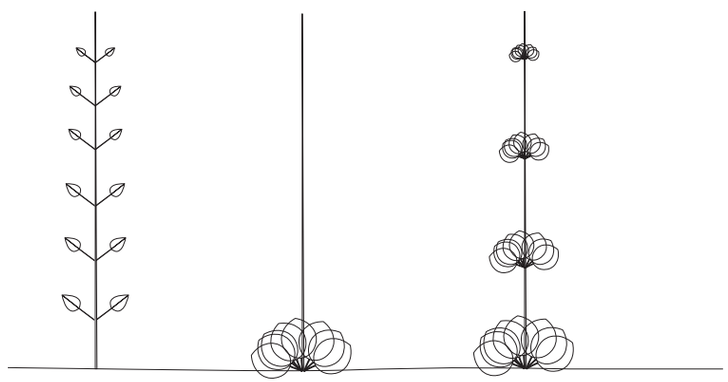
Specific Leaf Area (SLA)



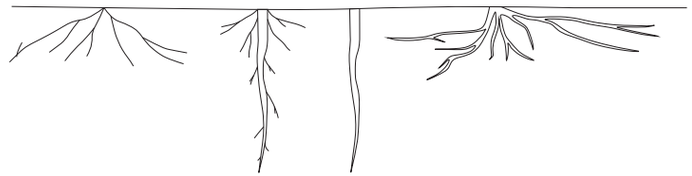
High SLA
Usually more productive
Capture more Carbon
Short-lived
Susceptible to herbivores

Low SLA
Less productive
Longer-lived

Leaf Distribution

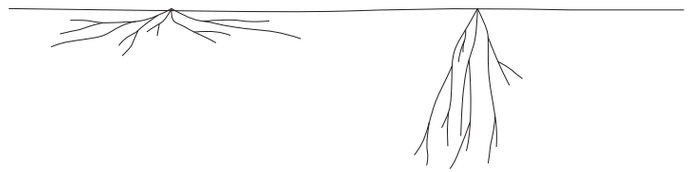


Root Density



Higher root mass increases nutrient and water capture and thus may enable resource preemption by a fast-growing species.

Root Depth



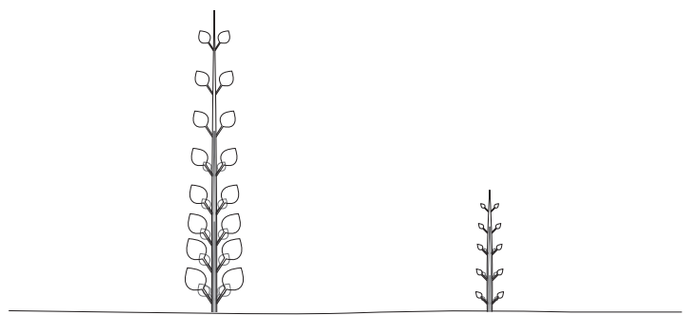
Seed Size + Mass



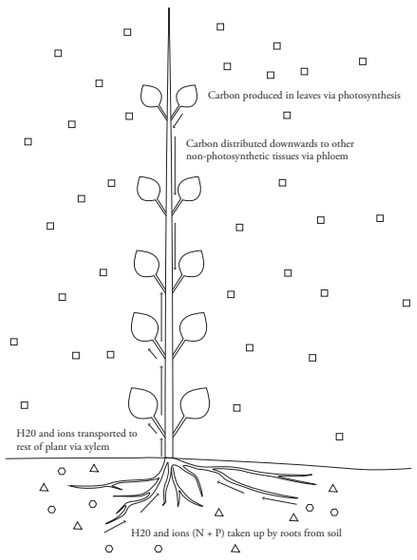
Larger, heavier seeds
Relatively less abundant
Produce seedlings with greater competitive ability

Smaller, lighter seeds
Disperse easily
More widely distributed

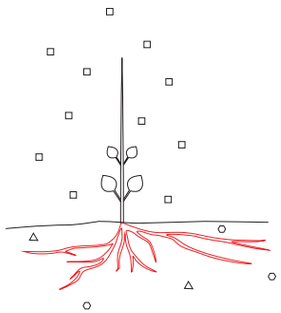
Growth Rate



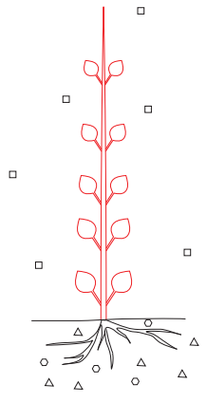
PLANT RESOURCE ALLOCATION



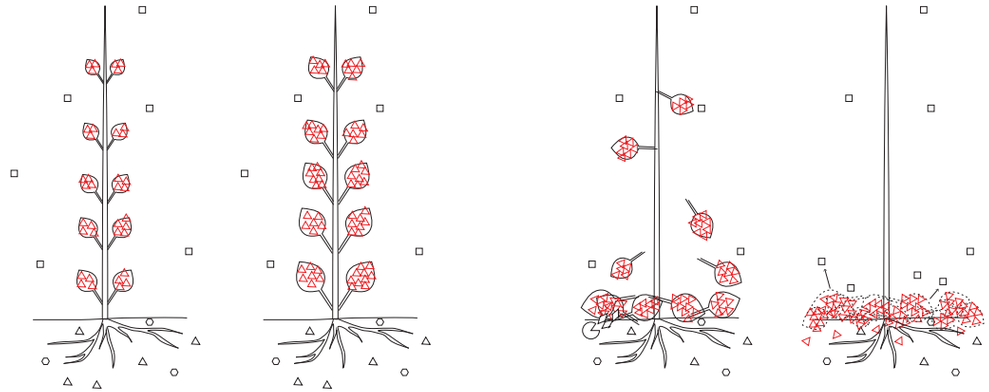
CO2
N
P
Enzymes
Microbes and fungi



Root growth favored over shoot growth when nutrient supply (N + P) is low.



Shoot growth favored over root growth when carbon supply is low.



High N content in foliage increases the rate of photosynthesis leading to a faster growth rate, shorter leaf life span and more rapid rate of decomposition in litter.

Carbon, hydrogen and oxygen make up walls of plant cells. Together they create:
Hemicellulose- Softest
Cellulose- Sturdier
Lignin- Toughest



Cellulose is composed of glucose rings attached to one another. Lignen is the glue that attaches cellulose and hemicellulose.

Microbes and fungi release enzymes to break down plant material and release nutrients in process.

N + P are released back into the soil as plant matter decomposes. Detached glucose ring can be taken up as food. Decomposer uses sugar for growth and releases CO2 as waste.





Garden in Berlin-Wannsee, designed by Willy Lange circa 1920.

DISTURBING PARALLELS

By shifting the conversation away from geographic origins, we can also avoid certain parallels that developed at moments in history between political agendas and ecological ones. For instance, during World War II in Germany, landscape architects developed certain rules that were heavily influenced by the national Socialist agenda as well as by Willy Lange's ideas about nature and design from the early 20th century, banning and eradicating any plant species considered non-native. Such rules led to a special understanding of plant geography, termed plant sociology, which established a particular aesthetic point of view that was eventually codified in governmental policy (Groening and Wolschke-Bulmahn).

Such policies create rigid dichotomies that reject the role of migration and inter-breeding on the composition of human and plant populations alike. Perhaps invasive species are simply agents that expedite biological evolution, reflecting the impact that we as humans impose on the landscape in an anthropogenic era.

[The Germans] still lack gardens that are race-specific, that have their origins in nationality and landscape, in blood and soil. Only our knowledge of the laws of the blood, and the spiritually inherited property, and our knowledge of the conditions of the home soil and its plant world (plant sociology) enable and oblige us to design blood-and-soil-rooted gardens.

- Albert Krämer (German landscape architect), 1936 (In Gröning and Wolschke-Bulmahn, "The Myth of Plant-invaded Gardens and Landscapes.")

Similar examples, though perhaps slightly less severe, can be traced through official U.S. policy and government supported programs. In the early 19th century, Thomas Jefferson was a strong proponent of plant cultivation and welcomed many new, introduced species stating, "The greatest service which can be rendered any country is to add a useful plant to its culture" (Boyd et al., 122–5.) He introduced *Cytisus scoparius* (Scotch Broom) to Monticello to be used in his design of the grove and the labyrinth on the north side of the mountain. Today the plant is considered highly invasive in many part of the U.S.

In the late 19th century, many plants were introduced around the world through World's Fairs and celebrated for their exotic, ornamental qualities. Not only were plants displayed during this time as a sign of imperial might, but also people. Ethnological exhibitions, or "human zoo garden" came to be common occurrences, reinforcing anthropological categories of "savage" versus "civilized" that contributed to state agendas. Charles Rau, who created the ethnological exhibits at the Philadelphia Centennial Exhibit in 1876 on behalf of the Smithsonian Institute stated, "The extreme lowness of our remote ancestors cannot be a source of humiliation; on the contrary, we should glory in our having advanced so far above them, and recognize the great truth that progress is the law that governs the development of mankind" (Rydell 24). Just 20 years later in 1896, the Cincinnati Zoo would display 100 Sioux Native Americans in a mock village for three months ("Deep Racism: The Forgotten History of Human Zoos"). This mode of display wherein both plants and human were completely severed from their original contexts and habitats and made into a spectacle had profound repercussions on both social norms and on the physical landscape.

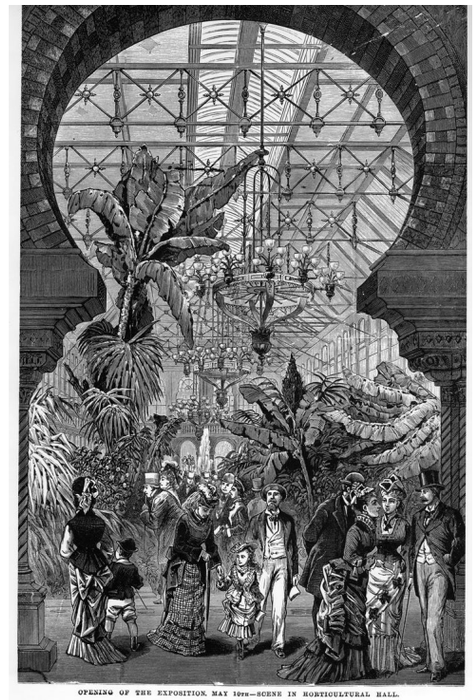
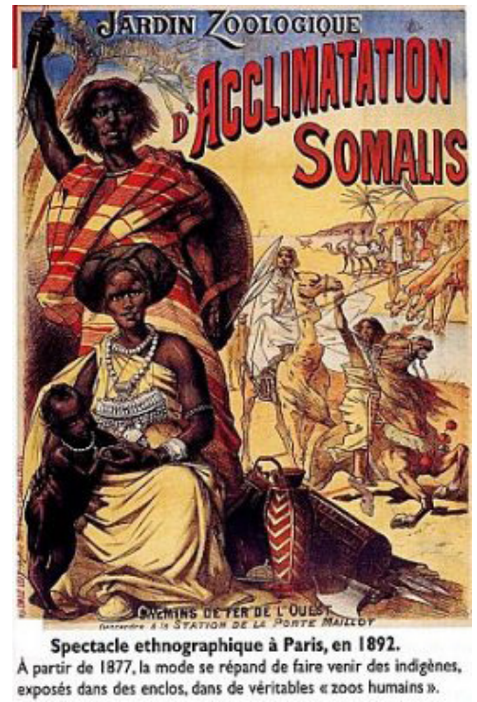


Image of the Horticultural Hall at the Philadelphia Centennial Exhibition in 1876.



Propaganda advertising an ethnographic exhibition as part of the World's Fair held in Paris in 1892.

The New York Times

SundayReview | OP-ED COLUMNIST

I.S. = Invasive Species

OCT. 11, 2014



Thomas L. Friedman

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AN Iraqi official recently told me this story: When the Islamic State, also known as ISIS, took over Mosul in the summer, the Sunni jihadist fighters in ISIS, many of whom were foreigners, went house to house. On the homes of Christians they marked "Nassarah," an archaic Arabic term for Christians. But on the homes of Shiites they marked "Rafidha," which means "those who reject" the Sunni line of authority as to who should be caliph, or leader of the Muslim community, after the death of the Prophet Muhammad. But here's what was interesting, the Iraqi official said, the term "Rafidha" was largely unknown in Iraq to describe Shiites. It is a term used by Wahhabi fundamentalists in Saudi Arabia. "We did not know this word," he told me. "This is not an Iraqi term."

I was intrigued by this story because it highlighted the degree to which ISIS operates just like an "invasive species" in the world of plants and animals. It is not native to either the Iraqi or Syrian ecosystems. It never before grew in their landscapes.

I find it useful at times to use the natural world to illuminate trends in geopolitics and globalization, and this is one of them. The United States National Arboretum website notes that "invasive plant species thrive where the continuity of a natural ecosystem is breached and are abundant on disturbed sites like construction areas and road cuts. ... In some situations these nonnative species cause serious ecological disturbances. In the worst cases, invasive plants ... ruthlessly choke out other plant life. This puts extreme pressure on native plants and animals, and threatened species may succumb to this pressure. Ultimately, invasive plants alter habitats and reduce biodiversity."

CONTEMPORARY DISCOURSE

Today the conversation has seen a resurgence. As socio-political agendas intersect with environmental concerns, disturbing parallels surface between social and ecological categorizations. With fear and suspicion of "the other" impregnated through continuous state-mandated alerts, unpredictable attacks that escape any form of surveillance, rapidly shifting economies and doomsday scenarios looming as climate change accelerates, the category of 'invasive' applies to a broad spectrum of phenomena. Even if we are able to separate invasive plant species from the term's broader use, the connotations that accompany it undoubtedly taint attitudes towards landscape applications of the term.

The New York Times



UNBUTTONED
Should Fashion Be Politically Correct?



Where Have All the Tomboys Gone?



ON THE RUNWAY
In London, Stella Tennant, Lily-Rose Depp and Others Celebrate Chanel

FASHION & STYLE

Is Their Pest Your Clean Conscience?

ANNA JANE GROSSMAN NOV. 17, 2010



Xiomara del Carmen helped Ana Lodriguss prepare for a nutria fashion show in New Orleans.
Jennifer Zdon for The New York Times

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BROOKLYN

TREATING nutria as a kind of "guilt free" fur is tough when you're cutting the pelt and fur gets caught in your eyes. That's what Micha Michelle Melancon, a fashion designer in New Orleans, found out when she was making a cloak from what is commonly known as a swamp rat.

"This is an animal," Ms. Melancon said, after her work space became filled with fluffy piles of excess fur. "A soft, furry, once-living-and-breathing being."

But unlike other soft and furry animals, nutria is being rebranded as a socially acceptable and environmentally friendly alternative way to wear fur. The effort culminates this Sunday, when Ms. Melancon and about 20 designers take part in a "righteous fur" fashion show at the House of Yes, an art space in Williamsburg, Brooklyn.

Popular perceptions of invasive plants persist today, at times aligning with political agendas and at times fighting against them. There is evidence of creative engagement through the production of fashion lines, recipes and products that attempt to harness the rapidly produced raw material that invasives offer. There are news headlines which offer horrifying images of invasives swallowing local ecosystems. There are artists whose work provides critical commentary on popular perceptions of these plants, causing us to question many of our own assumptions.

WE HAVE THE BEST WEED IN TOWN

(and we're giving it away)

THIS IS GUAYULE. IT'S A DESERT PLANT GROWN WITHOUT PESTICIDES IN THE AMERICAN SOUTHWEST, AND WE'VE LEARNED HOW TO MAKE WETSUITS FROM IT.

When we started building suits, we knew that neoprene itself was the most harmful material involved. Developed as polymerized chloroprene in the 1930s, neoprene has a highly toxic manufacturing process that combines chlorine with butadiene produced by the petrochemical industry. We did the best we could with what was available, but we knew we had to find something better.

Our search for alternatives led us to a partnership with Yulex, a company making plant-based biorubbers derived from guayule stems. Extracted in a waste-free, water-based separation process, we're now blending natural guayule rubber into our new Yulex® suits to reduce our dependence on conventional polychloroprene.

We've also made this proprietary, game-changing biorubber available to the rest of the surf industry. Why? Because when volumes go up, prices go down; and when more surfers can choose less harmful suits, we all win. There's no doubt that it's a better path forward for all of us.

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MEN'S R3® YULEX®/NEXSKIN®
FRONT-ZIP FULL SUIT

YULEX.

Martha Washington would be proud.

Advertisement for a wetsuit made from Guayule, a plant found in the American southwest.



Toni Matelli, *Abandon*, 2004
Matelli brings weeds to the forefront of the cultural sphere. He disrupts the clean lines that separate white gallery walls from the floor with his life size installations of bronze weeds.

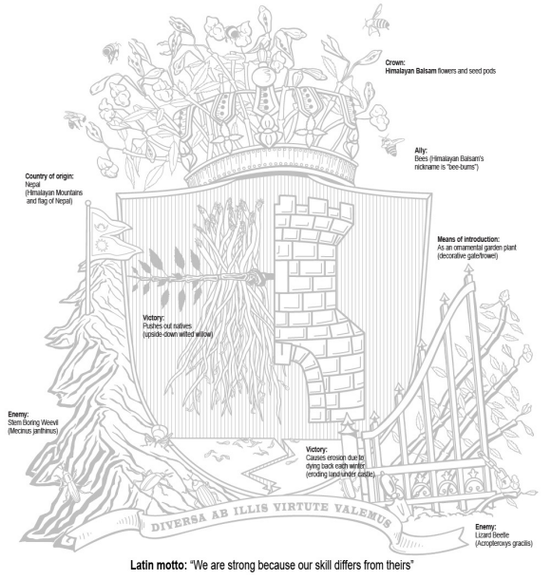


Michelle Gatton (food stylist), Christopher Testani (photographer), Mason Adams (art director)
Invasive Species: Envisioning the Future of American Food, 2015
Nutria skull (left) and dish made with nutria sausage gumbo, tiger shrimp, bell pepper and black rice.



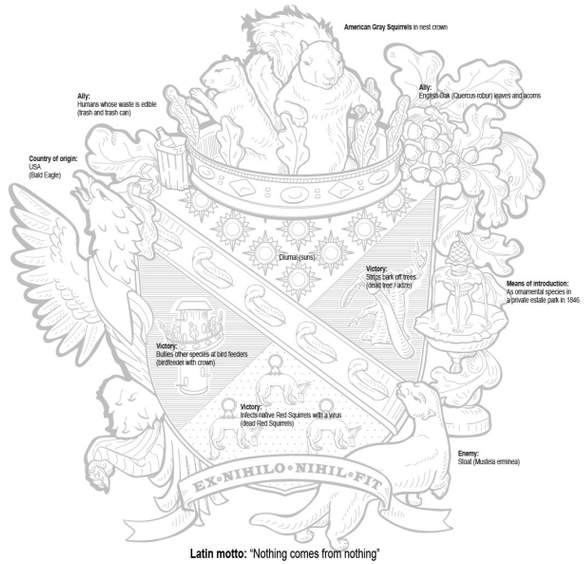
Alexis Rockman, *East 82nd Street,* 2007
Rockman's paintings depict doomsday scenarios of once fetishized objects and monuments left in a state of decay as invasive and mutated species persist long after human civilization has collapsed. His work recalls that of Thomas Cole's The Course of Empires series, offering a contemporary critique of human's impact on the landscape. Even Kudzu receives its moment in the limelight, appearing as the lone survivor in Rockman's *Gateway* and *East 82nd Street* paintings. These images are undoubtedly in conversation with Martin Johnson Heade's depictions of flora and hummingbirds that were painted at a time when exotics were celebrated and state sponsored expeditions were frequent. However, unlike Heade, Rockman does not have to travel to far off territories to discover these species. Instead, as a result of earlier expeditions, they are found in his immediate surroundings and persist despite state attempts to eradicate their presence.

Heraldic Crests for Invasive Species
Himalayan Balsam (Impatiens glandulifera)



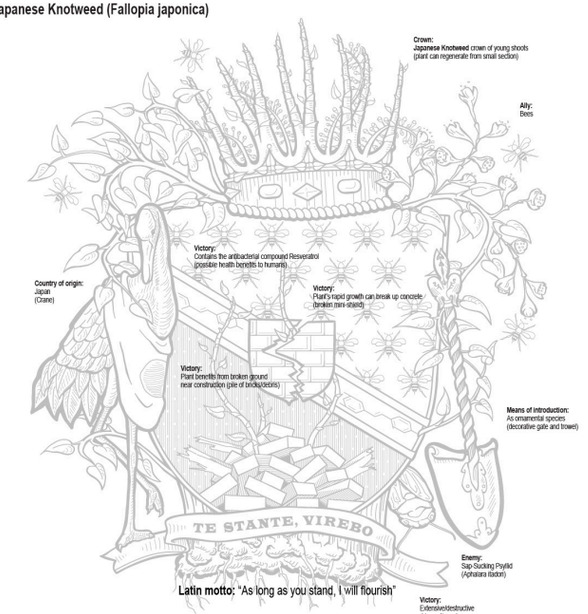
Latin motto: "We are strong because our skill differs from theirs"

Heraldic Crests for Invasive Species
American Gray Squirrel (Sciurus carolinensis)



Latin motto: "Nothing comes from nothing"

Heraldic Crests for Invasive Species
Japanese Knotweed (Fallopia japonica)



Latin motto: "As long as you stand, I will flourish"

Marina Zurkow, *Heraldic Crests for Invasive Species* series, 2011 (above)
12 species considered invasive to Northern England were, "chosen for their edibility: some are eaten in their countries of origin, some even considered delicacies; others were introduced as food schemes that went awry. Other species' edibility is incidental: they were first imported as exotic ornamentals in ponds or gardens or came as hitchhikers in the moving of global goods. The rhetoric around these species is combative, and they are usually vilified as foreign enemies."

Dillon Marsh, *Invasive Species* series, 2014 (below)
Marsh explores the relationship between the environment and the disguised towers of Cape Town.







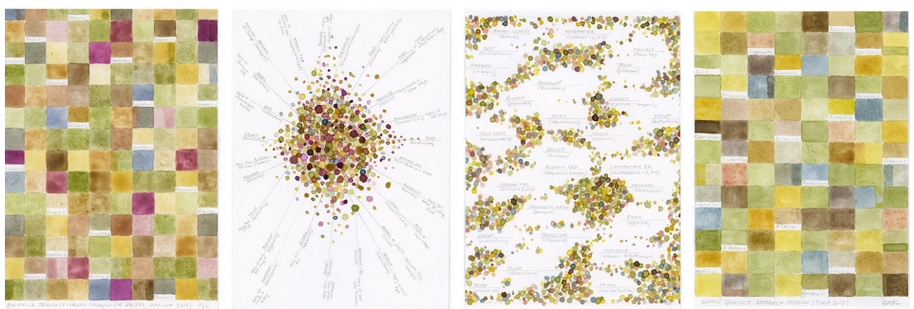










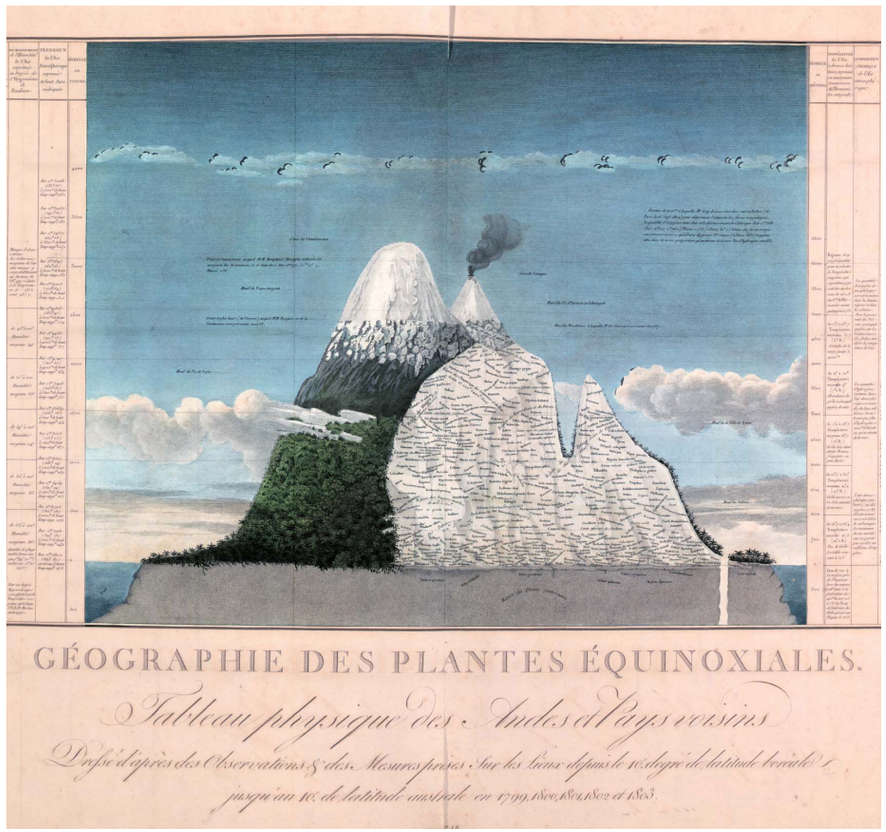


Ellie Irons celebrates the early successional life that takes hold in abandoned lots across Brooklyn with her *Invasive Pigments* series. She draws on knowledge from a range of cultures to reveal the unexpected color palette these plants reveal and, through community engagement, strives to renegotiate human relations to and perceptions of these often overlooked species.

While each of the artists contributes their own voice to the discourse surrounding invasive species, all offer a critique of the Orientalist dogma that is perpetuated by state policy and rhetoric. In an attempt to foreground and understand species that are stigmatized by society, they send a much larger message regarding the imprint state categories leave



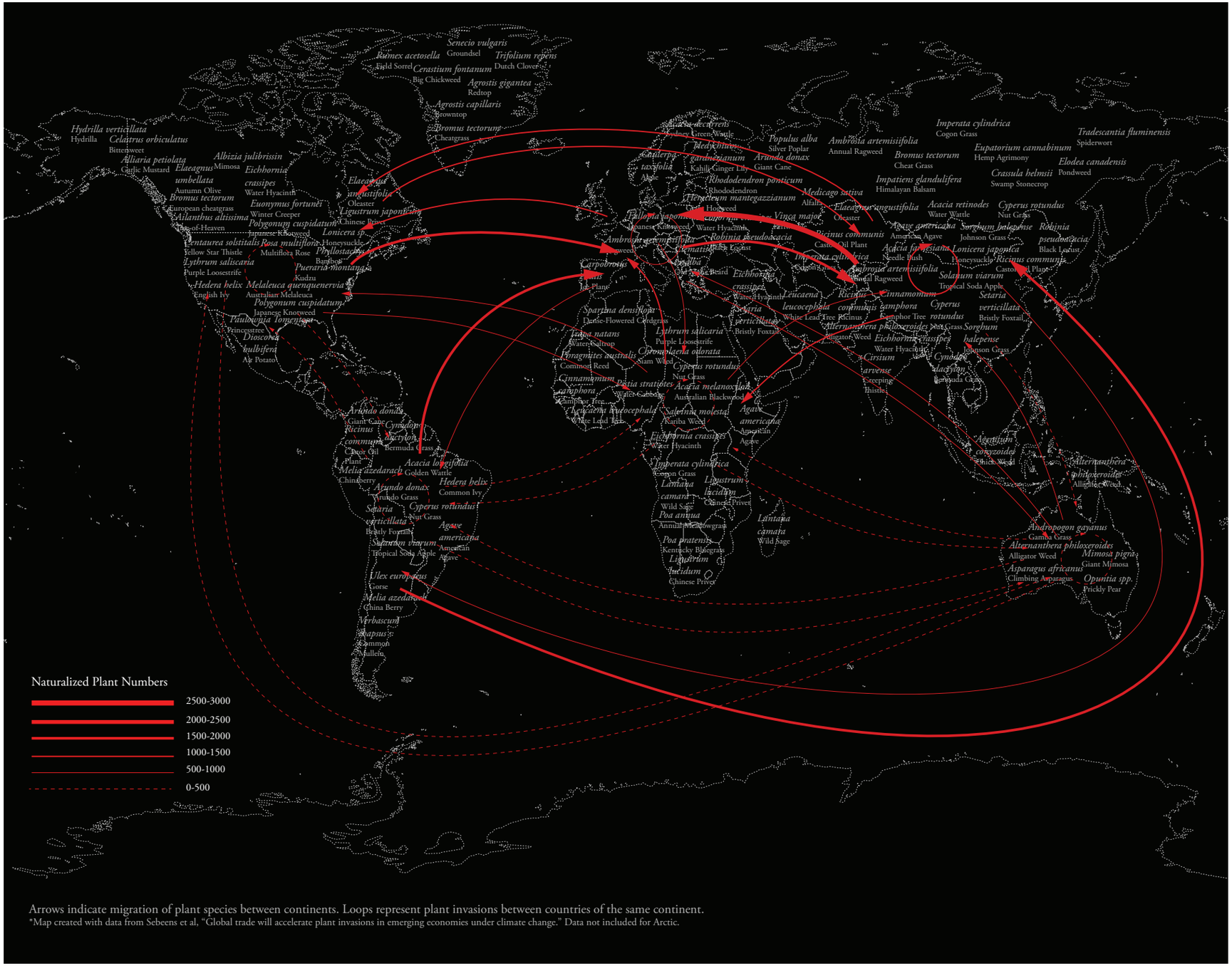
Diorama by author that is inspired by and builds on work conducted by Ellie Irons.



II. CONTEXT

The role of Orientalism… reminds us that circuits of flora and fauna are not completely free flowing or random but rather informed by the political economy of complex bio-geographies as well as a powerful political imaginary. Yet invasive species discourses in the United States tend to mask the cultural, economic, and political conditions of globalization under which the "foreign" enter "native" lands, often at the behest of the host. Thus we use the paradoxical term invited invasions to highlight the contradictory nature of the "assembling" process.

- Karen Cardoza and Banu Subramaniam, "Assembling Asian/American Naturecultures: Orientalism and Invited Invasions," 5.

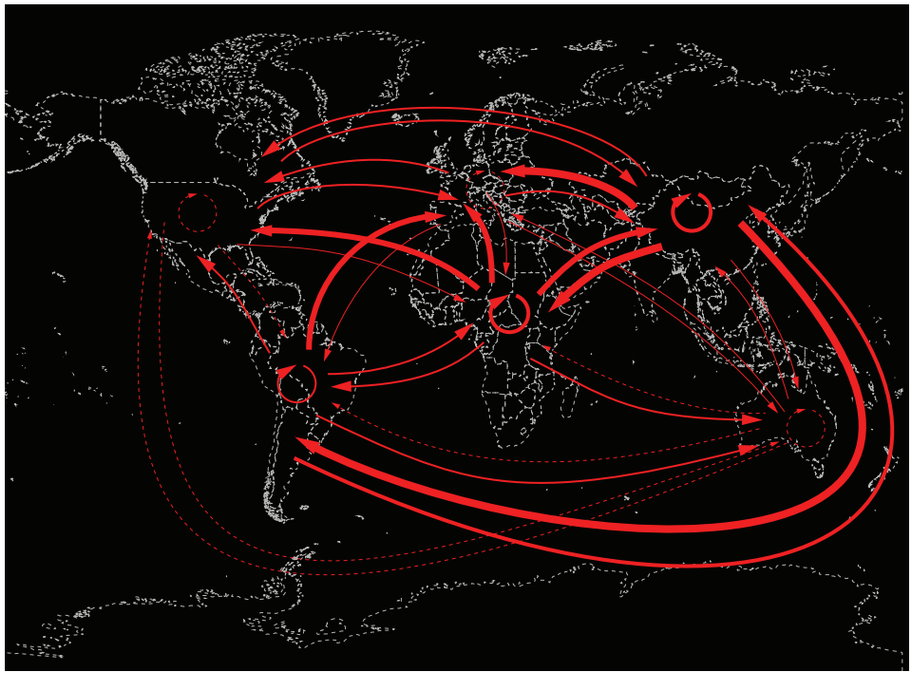


Arrows indicate migration of plant species between continents. Loops represent plant invasions between countries of the same continent.
*Map created with data from Sebeens et al, "Global trade will accelerate plant invasions in emerging economies under climate change." Data not included for Arctic.

GLOBAL TRADE has long catalyzed the migration of species and knowledge that shape the physical world and give rise to new patterns of social, ecological and economic interaction. The directionality of these exchanges is strongly dictated by economic patterns that reflect the rise and fall of nations and civilizations. Intentional and unintentional consequences affect ecological dynamics, global health and politics among a multitude of other factors.

A close study of global trade networks provides critical insight into how invasive species are introduced to and become naturalized in distant locations across the globe. It is important to emphasize that plant invasions are not a "naturally" occurring phenomena; they are induced by human actions and their patterns of migration show a strong correlation to trade routes, dating from the Silk Road to contemporary trade relations (Ritvo 26).

Image on previous page by Alexander von Humboldt, geographer, naturalist and explorer, (1810) from his expeditions to the New World.

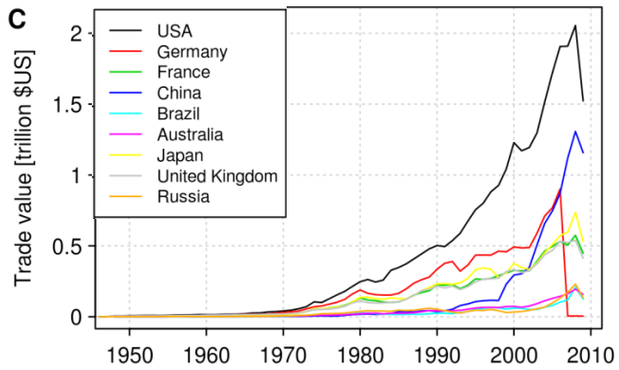


Projected changes in directional flow based on shifts in global trade patterns.

PROJECTED PATTERNS

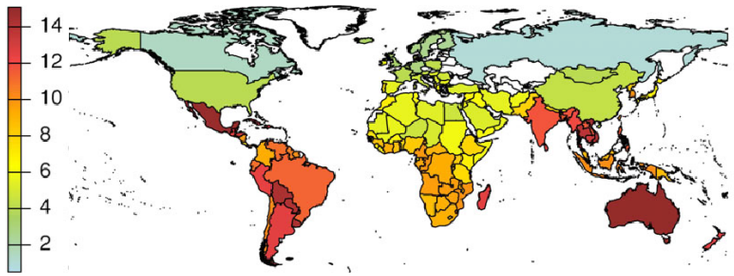
Globalization continues to impact the spread of invasive species. As the world becomes increasingly inter-connected and travel and trade continue to grow, the potential for invasives to establish themselves in distant lands also rises.

Between 1950 and 2007, exchanged commodities increased by more than 30-fold on average. While for the past 60 years, the greatest flows of alien plants that have successfully naturalized have been from Asia to Europe, this trend is now changing as emerging economies gain strength.

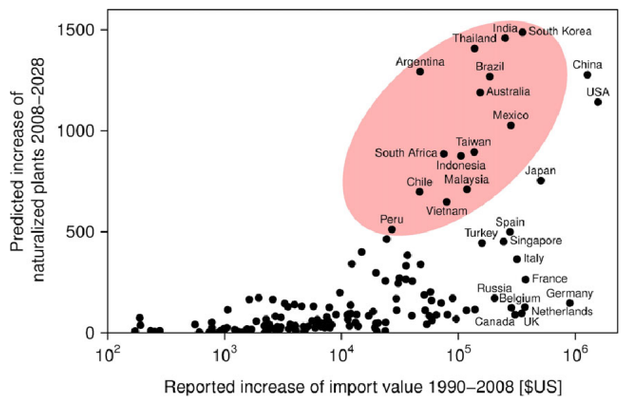


Imports by country in non-log format.

*Images by Sebeens et al, "Global trade will accelerate plant invasions in emerging economies under climate change."

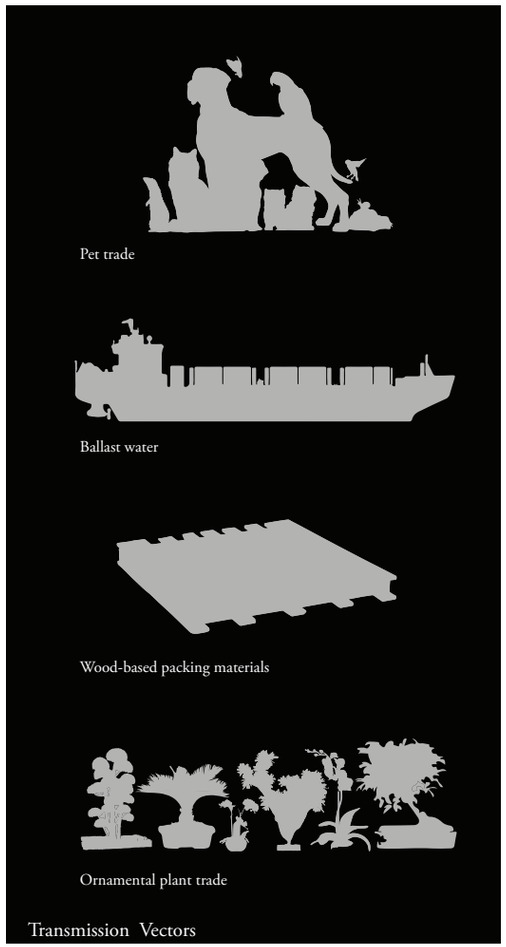


Number of naturalized plants per monetary unit [billion $US-1]



As emerging economies begin to import more goods, the number of naturalized plants in those countries is also expected to increase.

*Images by Sebeens et al, "Global trade will accelerate plant invasions in emerging economies under climate change."



The global spread of invasive species can often be traced to four main transmission vectors: the pet trade, water dispensed from the ballast of ships, wood-based packing products, and the plant trade.

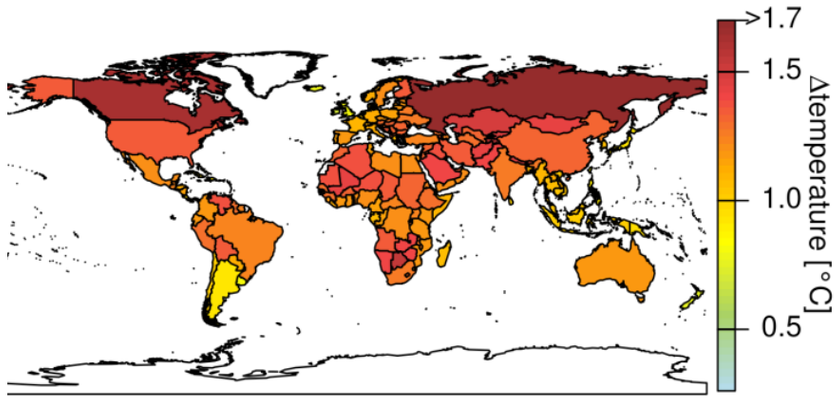
The plant trade can be divided into two basic categories: ornamental and economic. For both, those plants that can be commoditized and controlled become categorized as useful and are praised for their nutritional or aesthetic value.

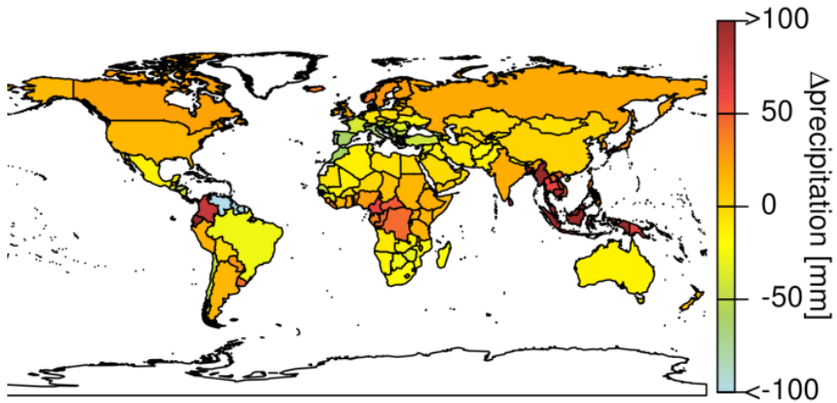


Samuel van Hoogstraten. *Portrait of Johan Cornelisz Vijgeboom and His Wife*, 1647.

Much like the economic-driven plant trade, the ornamental trade has proven a highly lucrative business. It has been driven by both politics and human desires that shape categories and cultural values in the process. Botanic gardens, especially those established during the 16th and 17th centuries such as Royal Botanic Gardens, Kew, celebrated the exotic, often importing plants from afar for their ornamental value ("The History of Botanic Gardens"). Removed from their original landscape and de-contextualized within the space of the enclosed garden or greenhouse, such introduced species often became fetishized and were domesticated through the act of imposed cross-breeding and/or genetic modifications.

Through the act of domestication, plants become codified, controlled and accounted for, and in the case of ornamentals, manipulated to meet human desires. The Dutch tulip craze serves as a large-scale example of such phenomena that greatly marked and continues to mark the physical landscape. Today, nurseries and botanic gardens continue to fulfill this role, though they tend to be much more cautious in releasing new species before fully understanding their effects on local ecologies for fear that some introductions may prove to be invasive (Hayden and White 105).





Predicted temperature increases from 2020-2029.
*Images by Sebeens et al, "Global trade will accelerate plant invasions in emerging economies under climate change."

Climate change will also impact invasive species' migration patterns. By 2100, average global temperatures likely will rise between 4° and 9° Fahrenheit. This change will bring about massive changes in the way carbon is stored, distributed and used by plant and animal communities alike.

As temperatures rise, temperate regions will become host to a range of species that couldn't previously establish themselves under harsher conditions. In contrast, as the tropics continue to warm, they will likely become less hospitable to the diversity of species which currently occupy them. However, while global temperatures are expected to increase and will undoubtedly change ecosystem dynamics (Sebeens et al. 4129), the impact of global trade on invasive species will likely far outweigh that of climate change.



III. MANAGEMENT

The spread of [invasive] species across the landscape is as much a sociological as a biological problem, and we ignore this fact at our peril.

- Peter Del Tredici, “Flora of the Future.”

MYTHS

Various representations of the landscape have reinforced cultural myths which continue to drive land management and design practices. Human attempts to manage the landscape can be traced back over 10,000 years, with initial ambitions aimed at creating reliable food sources. In doing so, the shift from the Holocene to the Anthropocene created a world in which humans increasingly influenced and defined nature.

The Edenic and Peaceable Kingdom aesthetics that developed during the Romantic period laid the foundation for how many continue to envision "natural" or unmanaged landscapes. Balance, diversity, harmony and the absence of human needs are key to maintaining these myths despite the reality of competition, diseases, dynamism and continuous evolution (Naeem 70).



Above: Edward Hicks, "Peaceable Kingdom," 1834
Previous: Erastus Salisbury Field, "The Garden of Eden," 1860s

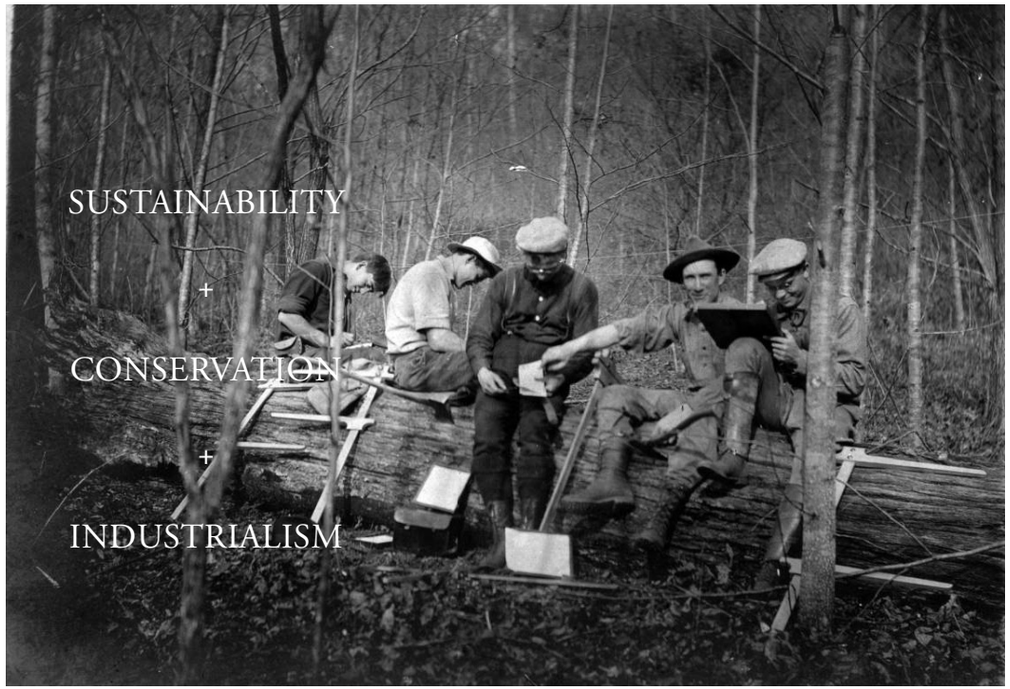
LINEAGE

Scientific forestry was a practice adapted from Europe and first applied in the United States at the Biltmore Estate in Asheville, North Carolina in the late 19th century. Frederick Law Olmsted and George Pinchot led the efforts at large-scale land management for George Washington Vanderbilt. Carl Alvin Schenck succeeded Pinchot as chief forester and in 1898, along with Vanderbilt, established the Biltmore School of Forestry, the first of its kind in the U.S.

While the estate emphasized sustainability and conservation, it also had a strong industrialist agenda. For Olmsted, Pinchot, and Schenck, scientific forestry was regarded as the "economic management of woodlands designed to maximize timber crops and foster future healthy growth." (Foreman and Stimson, The Vanderbilts and the Gilded Age, 289) The goal was not necessarily to maintain and protect the forest ecosystem as it had existed before human intervention.



Students from the Biltmore Forest School inspecting a portable forest railroad in Darmstadt, Germany, c. 1912. Images courtesy National Forests of North Carolina Historic Photographs, D.H. Ramsey Library, Special Collections, University of North Carolina at Asheville.



Biltmore Forest School students measure logs and estimate yields.

The more you think about the services of the forest, the more you understand them, the more essential they appear. It is true indeed that the forest, rightly handled – given the chance – is, next to the earth itself, the most useful servant of man.

-Gifford Pinchot, *Breaking New Ground*, 32.

LANDSCAPE CATEGORIES

MANAGED, adj.

Aim is to be in control of biodiversity or ecosystem functions or services (often provisioning services). Landscapes are often either highly productive or a total failure. Subsidies, such as fertilizers, irrigation and biocides, are often used to avoid failure and manage contingency.

UNMANAGED, adj.

A landscape that is not intentionally managed. In such scenarios, species are allowed to compete, increasing in density until they exhaust their most limiting resource and become stable.

DEGRADED, adj.

A landscape in which biodiversity and ecosystem functioning decrease because of poor management or exploitation.

RESTORED, adj.

A landscape that has is recovering from a managed or degraded state and has achieved some level of biodiversity or ecosystem targets.

*Definitions derived from Naeem, “Biodiversity, Ecosystem Functioning and the Design of Landscapes.”

ESTABLISHED PRACTICES



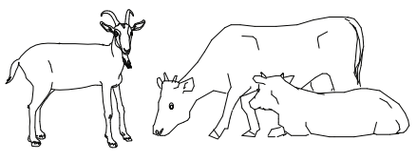
Cut



Prescribed burn



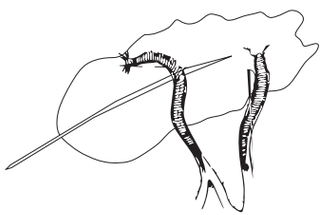
Mow



Graze



Chemical spray

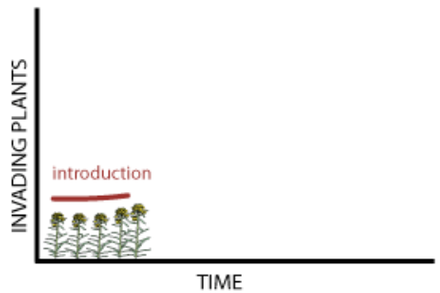


Biological control

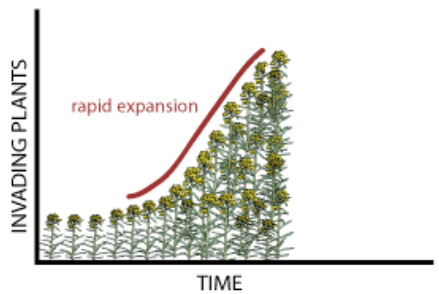
INVASION PROCESS

MANAGEMENT POLICY

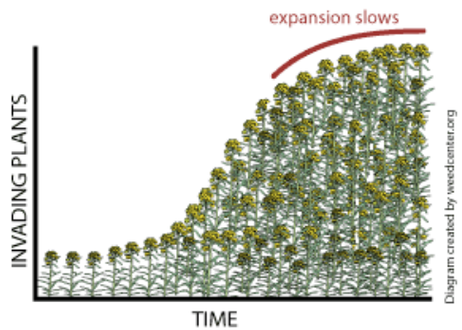
Introduce



Establish



Naturalize



Invade

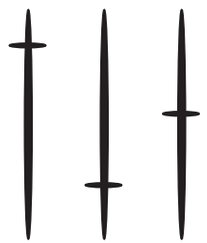
Prevent



Eradicate



Control

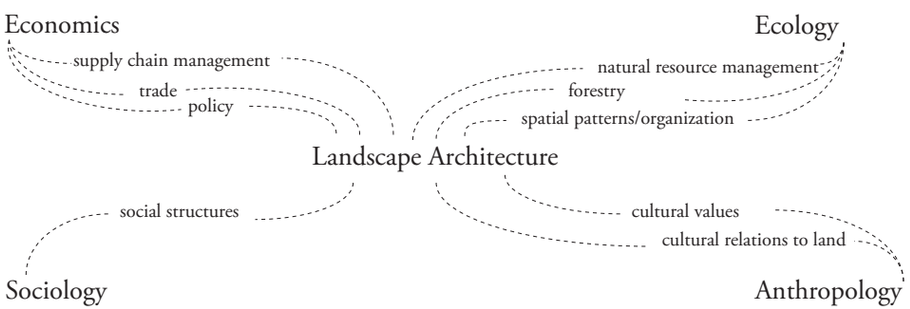


Human adaptation
or restoration



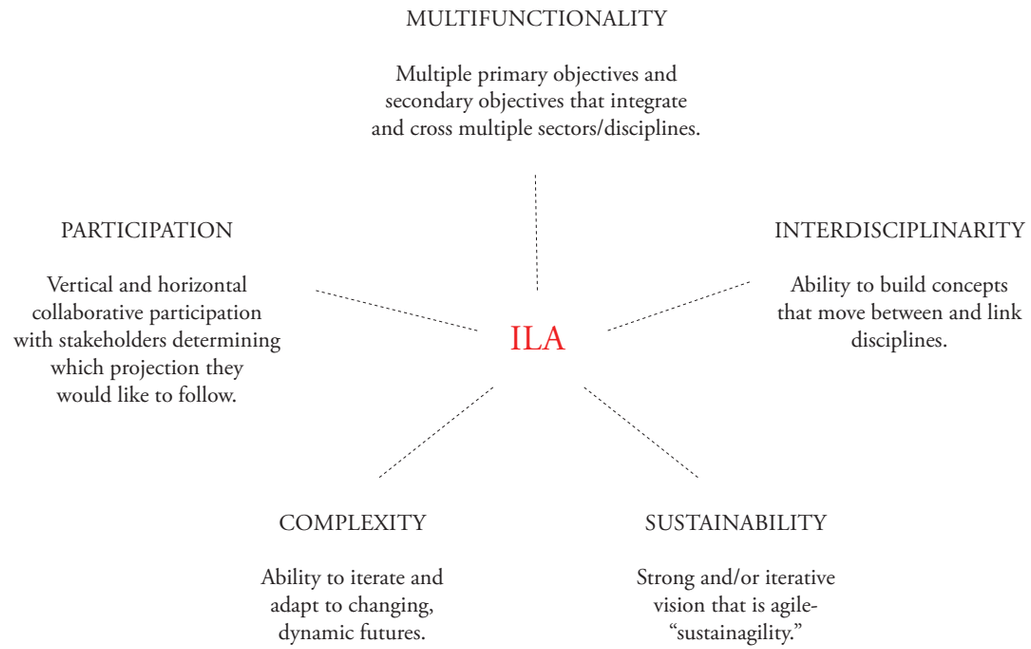
EVOLVING PRACTICES

As landscape architects, we edit the landscape, constantly selecting what to add, what to delete, and how to realistically manage our visions over time. Though our mode of practice has evolved, we rely on long-standing categories that evoke specific reactions. Western management approaches often strive to contain and eventually eradicate invasive populations, re-storing the landscape to its previous state and discarding huge quantities of biomass in the process. However, what if we made it our responsibility to allow room for new understandings of these intrepid travelers, while safeguarding ecological integrity? Could we begin to proactively search for missed opportunities and find ways to re-engage with them? Approaches borrowed from several other fields show promise.



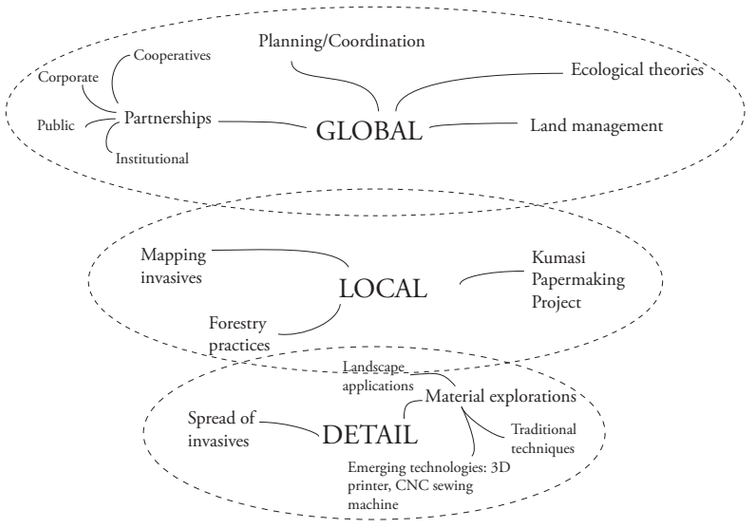
"How to bring DISCIPLINE to architecture's UNDISCIPLINED APPEARANCES?"

- Mark Linder, "TRANSdisciplinarity"



INTEGRATED LANDSCAPE APPROACH

An intergrated landscape approach (ILA) to management emphasizes a holistic view where the landscape is seen as a complex system. It incorporates ecological, economic, social and cultural considerations and accounts for change in future visions (Freeman et al).



SUSTAINABLE DEVELOPMENT

The term "sustainability" was officially defined in 1987 by the World Commission on Environment and Development. It is defined as "meeting the needs of the present without compromising the ability of the future generation to meet their own needs." The concept has greatly influenced environmental, political and economic initiatives and dictated contemporary management practices.

Management is no longer simply a matter of ecological conservation. As supply chains, carbon trading and international trade agreements increasingly impact the environment and deplete resources, consumers and regulating bodies demand tighter restrictions. In response, Corporate Social Responsibility (CSR) reports have become commonplace as corporations battle to prove their socially and environmentally good intentions in the face of scrutiny (Gyau et al). For those looking for a new means of environmental impact, perhaps a strategy for managing invasive species could provide a window of opportunity, not to mention a quick, endlessly replenished source of raw materials.

ENVIRONMENTAL

Sustainability

+

SOCIAL

CSR practices and the importance of multi-stakholder platforms that promote collective action and partnerships between public, private and civil society sectors.

+

ECONOMIC

Supply chain management

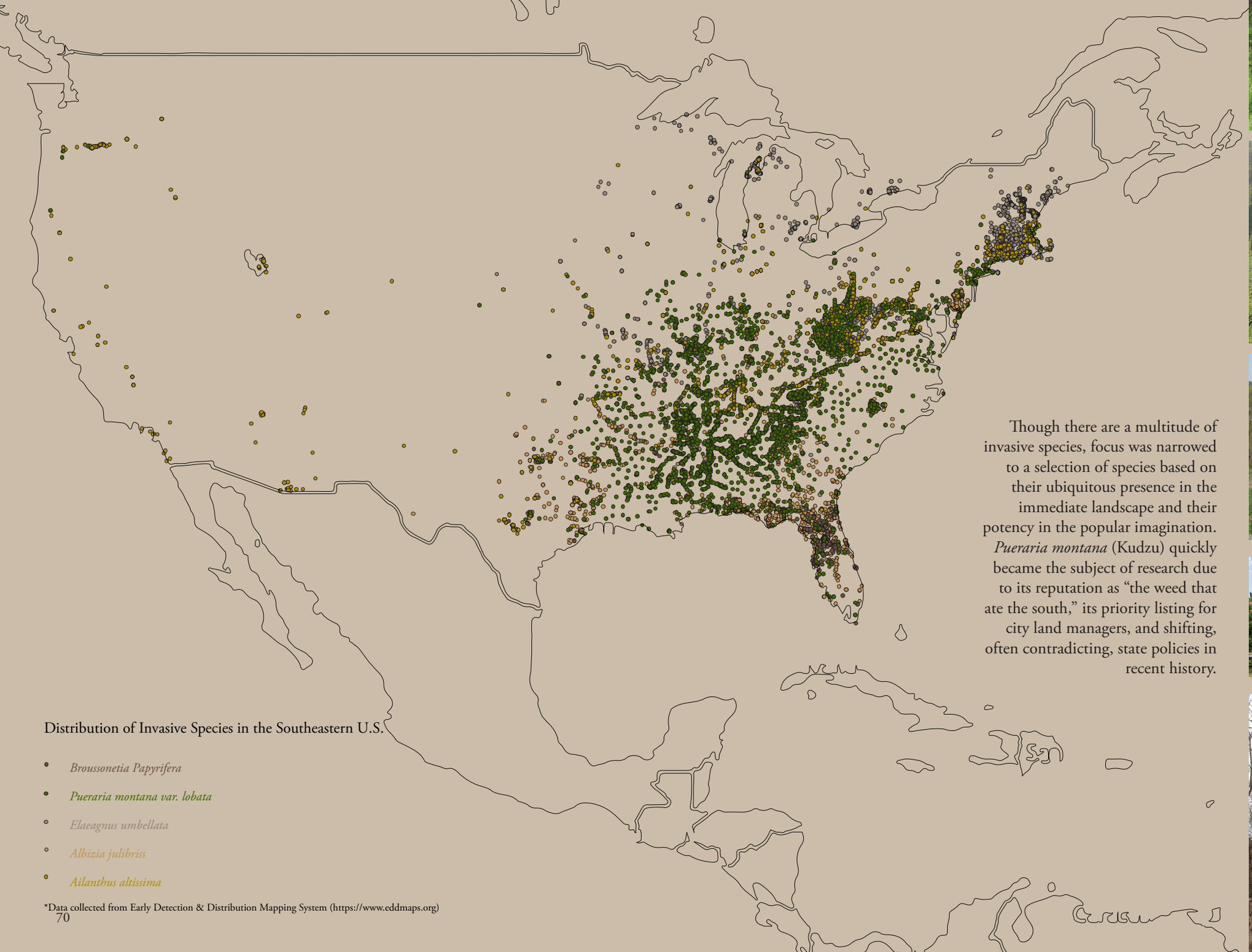


Image courtesy EDD Maps/Bugwood Images

III. *PUERARIA MONTANA* | 'KUDZU'

Weeds are those plants that get in the way of programs, agendas, or desires that we project into spatial constructs.

-David Gissen, *Subnature*



Though there are a multitude of invasive species, focus was narrowed to a selection of species based on their ubiquitous presence in the immediate landscape and their potency in the popular imagination. *Pueraria montana* (Kudzu) quickly became the subject of research due to its reputation as "the weed that ate the south," its priority listing for city land managers, and shifting, often contradicting, state policies in recent history.

Distribution of Invasive Species in the Southeastern U.S.

- *Broussonetia Papyrifera*
- *Pueraria montana var. lobata*
- *Elaeagnus umbellata*
- *Albizia julibriss*
- *Ailanthus altissima*

*Data collected from Early Detection & Distribution Mapping System (https://www.eddmaps.org)

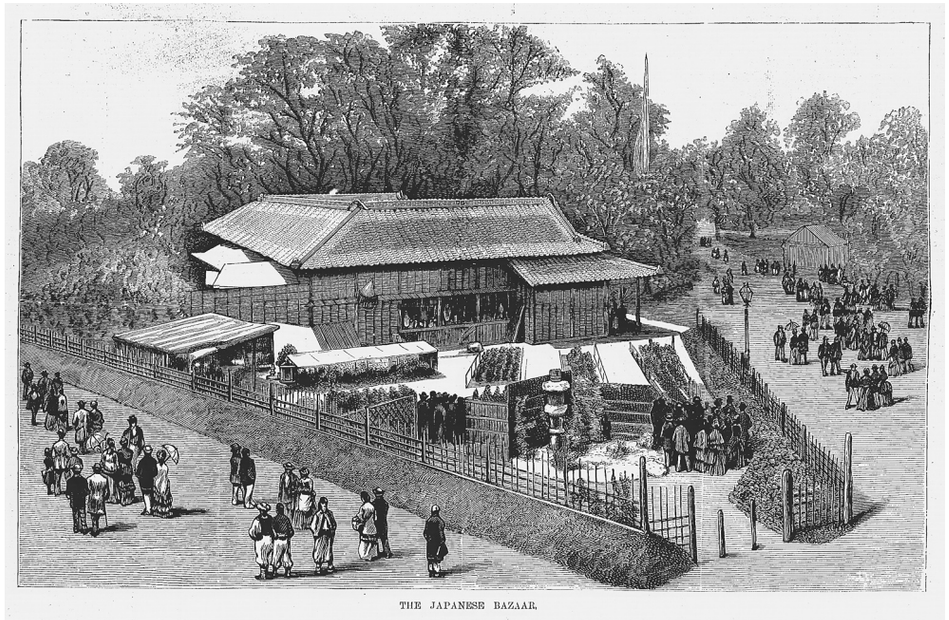










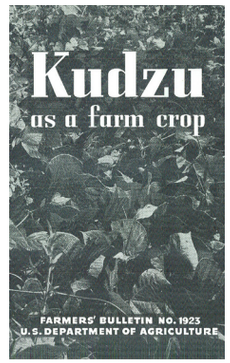


THE JAPANESE BAZAAR.

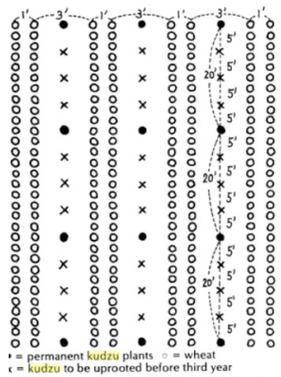
POLITICAL HISTORY

The history of *Pueraria montana var. lobata* (Kudzu) strongly illustrates how state attitudes can impact popular perceptions. Initially introduced to the U.S. in 1876 as part of the Japanese Pavillion at the Philadelphia Centennial Exhibition (the same event where Rau organized ethnological exhibitions), Kudzu was praised as an ornamental shade plant and admired for its fragrant, grape-like smelling flowers (Stewart 154). Kudzu was well adapted to the climate of the southeastern United States and required little assistance in becoming established.

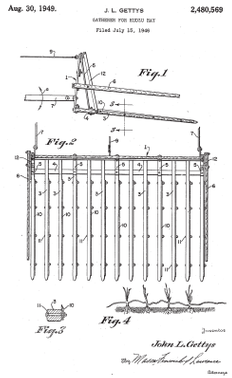












By the 1910s, it was widely used as a high-protein source of livestock pasturage, fodder and hay. However, its real impact was compounded by the Soil Conservations Society (SCS) in the 1930s. As part of the New Deal and Works Progress Administration (WPA), the SCS promoted Kudzu as a form of erosion control, offering farmers up to $8 per acre in subsidies to plant the vine, especially on land where cotton had exhausted the soil (Stewart 157). Similarly, other species now considered highly invasive, such as *Elaeagnus angustifolia* (Russian Olive) and *Rosa multiflora* (Multiflora Rose), were also promoted as forms of erosion control during this time.

For a period of about 20 years, Kudzu was hailed as a landscape healing agent. However, by the mid-1950s, Kudzu became condemned as the "the weed that ate the south." Strict eradication efforts ensued. and combative attitudes towards the plant have remained largely unchanged to the present time.

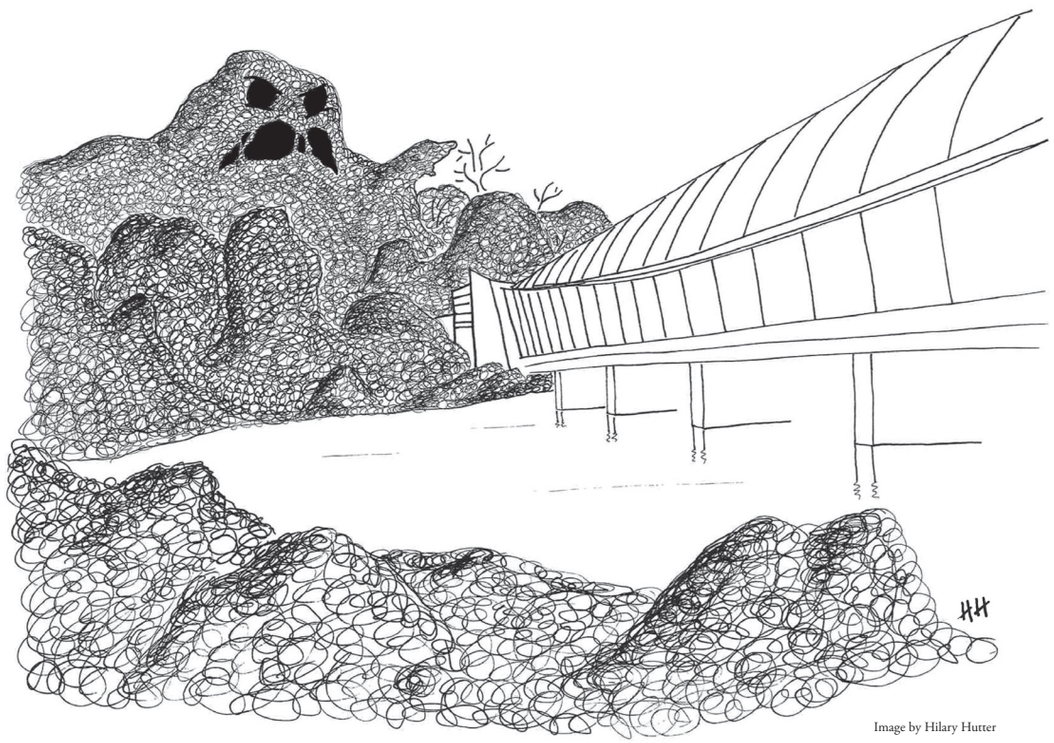


Image by Hilary Hutter

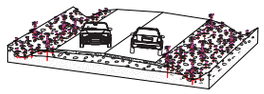
When considering why this sudden change in attitude occurred, it is helpful to look at the larger socio-political climate that was influencing state policy and decisions at the time. In the post-World War II era, protectionist measures were developing as the Cold War, Korean War, Vietnam War and Cuban Revolution were mounting, heightening fears and raising suspicions of anything considered foreign or growing unchecked. It is also reasonable to consider that perhaps some of the push for native plants that was being promoted in the 1920s and 1930s by ecologists and landscape architects such as Jens Jensen, Aldo Leopold, Elsa Rehmann, Edith Roberts, finally resonated with the larger public during a time of heightened anxiety (Beardsley 4).



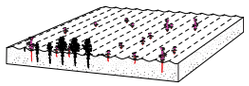
Edith Roberts established the Ecological Laboratory at Vassar College in the 1930s. It housed over 2,000 species native to Dutchess County.

Pueraria montana var. lobata
Kudzu

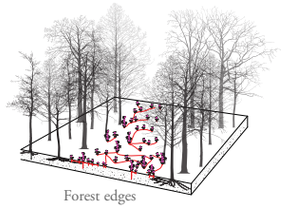
HABITAT



Roadsides



Abandoned fields



Forest edges

LEAVES



Entire or lobed leaflets
3 broad leaflets
Hairy margins
Alternate, deciduous, compound leaves

FRUIT



Brown, pubescent
Flattened
Usually contain 10
hard seeds
Not usually established
from seed in US

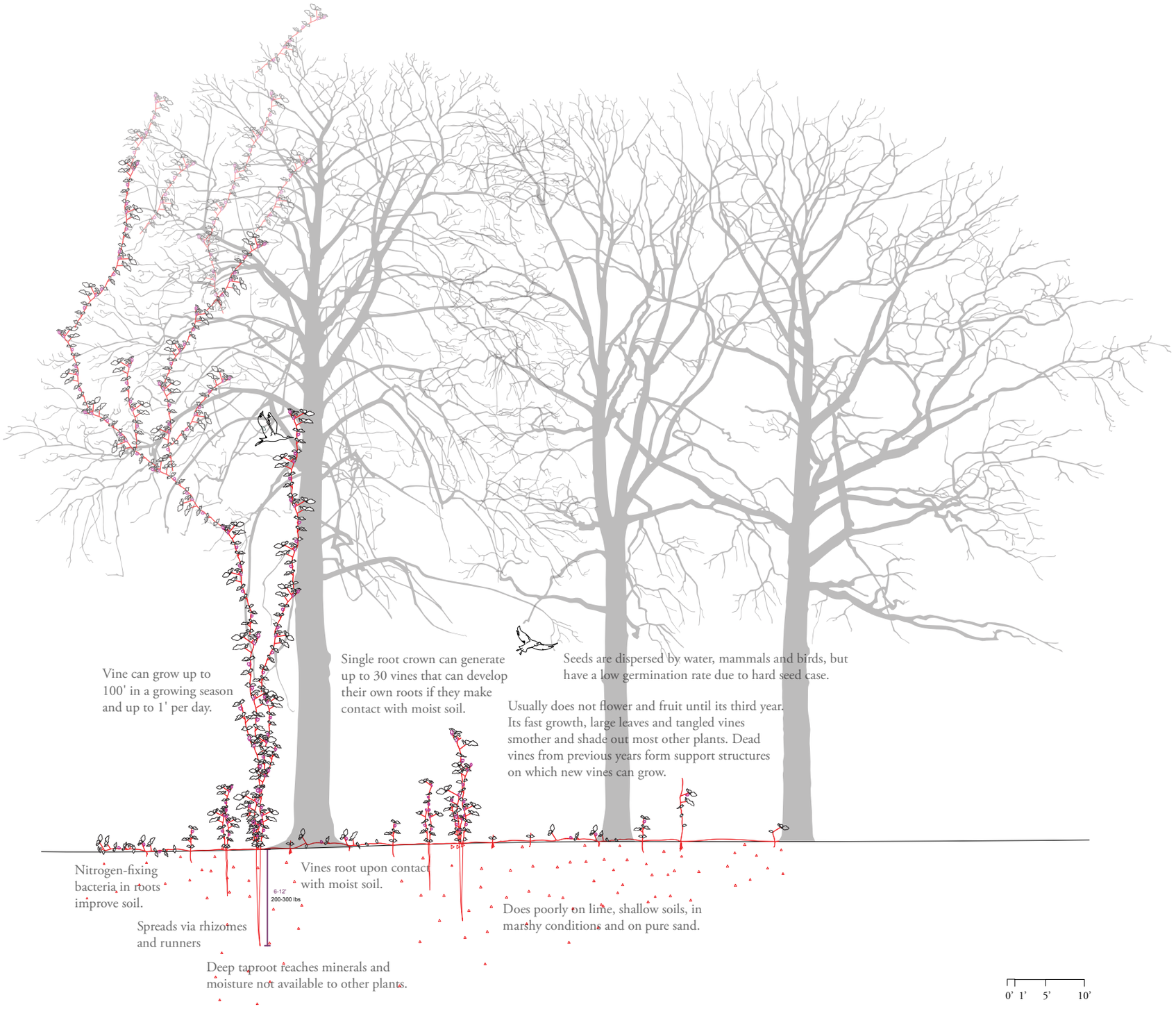
FLOWER



Upright clusters
Purple
Fragrant
Late summer

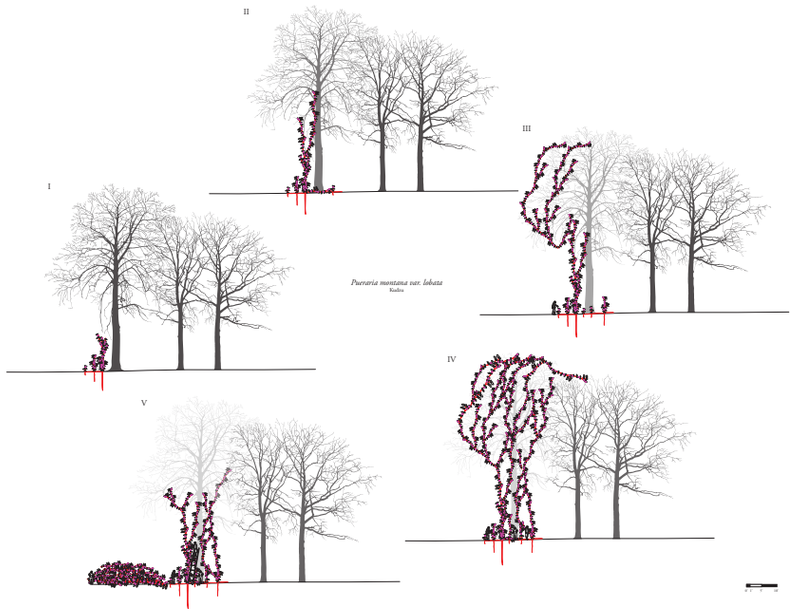
ORIGIN

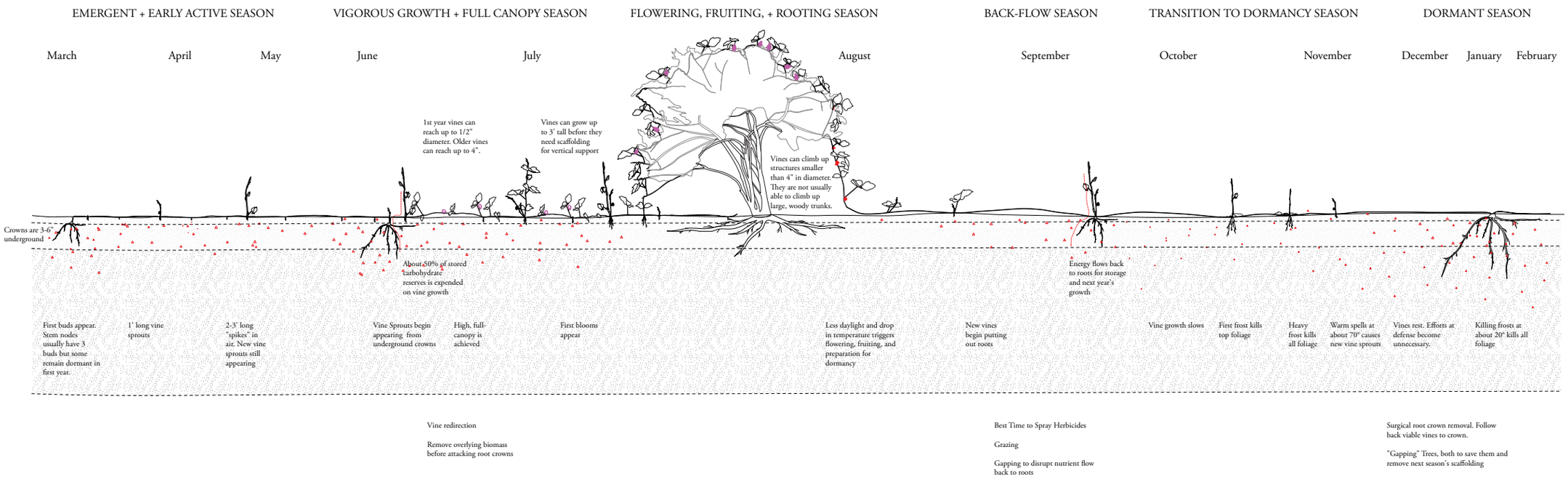


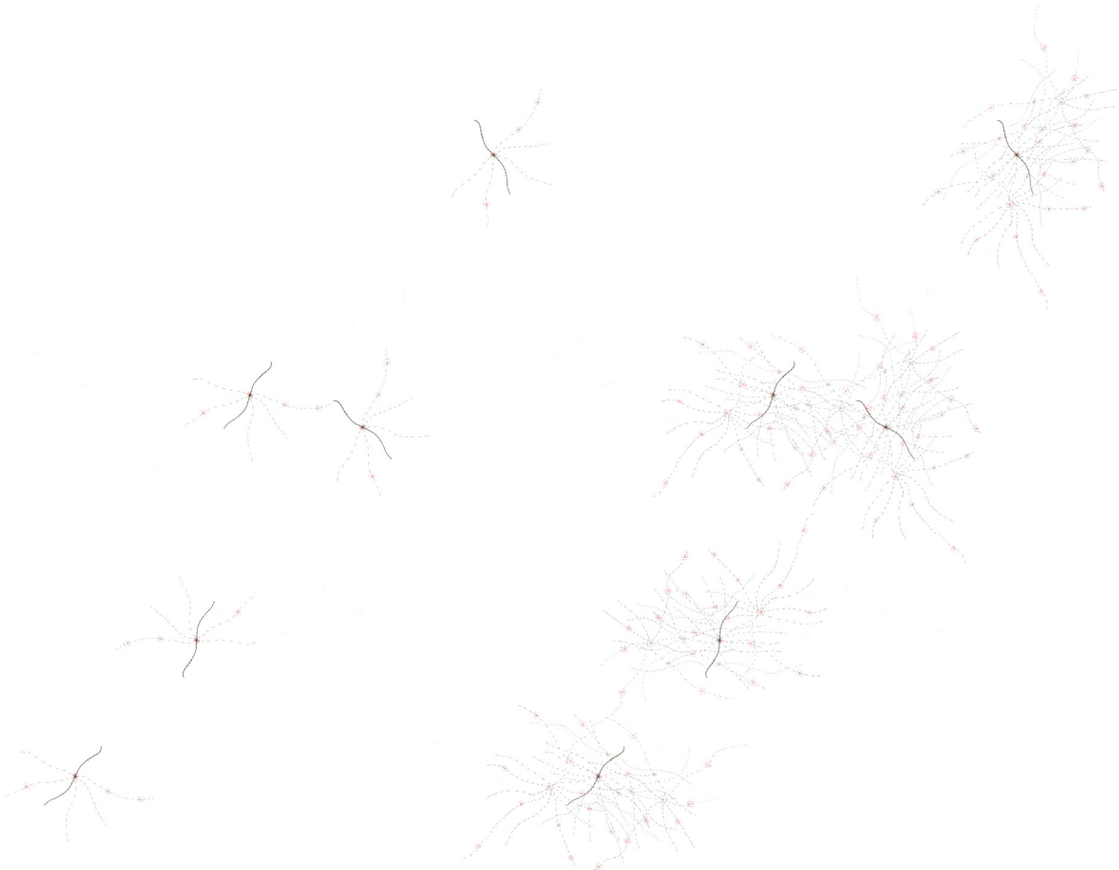


ANNUAL CYCLE

Kudzu reproduces vegetatively via stolons. Vines can grow up to one foot per day in the early growing season. When root tips come into contact with moist soil, new root nodes can develop and eventually form independent plants. While the plant does have seeds, its hard outer case reduces its chances of germinating.

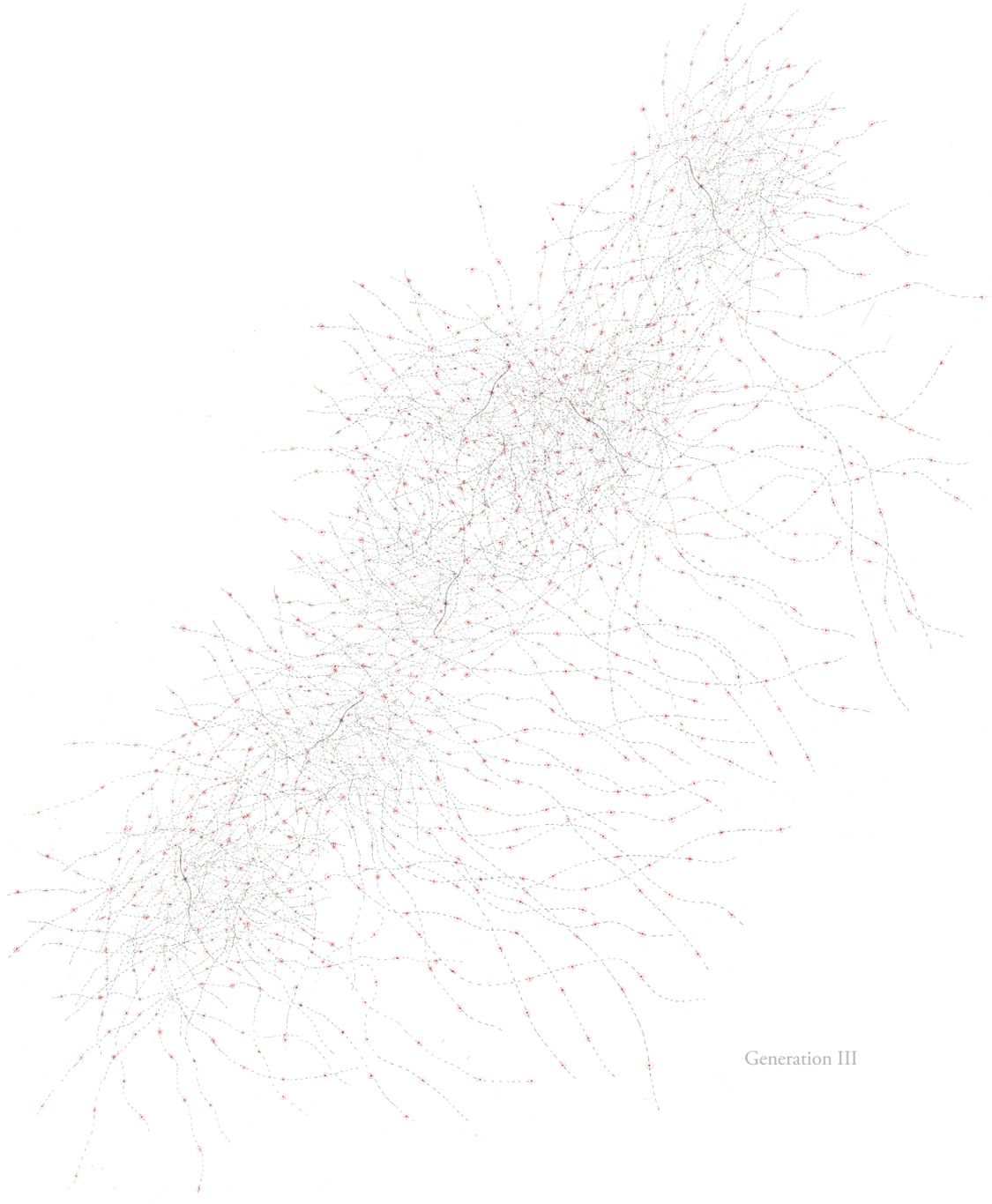






Generation I

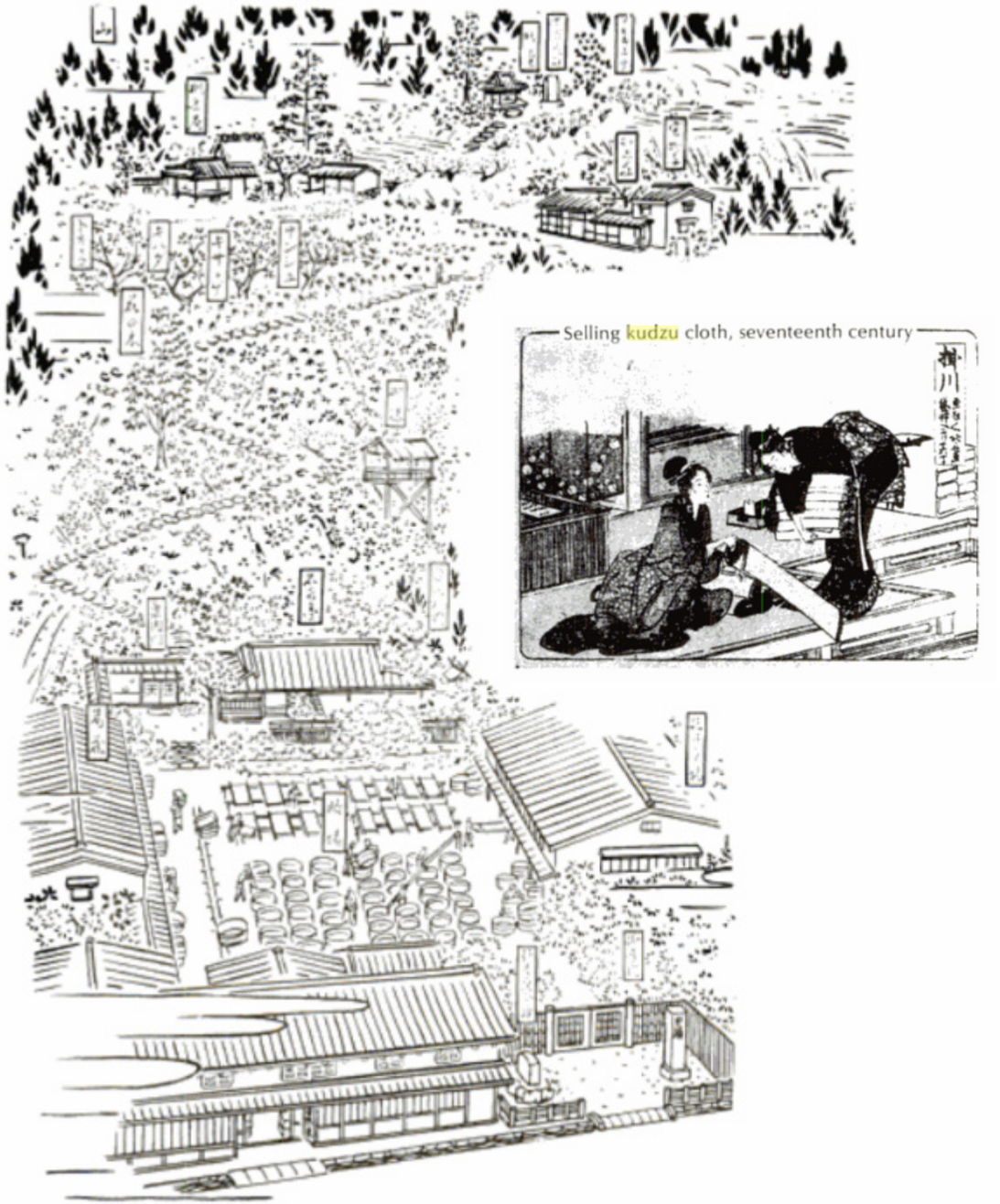
Generation II



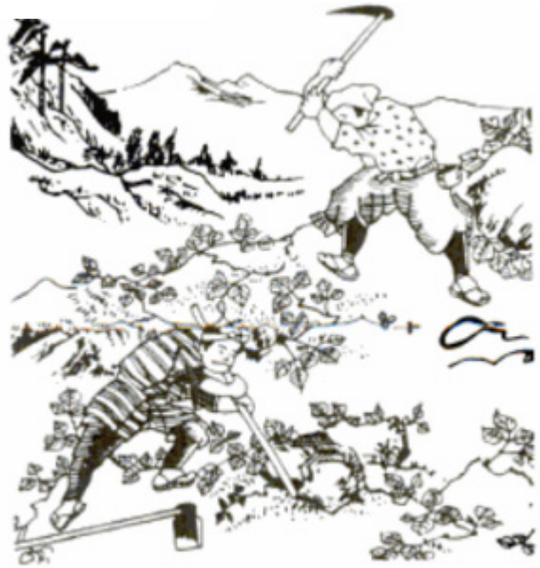
Generation III

ROOTS

Kudzu develops an extensive vine network, with each root crown hosting up to 30 individual vines that have the potential to develop into new plants.



Traditional herb garden and shop at Morino Yoshino Kudzu Honpo in town of Ouda in Nara Prefecture, Japan. Images from *The Book Of Kudzu: A Culinary & Healing Guide by* William Shurtleff and Akiko Aoyagi.



ALTERNATIVE ASSOCIATIONS

Though we are accustomed to viewing Kudzu as a nuisance, a study of its use in its native habitats revealed important findings. Part of Kudzu's ability to thrive and overtake local ecosystems in the southeastern U.S. can be traced to ecological dynamics as well as slight differences in climate. However, drastically difference cultural associations are evident in its use as a source of food, medicine and fiber in Korea, Japan and IndoChina. Its large tuberous roots, which can weigh up to 400 lbs, serve as an important source of starch that is used in bread, noodles, ice cream, drink and jelly. In traditional Chinese medicine, it has been used to treat diabetes, typhoid, alcoholism and bleeding in the upper digestive tract. Its use as a fiber in dates back over 6,000 years, when it was used in the production of kimonos and other ceremonial attire. It is referred to as kudzu-fu, ko-pu, kung-pu, ge-yi, kappu, katsui.

PART II
FIELDWORK

METHODOLOGY

Through a series of grants and outreach efforts, a multi-faceted network has developed, bringing together experts in landscape architecture, natural resource management, ecology, material science, chemistry, fashion, textiles, and art. Fieldwork began in summer 2014 in Kumasi, Ghana with a site visit to a paper making project that uses fibers from the invasive *Broussonetia papyrifera* (Paper Mulberry). In spring 2016, local test plots were established in conjunction with the Charlottesville Parks and Recreation department to investigate Kudzu's seasonal growth pattern and form, its interaction with host plants, the city's current management regimes, as well as to harvest and send samples to test its fiber viability in labs. Throughout the project, consultative trips have expanded the scope of work, provided critical feedback and bridged the divide between academic research and real world application.



IV. CASE STUDY | KUMASI PAPERMAKING PROJECT

Society is not what it is but what it makes itself be: through knowledge, which creates a state of relations between society and its environment; through accumulation, which subtracts a portion of available product from the cycle leading to consumption; through the cultural model, which captures creativity in forms dependent on the society's practical dominion over its own functioning.

- Alain Touraine, *The Self-production of Society,* 4.

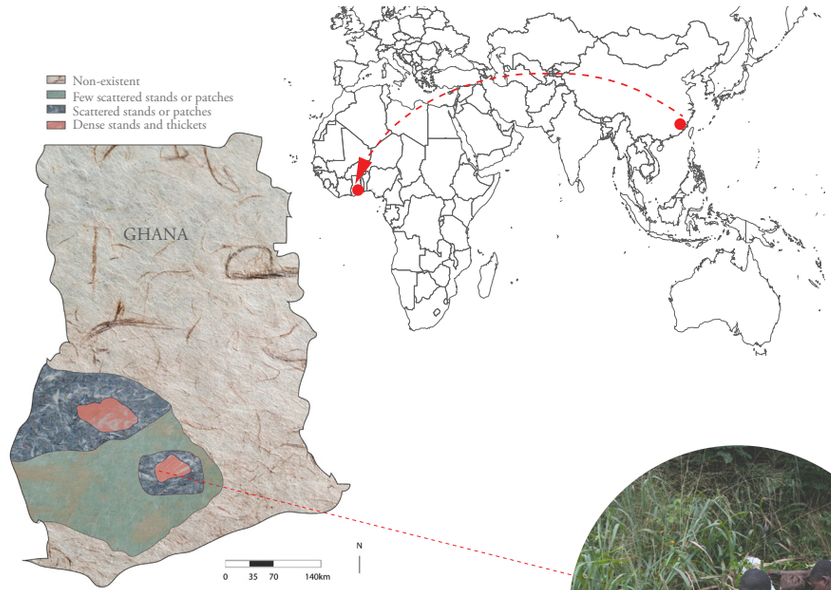
LOCATION: Kumasi, Ghana
YEAR: 2014

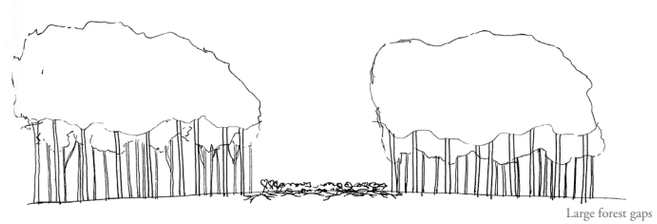
ABSTRACT

Global health requires a consideration of both human and ecological concerns at a variety of scales. This project follows the history of the spread of the invasive *Broussonetia papyrifera* (Paper Mulberry) and how an environmental challenge was turned into an opportunity through an ongoing papermaking project in Kumasi, Ghana. The project addresses two main challenges- the onslaught of Paper Mulberry and a lack of nationally produced fine arts paper. In doing so, it creates economic, social and educational opportunities that support environmental and human health. The project was initiated in summer 2014 and was sponsored by the UVA Center for Global Health to investigate the confluence of artisan cultures, natural resource use and global migration.

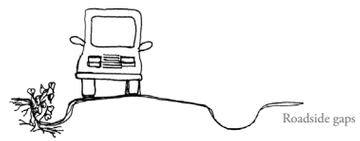
BACKGROUND

In 1969, Ghana received 14 Paper Mulberry plants from China to evaluate the potential for developing a paper industry. The project was abandoned and the plants were left unattended. Because both male and female species were introduced, it quickly became invasive and posed a new challenge to farmers who constantly battled to keep it at bay. More than 40 years later, the species now covers around 80,000 sq km of land and spreads rampantly in roadside gaps, abandoned fields and large forest gaps.







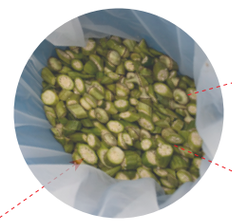


COLONIZATION AND SPREAD













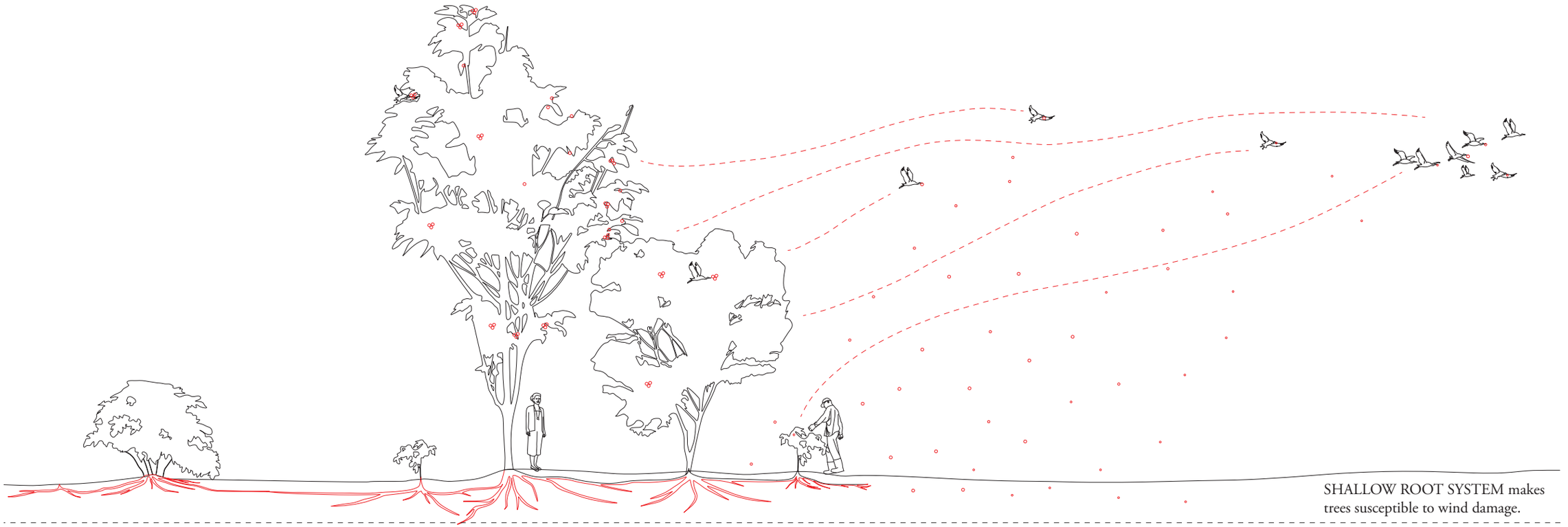






Broussonetia papyrifera

Paper Mulberry



Growth form varies. Some appear as LARGE SHRUBS, forming thickets from root sprouts.

Others grow as TREES, with a broad, rounded crown and wide-spreading branches.

New plants GROW RAPIDLY from ROOT SPROUTING and SUCKERING

WILDLIFE who feed on the fruit spread SEEDS over large distances.

The project relies on fibers extracted from the inner bark of Paper Mulberry. The introduction of Paper Mulberry in Ghana was specifically problematic because of the introduction of both male and female species. As a dioecious plant, if only one sex is introduced, its reproductive potential drops dramatically. In many regions in the Pacific, the plant is not considered invasive because only male species were introduced.



CONTEXT

The project unfolds in the Ashanti region of Kumasi, Ghana, a region rich in natural resources and a culture with a strong historic and lively entrepreneurial arts and crafts scene. The Forestry Research Institute of Ghana (FORIG) is located here, playing a role in land management and rural economic development initiatives.

The city is also home to the well-respected Kwame Nkrumah University of Science and Technology (KNUST), making it an ideal place to test ideas and get young people involved. A lively market is at the node of the city, drawing goods, people and services from across the region to engage in exchange.





The Kumasi Papermaking Project was initiated by Mary Hark, a textile and fiber artist and educator who I met as an instructor during my undergraduate education at Macalester College. In 2006, Hark was awarded a Fulbright Senior Research Grant and has since been working with a Ghanaian team to transform plant fibres into high quality papers.







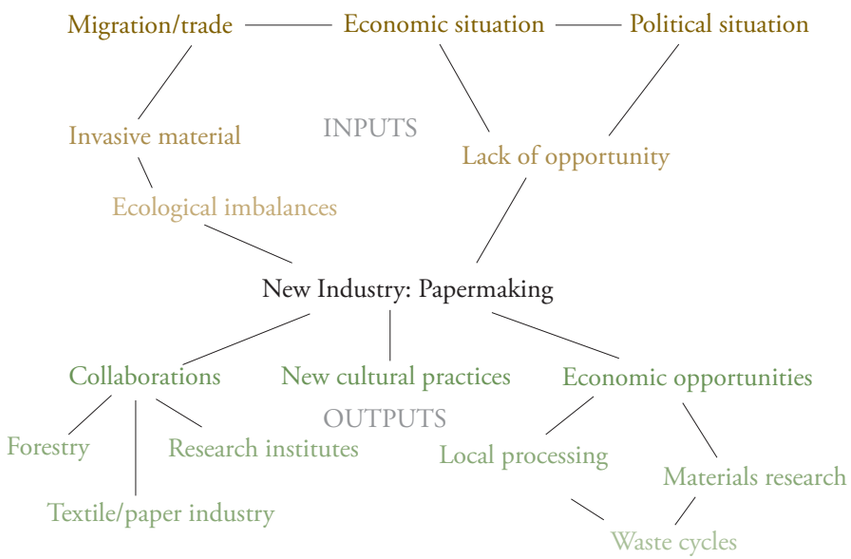






CHALLENGE TO OPPORTUNITY

The project merges science and art as a means to create social, economic and educational opportunities while supporting environmental and human health yet little attention has been paid to the sustainability of the landscape that supports the project.





"A piece of paper is a plant re-engineered for specifically human purposes."

– Levine, Mark. "Can a Papermaker Help to Save Civilization?"









Mary works in collaboration with several local partners. Farmers help to harvest the raw fibers from a nearby forest where the plant is abundant. The land is managed by FORIG.

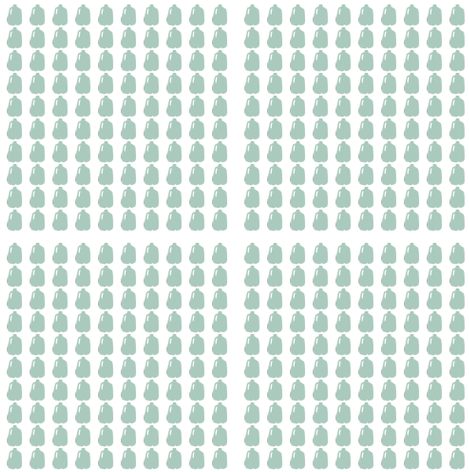


To date, the project remains an educational initiative, happening mostly when Mary Hark is present to gather material from local farmers and conduct workshops. There is promise that the project could evolve into a larger venture, or it could simply remain as is- a reminder of how to use materials that are readily available and currently considered a burden to the local landscape. It serves as the seed that inspires and drives my thesis work.

V. IMBALANCES

Modern natural resource management…has relied on fixed rules for achieving constant yields.

- Carl Folke et al., “Linking Social and Ecological Systems for Resiliency and Sustainability.”

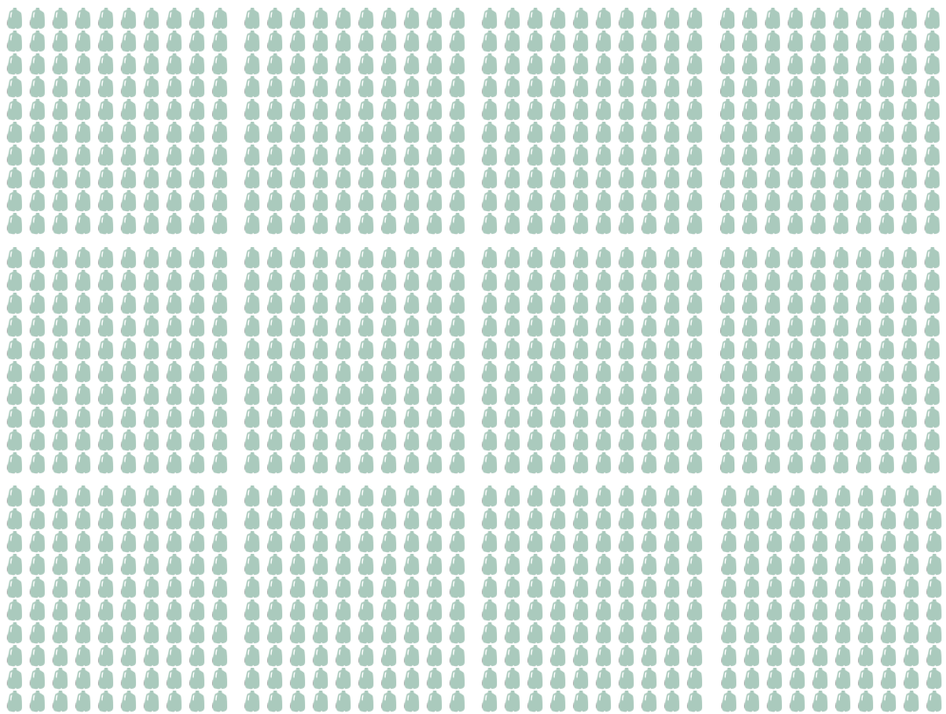


400 Gallons

CRITIQUE

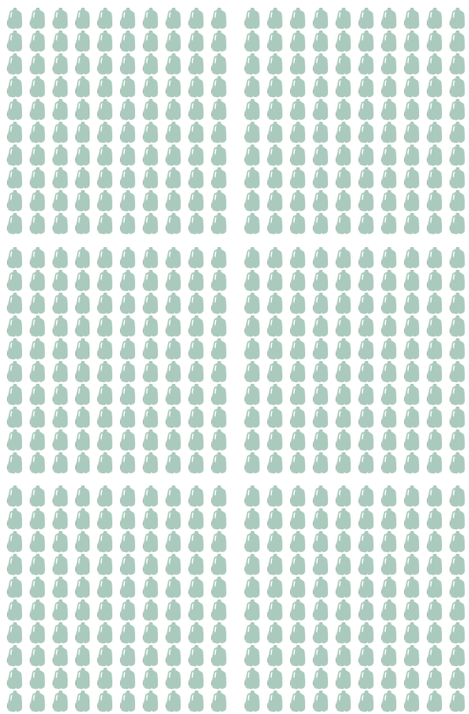
The fiber aspect of research stems from a critique of the current fashion and textile industry, informed by my background as a writer and photographer focused extensively on textiles and fashion from an anthropological perspective. Much like invasives, the fashion industry threatens ecological diversity as it often relies on expansive monocultures of crops and patterns of rapid consumption.

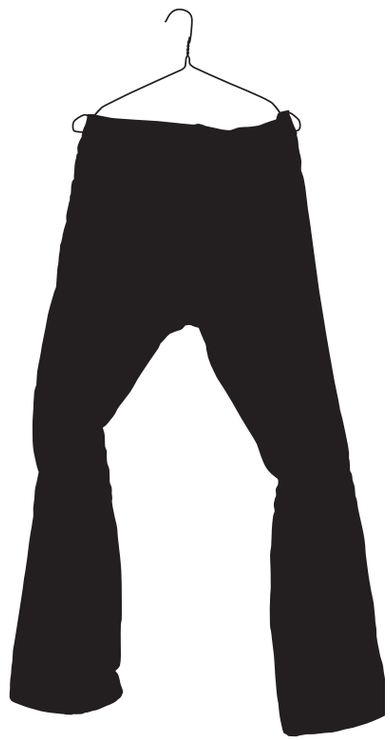




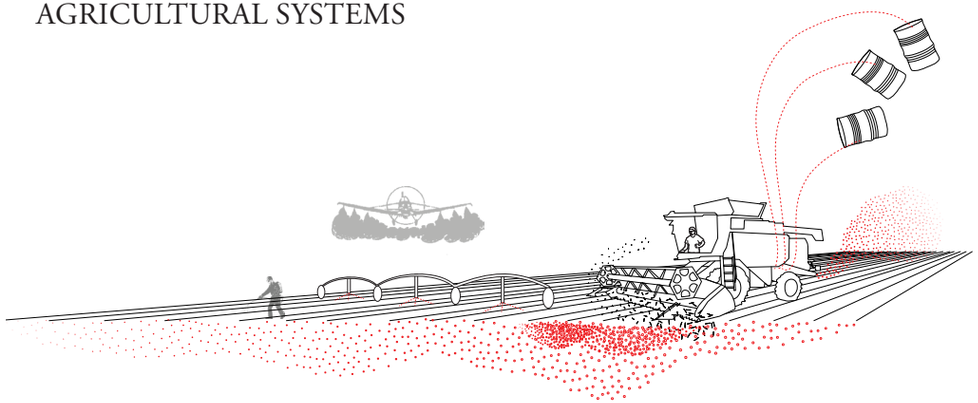
1800 Gallons

Cotton accounts for 2.5% of global cropland and 24.4% of world fiber demand. Current cotton growing practices are responsible for 2.6% of global water use, more than 10% of global pesticide use and nearly 25% of insecticides.



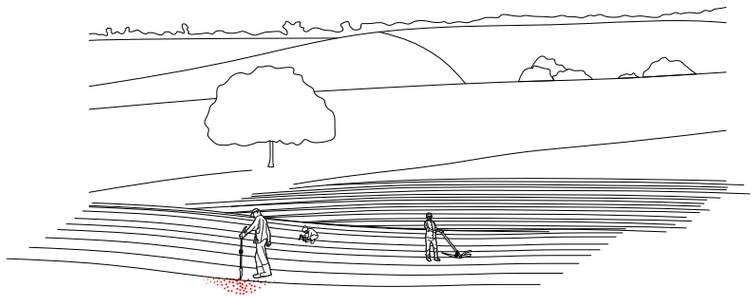


AGRICULTURAL SYSTEMS



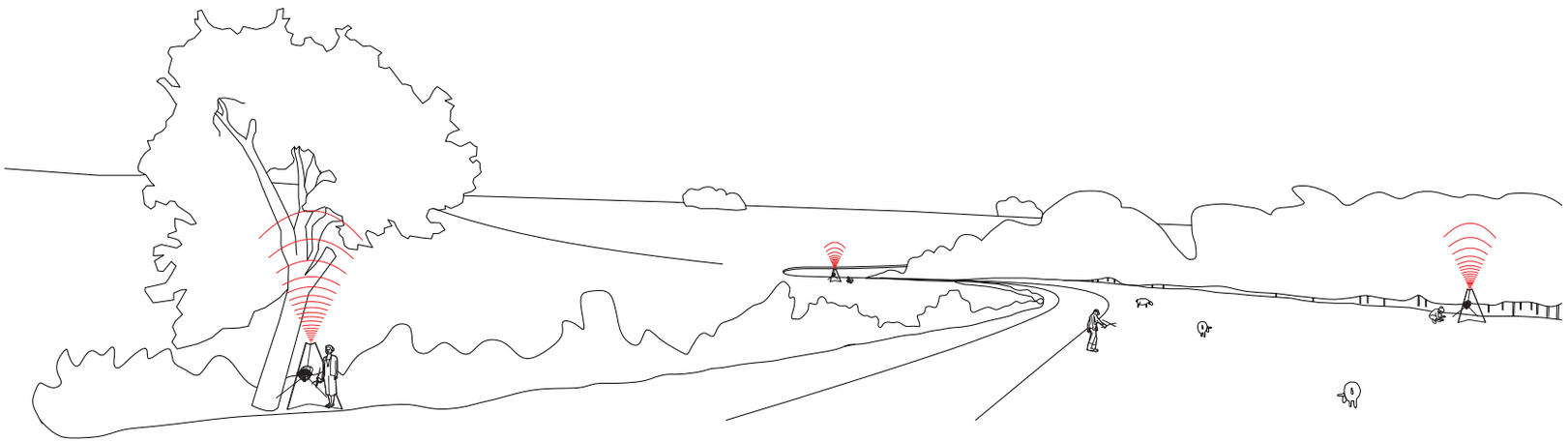
Extensive

Small amount of labor and capital in relation to land being farmed.
Practiced in areas with low population density and far from primary markets.
Yields depend on natural fertility of soil, terrain, climate and water availability.
Common in hilly and mountainous regions.



Intensive

Large input of labor and capital in relation to land area.
Often located close to markets- lower transportation costs.
Reliant on chemicals, pesticides and irrigation to drive high yields.
Often practiced on relatively flat topography.



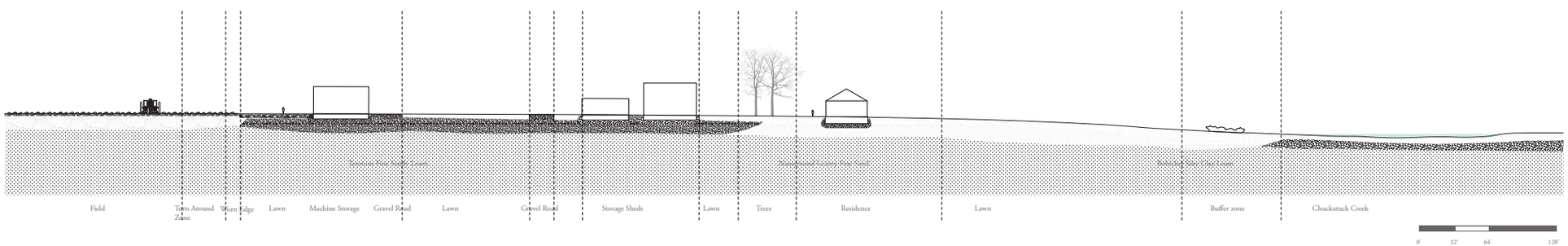
Proposed: Targeted

Small amount of labor and chemical inputs in relation to land area.
Practiced wherever misplaced gifts are found.
Yield depends on growth rate, climate specificities and surveillance techniques.
Common in disturbed areas and along roadsides.

EXISTING

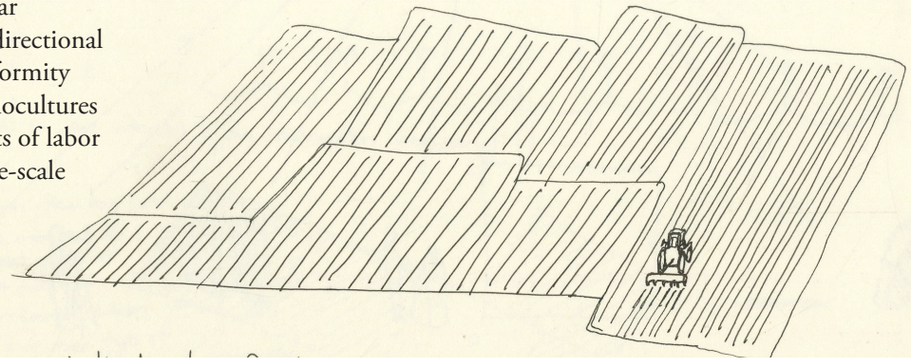
Existing extensive agricultural practices often rely on relatively flat, monotonous topographies in rural settings. Boundaries are clearly delineated and large expanses of land are dedicated to a single crop.

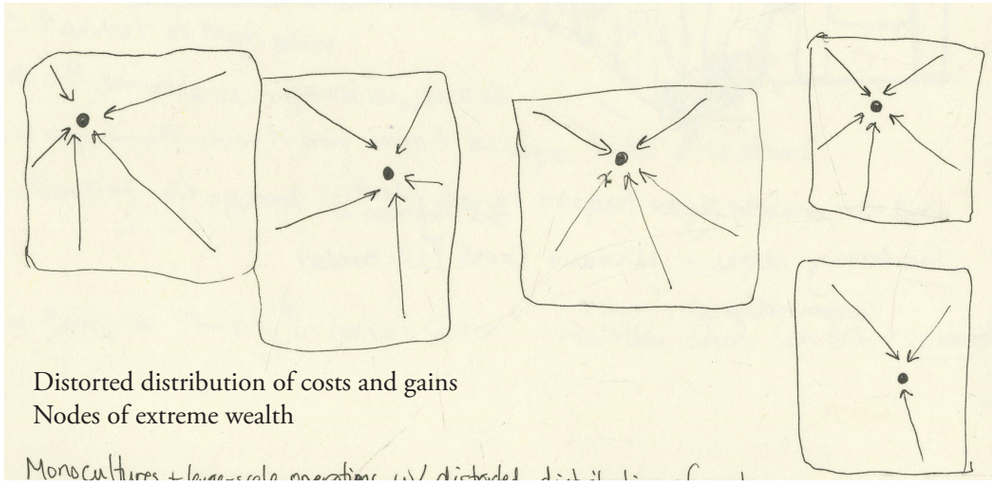




CONVENTIONAL FIBER PRODUCTION

Linear
Unidirectional
Uniformity
Monocultures
Fruits of labor
Large-scale

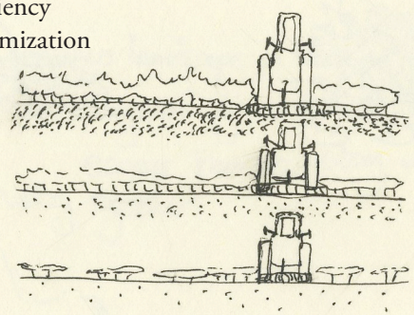


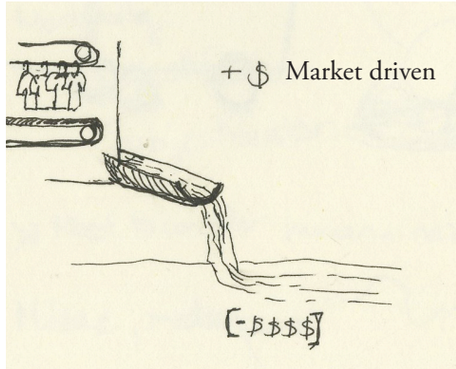


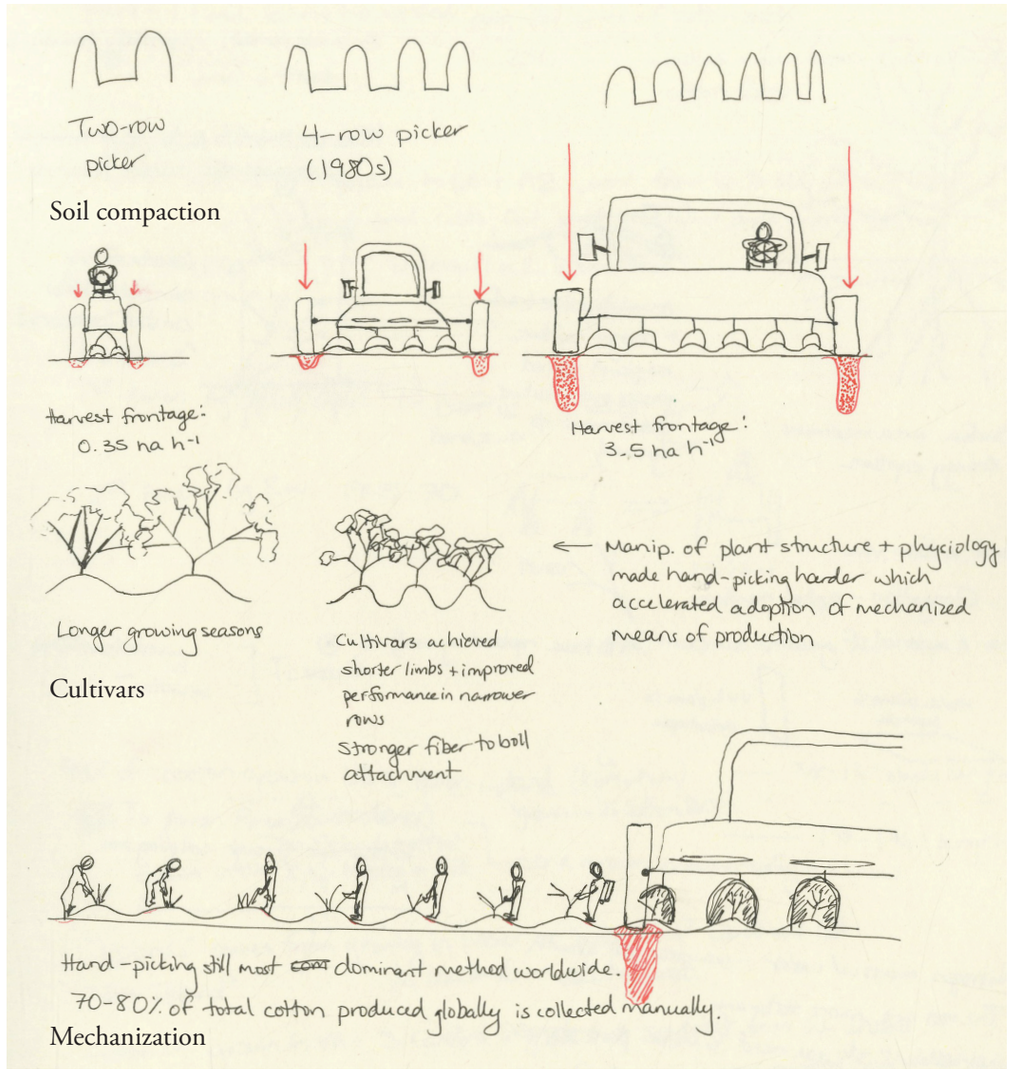
Distorted distribution of costs and gains
Nodes of extreme wealth

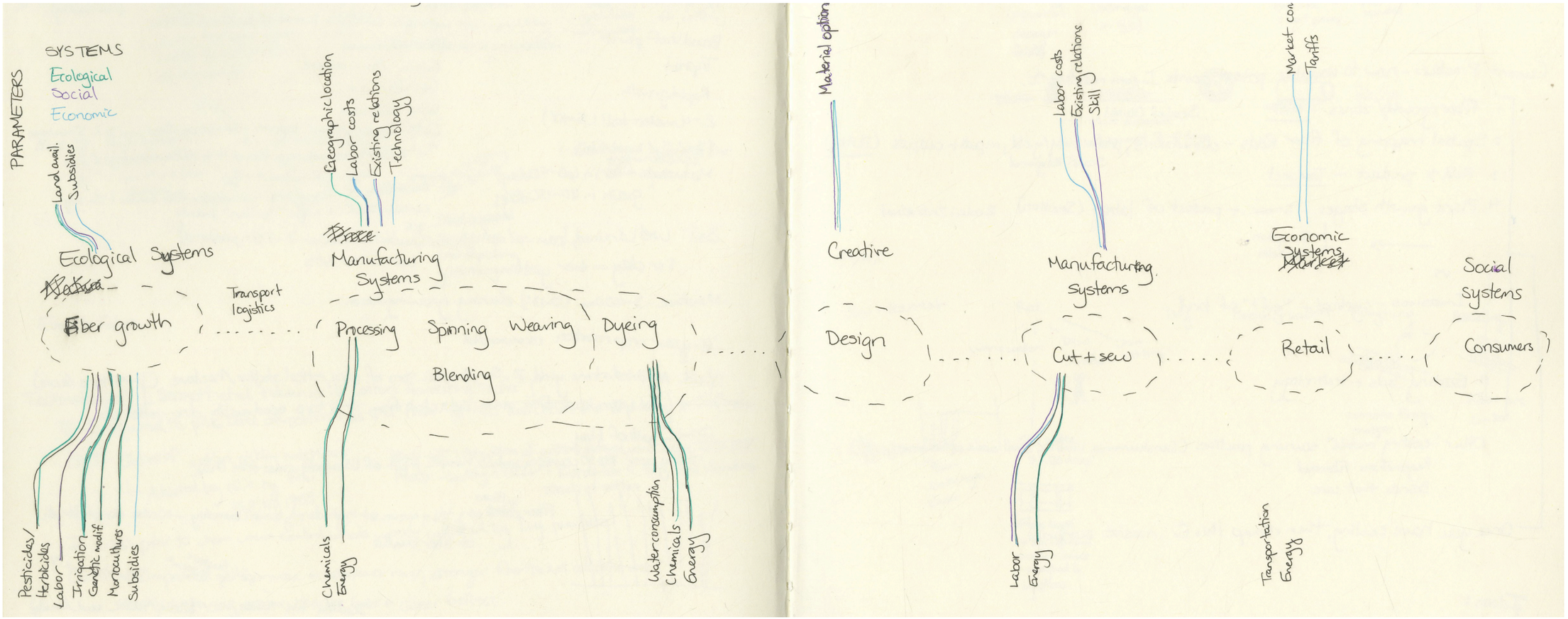
Monocultures + large-scale operations w/ distorted

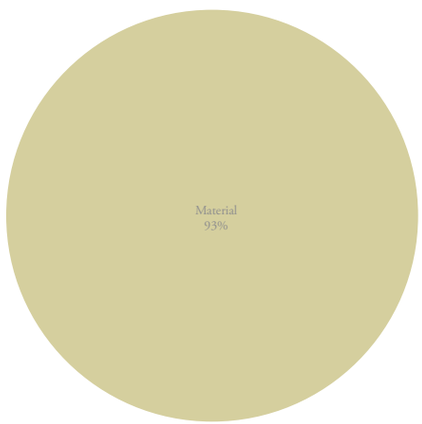
Efficiency
Optimization

















TOXICITY PROFILE

Toxicity profile throughout the lifecycle of a conventionally grown cotton t-shirt stresses the disproportionate need to address fiber production systems.

* Data from *Life After the MFA*, Fashioning an Ethical Industry.

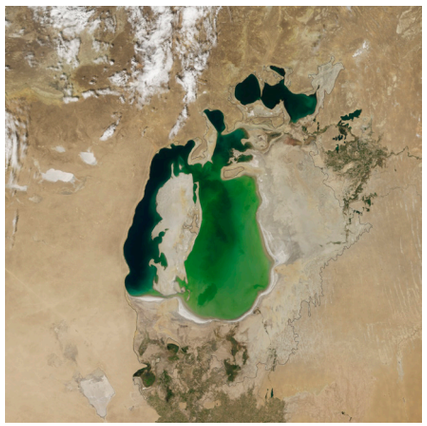
ENVIRONMENTAL DISASTERS

ARAL SEA | CENTRAL ASIA

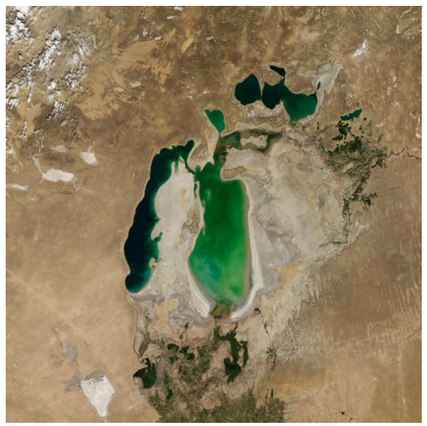
In 1960s, Soviets wanted to turn Central Asia into the world's largest producer of cotton and built an enormous irrigation network, including 20,000 miles of canals, 45 dams, and more than 80 reservoirs, all to irrigate sprawling fields of cotton and wheat in Kazakhstan and Uzbekistan. Today, what was formerly the fourth largest lake in the world has nearly dried up. Millions of fish died, coastlines receded miles from towns, and those few people who remained were plagued with toxic dust storms, the residue of industrial agriculture and weapons testing in the area.

(Data from bbc.com and nationalgeographic.com)

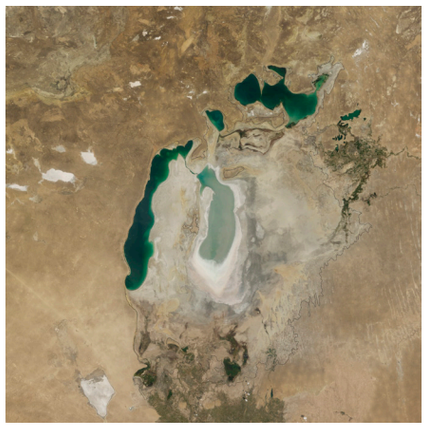




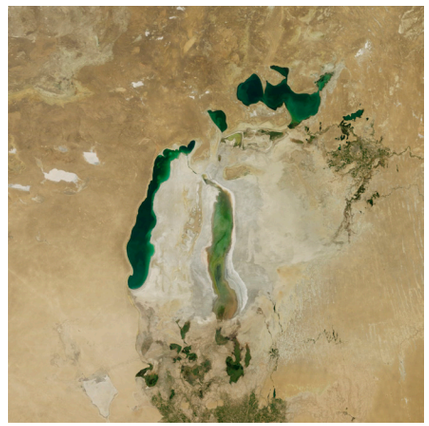
Aral Sea, 2000
(Black outline shows sea level in 1960)



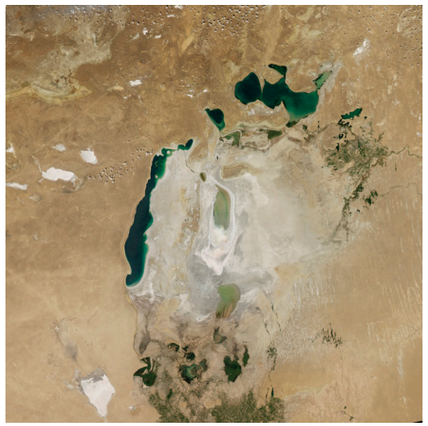
Aral Sea, 2004



Aral Sea, 2008



Aral Sea, 2012



Aral Sea, 2015
(Images courtesy NASA)


Irrigation zones
Water bodies 1991
Aral Sea 1960
Aralsk
KAZAKHSTAN
Caspian Sea
Aral Sea
Zaslyk
Syrdarya
Chabankazgan
Muynak
Nukus
L. Sarykamysh
UZBEKISTAN
KYRGYZSTAN
Khiva
Tashkent
Turkmenbashi City
Amudarya
L. Arnasai
Fergana valley
TURKMENISTAN
Bukhara
CHINA
Karshi Steppe
Karakum Canal
TAJIKISTAN
Ashgabat
0
400 km
IRAN
AFGHANISTAN
PAKISTAN

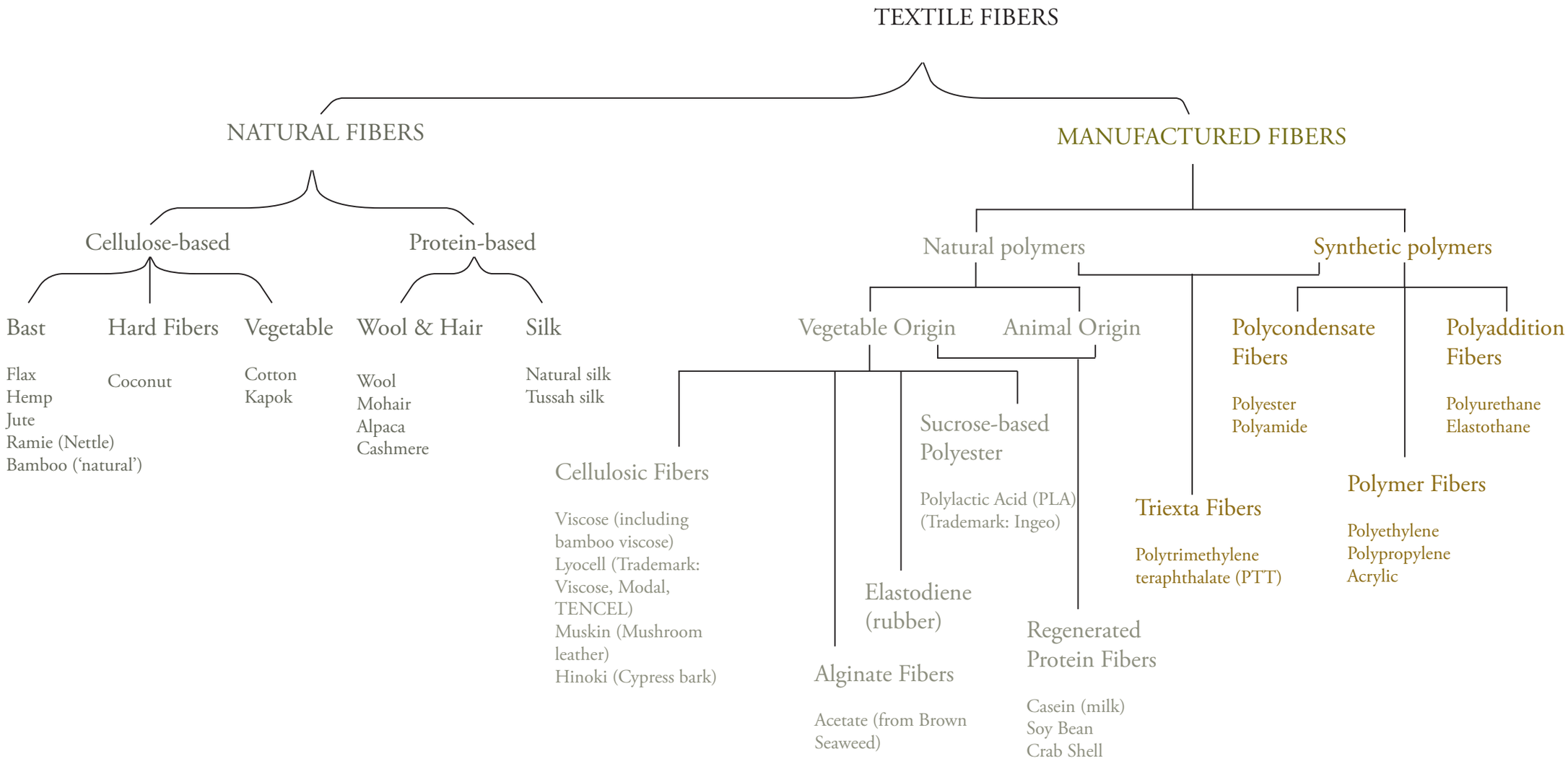






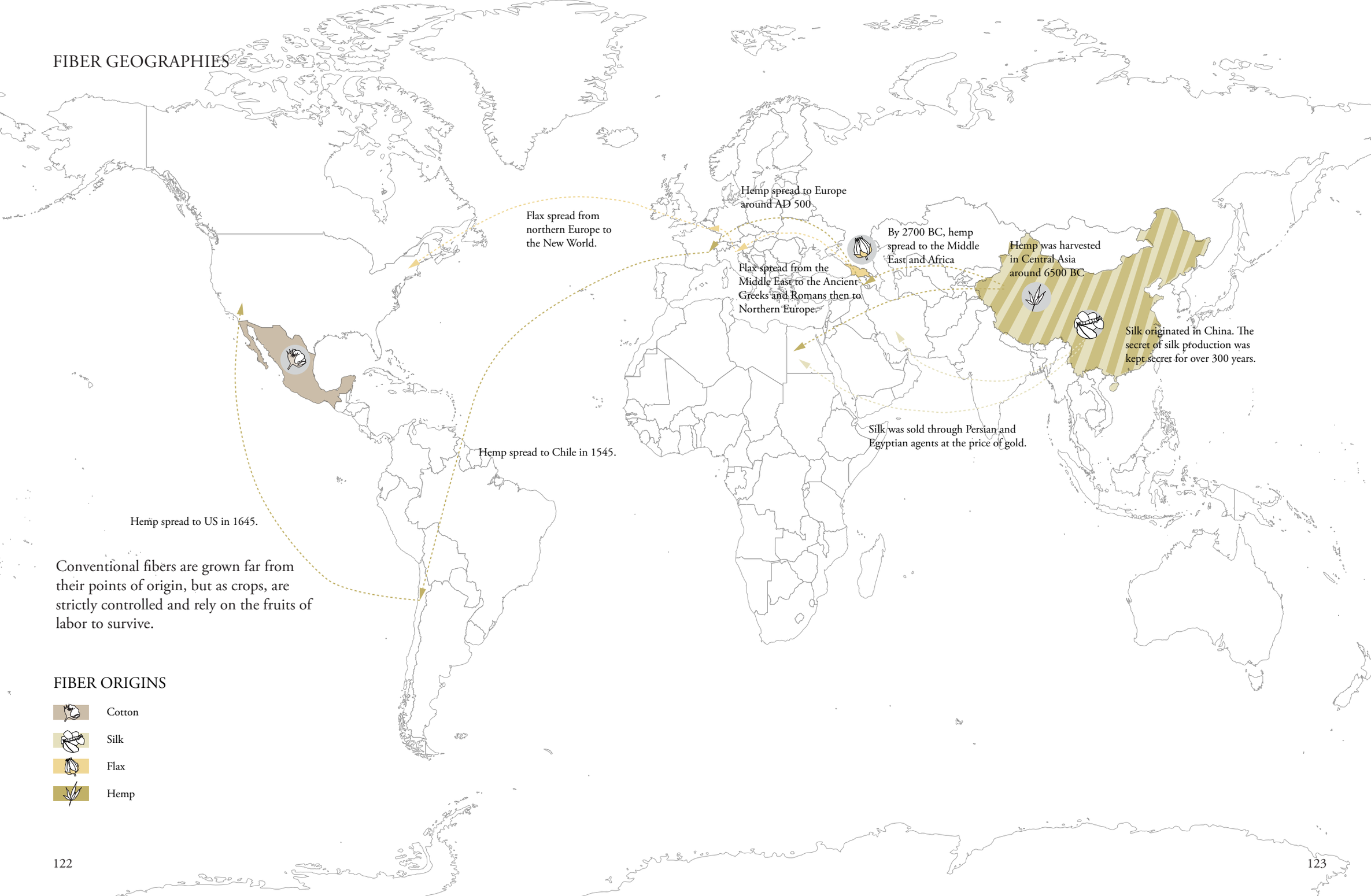
CONVENTIONAL FIBERS

Cotton, flax and hemp were researched to understand the agricultural processes surrounding their production and the physical properties that make them strong fiber candidates. Inferences were then drawn to identify invasive species well-suited to fiber production.



* Diagram interpreted from F*ashion and Sustainability: Design for Change,* by Kate Fletcher, Lynda Grose, and Paul Hawken.

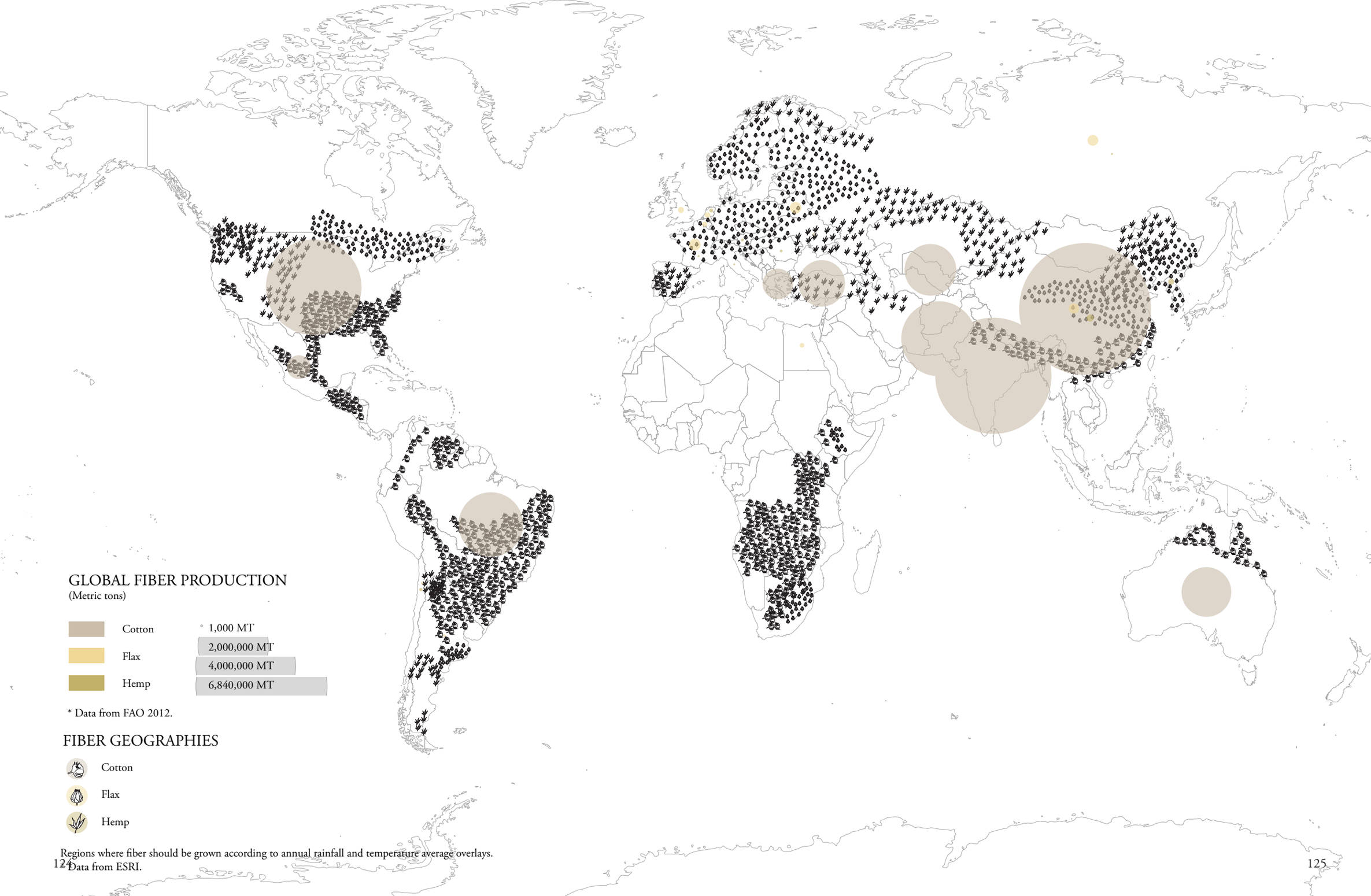
FIBER GEOGRAPHIES



Conventional fibers are grown far from their points of origin, but as crops, are strictly controlled and rely on the fruits of labor to survive.

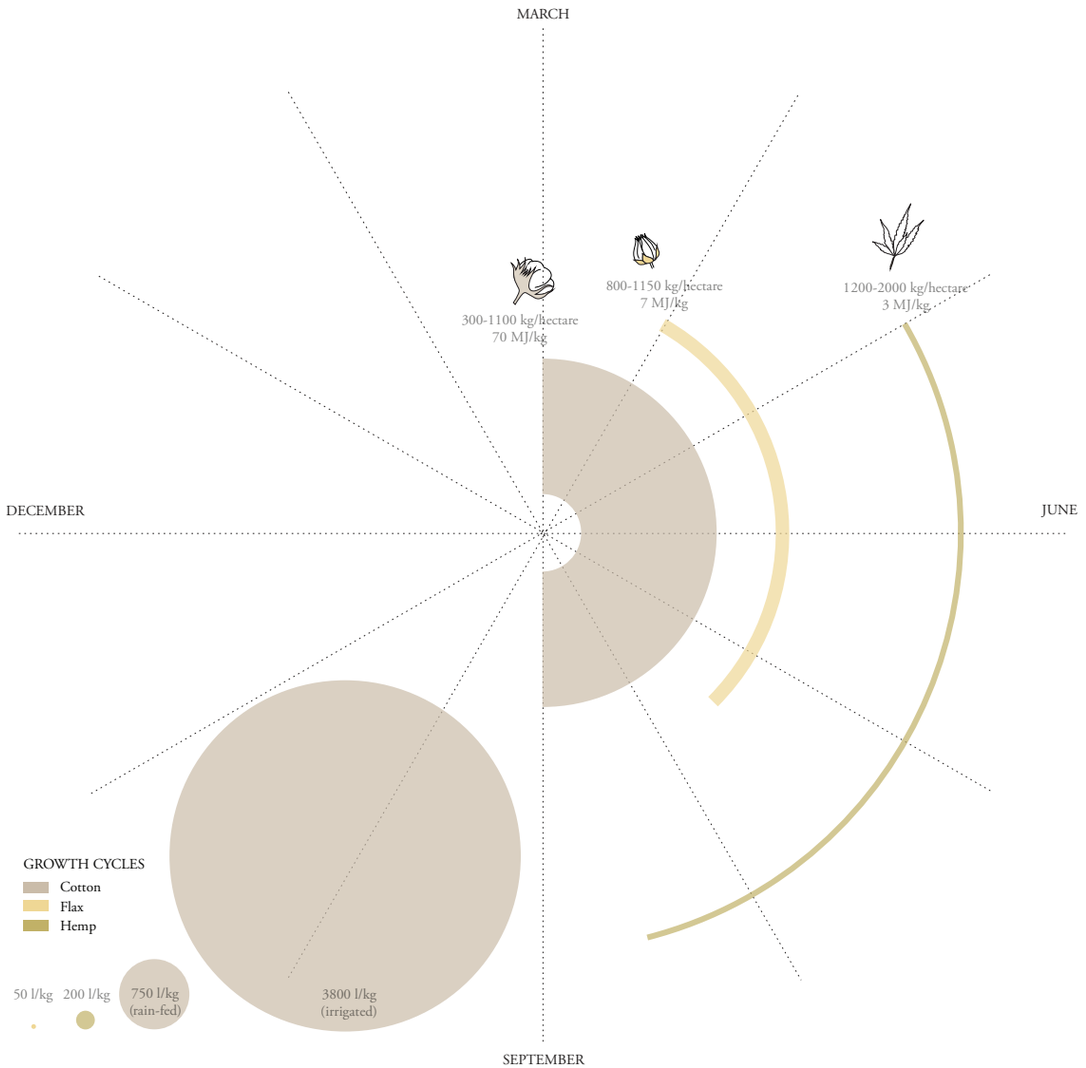
FIBER ORIGINS

- Cotton
- Silk
- Flax
- Hemp



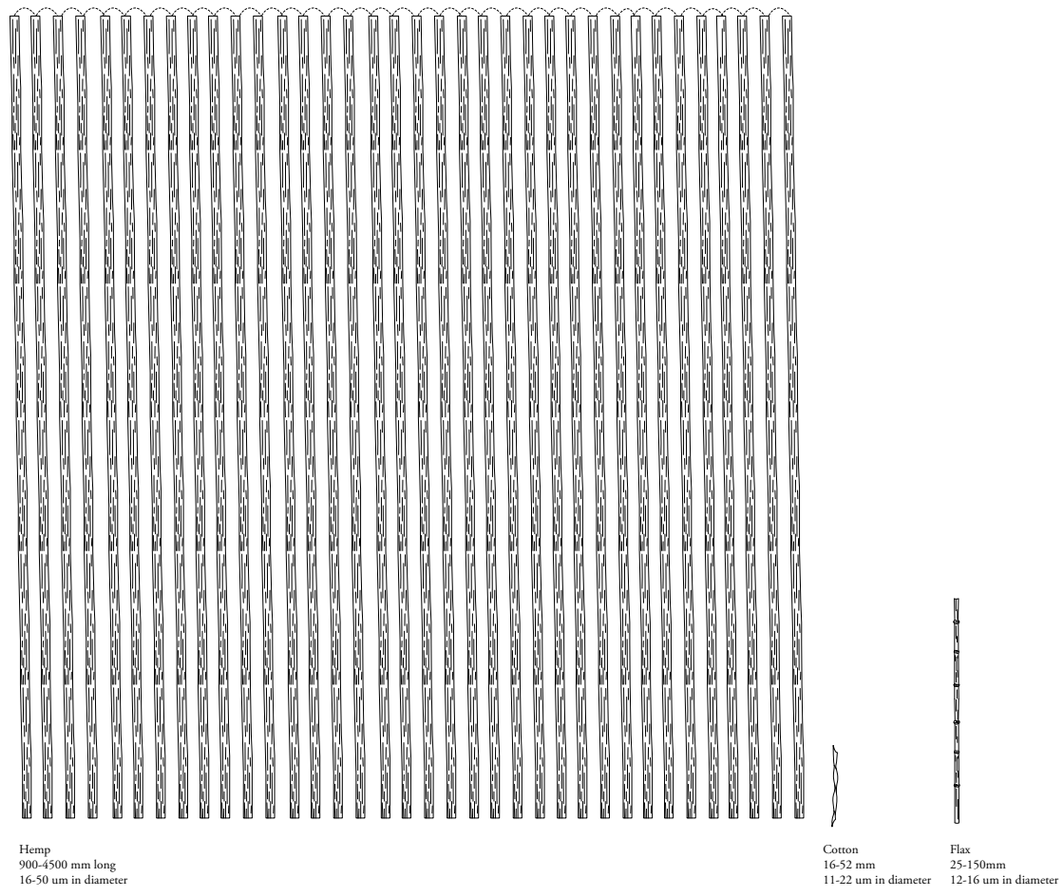
Regions where fiber should be grown according to annual rainfall and temperature average overlays.
Data from ESRI.

GROWTH CYCLES



Radii of arcs represent average fiber production (kg) per hectare and line thicknesses represent energy consumption (MJ/kg). Circle diameters represent water consumption (l/kg).
* Data from *Sustainable Fashion and Textiles: Design Journeys* by Kate Fletcher and „The role and business case for existing and emerging fibers in sustainable clothing," London: DEFRA (2009).

RELATIVE FIBER STRUCTURE + LENGTH



Hemp
900-4500 mm long
16-50 um in diameter

Cotton
16-52 mm
11-22 um in diameter

Flax
25-150mm
12-16 um in diameter







© Underwood & Underwood

SOAKING FLAX ON A BELGIAN FARM

Raising flax and manufacturing linens and linen laces are important industries of Belgium. The flax is gathered, tied in bundles, and piled in stacks such as appear in the background of the picture. The woody bark and stem of the fibers are rotted off by sinking them on rafts in running water. The straw is then pounded until only the fibers are left. It is from the fibers that linen is made.



Linum usitatissimum
Flax

Planting Density: 50/sq ft
Seeding Density: 44 lbs/acre
Rainfall: 600-650 mm
Yield: 700-1000 lbs/acre
Soil pH: 5-7
Latitude: 10-25 N; 10-25 S
Temp: 50-80 F

Sow

Germination

Shoot development

Inflorescence emerges

Flowering

Development of Flax Capsules

Ripening of Flax Capsules

Harvest

8-12"
Formation of fibers begins.
6"
Vegetative development switches to reproductive development.
Avoid sowing deeper than 2".

Seeds should be planted in rows 6-8" apart. Seeds should be sown thickly to avoid branching out in order to maintain long fibers.

Industrial plantation seed density
2000-2400 seeds/m2

Seed plantation seed density
1000-1100 seeds/m2

Majority of fiber biomass accumulates between 30-70 days.

Taproot can extend up to 3' with lateral roots 11.5"

Stems are yellow up to 1/3 of height.

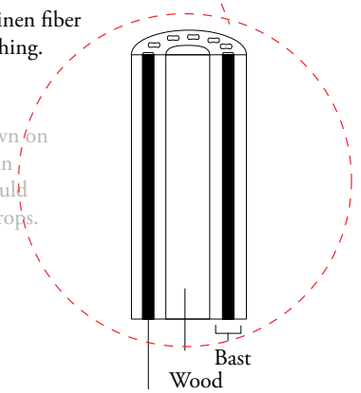
Leaves fallen down from up to ¼ of stem height. Flax capsules beginning to yellow.

6-12 days	35-40 days	50-55 days	60-65 days	70-80 days	90-120 days
Seeds begin to germinate.	Stem is 20% final length.	Bud formation begins.	Full bloom occurs.	Plant reaches green maturity stage.	Flax is usually pulled out at by roots at green-yellow maturity stage.

Over 70% of linen fiber is used for clothing.

Flax should not be grown on the same field more than once every 7 years. Should be rotated with other crops.

Flax is collected and wrapped into bundles or "wigwams" to dry in the field.

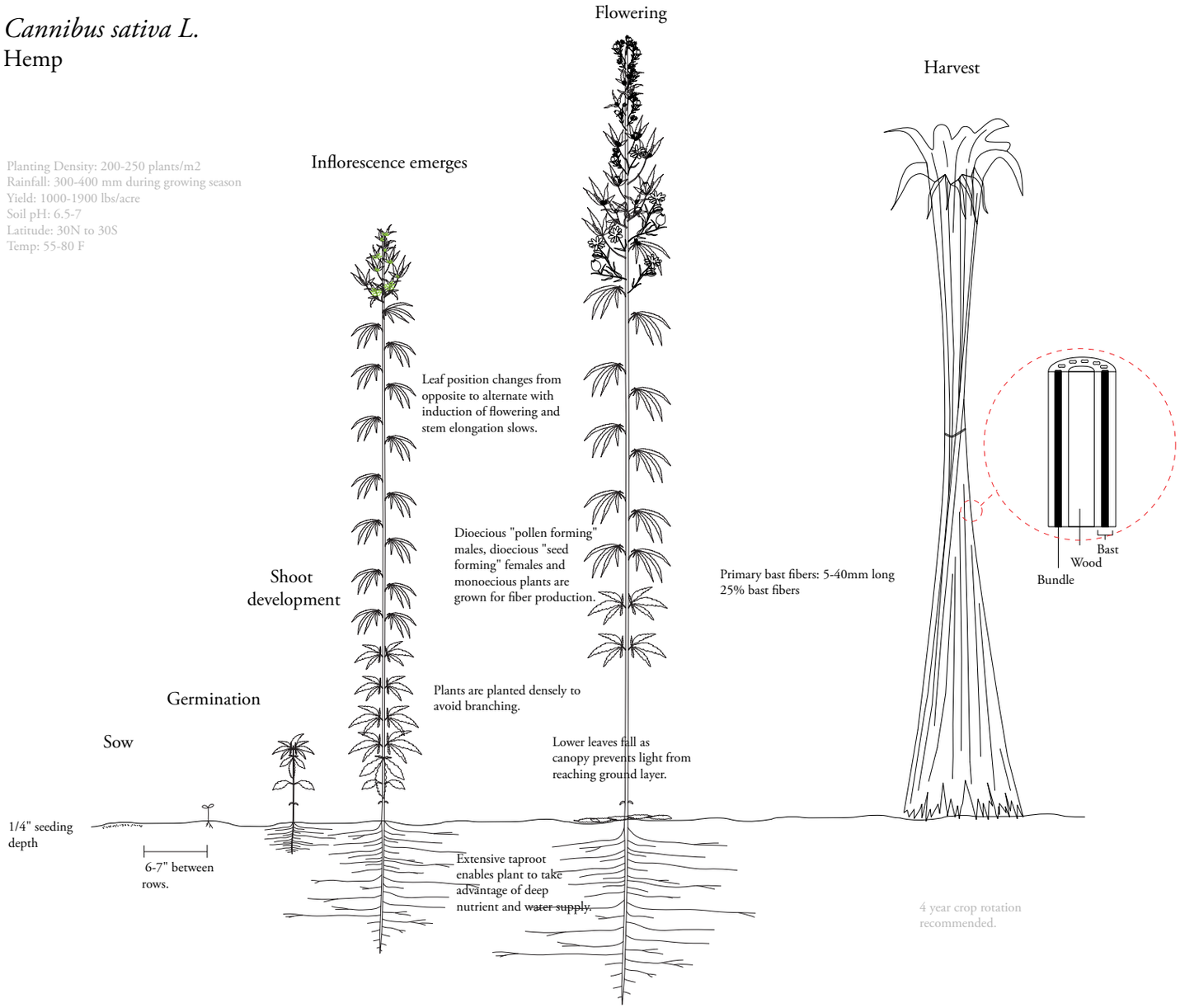


Each bundle onsists of 10 to 40 individual fibres that are about 30 mm long and 0.02 mm in diameter.



Cannibus sativa L.
Hemp

Planting Density: 200-250 plants/m2
Rainfall: 300-400 mm during growing season
Yield: 1000-1900 lbs/acre
Soil pH: 6.5-7
Latitude: 30N to 30S
Temp: 55-80 F



0 days

Seeds should be planted when ground temperature is 46F and above.

3-7 days

Germination occurs.

21-28 days

At beginning of vegetative stage, plant grows slowly. Plant grows about 12", providing 90% ground shade which blocks light and supresses weeds without the use of herbicides.

75-90 days

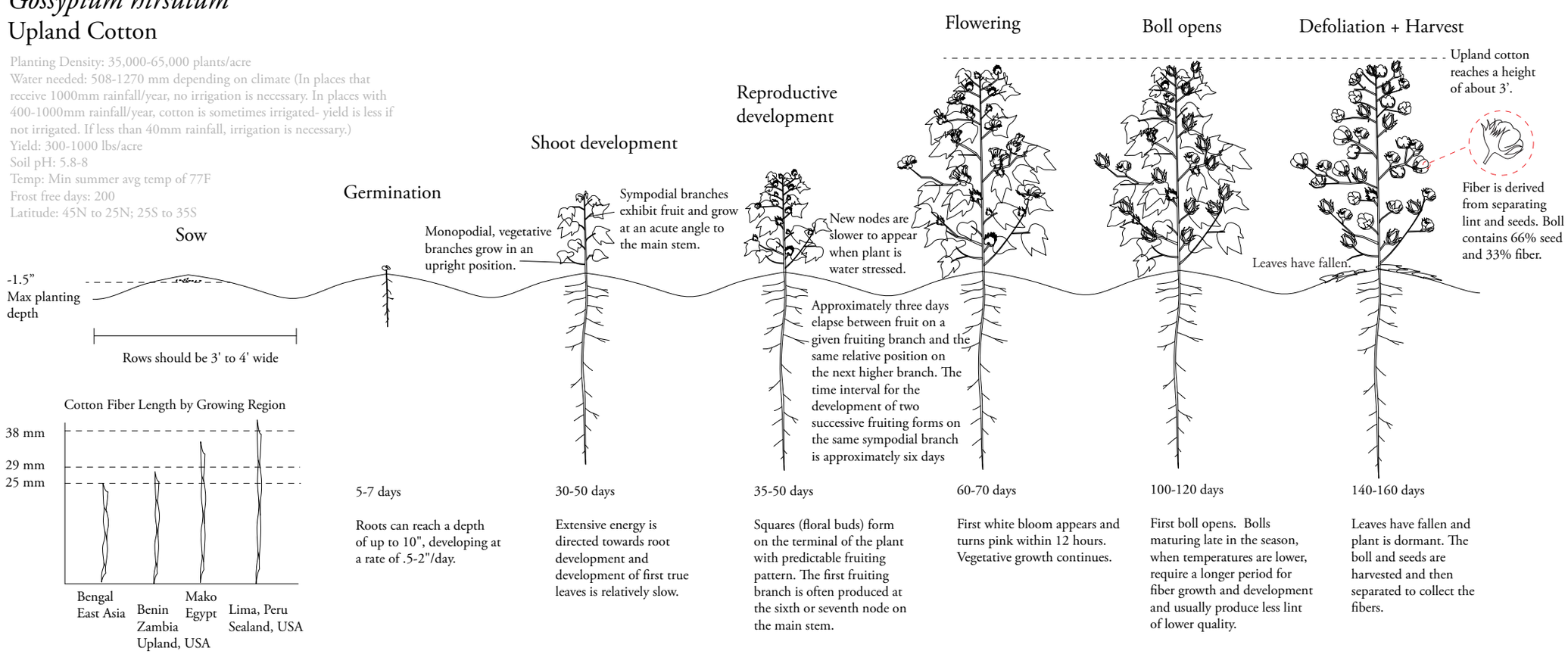
Hemp can reach 10-12'. Fiber should be harvested when male plants shed pollen and are in early flowering stage.

Hemp is cut and bundled to dry.



Gossypium hirsutum
Upland Cotton

Planting Density: 35,000-65,000 plants/acre
Water needed: 508-1270 mm depending on climate (In places that receive 1000mm rainfall/year, no irrigation is necessary. In places with 400-1000mm rainfall/year, cotton is sometimes irrigated- yield is less if not irrigated. If less than 40mm rainfall, irrigation is necessary.)
Yield: 300-1000 lbs/acre
Soil pH: 5.8-8
Temp: Min summer avg temp of 77F
Frost free days: 200
Latitude: 45N to 25N; 25S to 35S



5-7 days

Roots can reach a depth of up to 10", developing at a rate of .5-2"/day.

30-50 days

Extensive energy is directed towards root development and development of first true leaves is relatively slow.

35-50 days

Squares (floral buds) form on the terminal of the plant with predictable fruiting pattern. The first fruiting branch is often produced at the sixth or seventh node on the main stem.

60-70 days

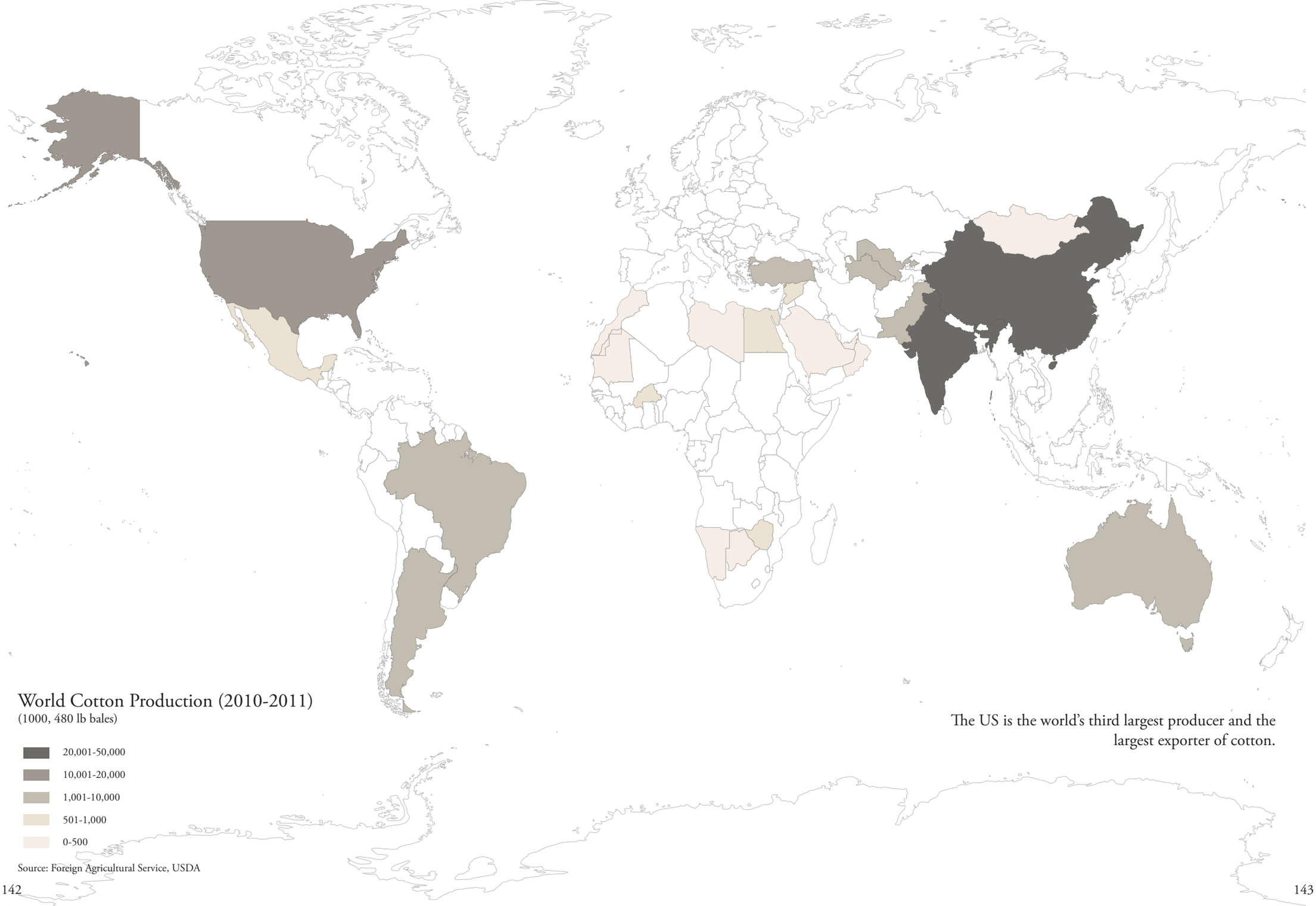
First white bloom appears and turns pink within 12 hours. Vegetative growth continues.

100-120 days

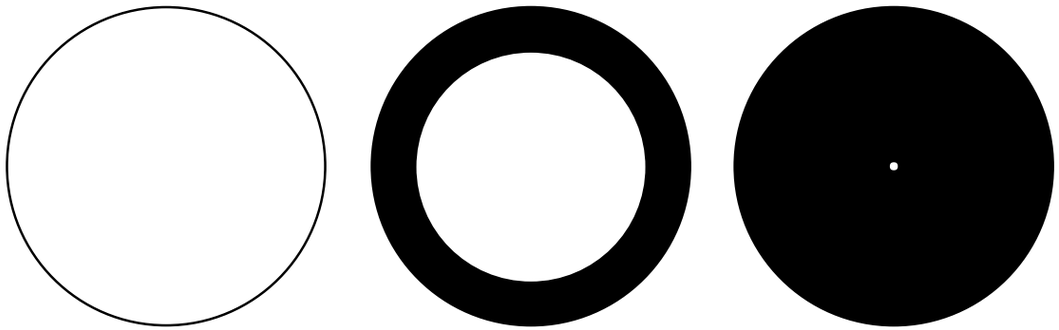
First boll opens. Bolls maturing late in the season, when temperatures are lower, require a longer period for fiber growth and development and usually produce less lint of lower quality.

140-160 days

Leaves have fallen and plant is dormant. The boll and seeds are harvested and then separated to collect the fibers.

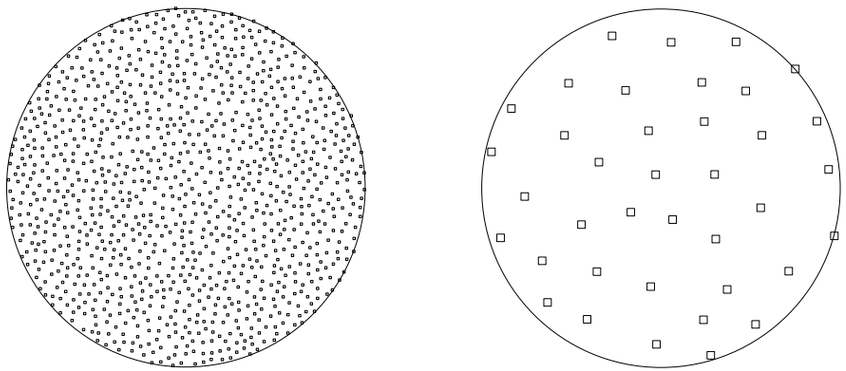


The US is the world's third largest producer and the largest exporter of cotton.



1947 1957 1970

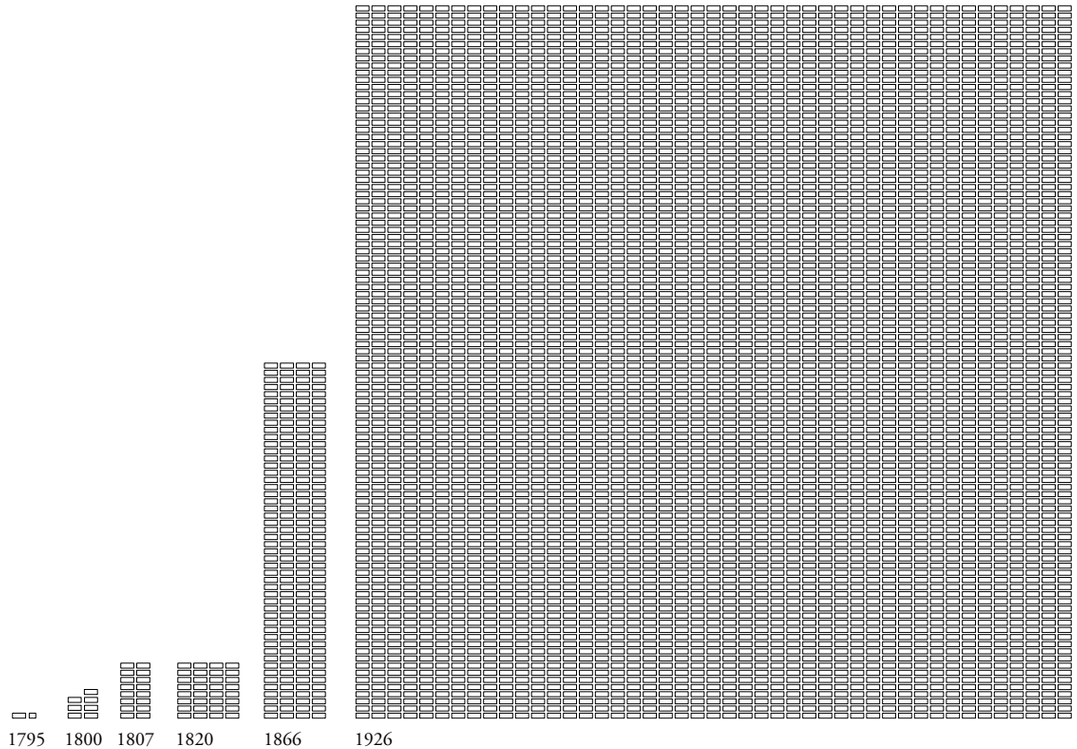
Mechanization of US Cotton Harvesting
(White represents % handpicked)



1949 1982

Number of farms and acreage per farm

- 24 acres
- 256 acres



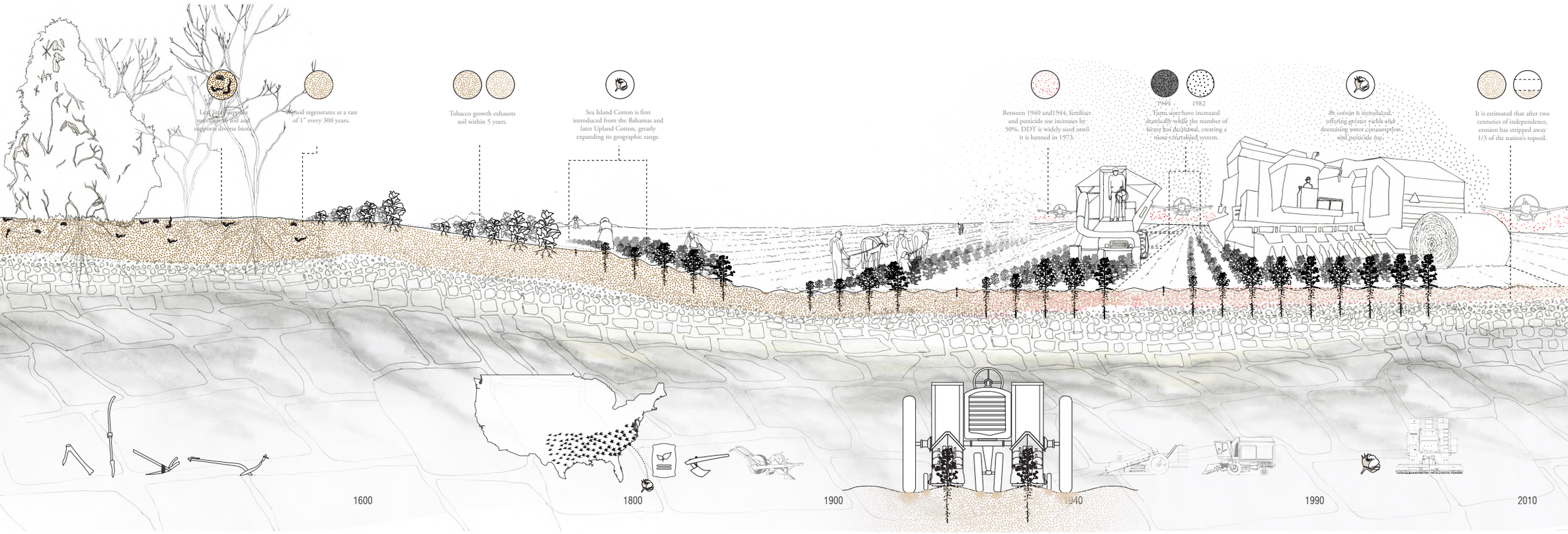
1795 1800 1807 1820 1866 1926

Cotton Production (1 rectangle=10,000 lbs)



1926 1950 1965 1986 2014

Cotton Yield (lbs/acre)



Drawing illustrates evolution of American agricultural practices over time, with a focus on tobacco and cotton growth in the southeast. A case study was conducted over the course of a year with regular email correspondences to Cotton Plains Farm in Suffolk, Virginia. Particular attention is drawn to soil quality due to changes in technologies and policy. While farming practices have improved dramatically, the system remains flawed.

VI. KNOWLEDGE NETWORK

Design processes in landscape architecture are complex and non-linear.

- Paula Meijerink, “Small Matters,” 6.



Kudzu-fu Haori Jacket by Cosmic Wonder

As an increasing number of fashion labels search for alternative fiber sources, landscape architects should play a key role in influencing those decisions by proposing new solutions that engage with and reflect plant growth cycles while also acknowledging ecological limits. Consultative trips and presentations of work serve as an attempt to start this process.

KNOWLEDGE NETWORK



In January 2016, with support from the Center for Global Inquiry and Innovation, work was presented to the materials research team led by Inka Apter at Eileen Fisher in New York. The established fashion label is leading change in the industry.









Mimi Robinson
International Design Consultant







Sasha Duerr
Founder, Permacouture Institute; Fiber artist; Adjunct Professor, CCA

In March 2016, presentations were delivered to a group of textile faculty and students at the California College of the Arts who are conducting cutting edge research at the intersection of textiles and environmental systems thinking.





Lynda Grose
Fashion Consultant; Associate Professor, CCA







Rebecca Burgess
Founder, Fibershed

Meetings with industry professionals and the founder of Fibershed, an initiative that aims enliven connection and ownership of 'soil-to-soil' textile processes, have also generated momentum that extends beyond academia.

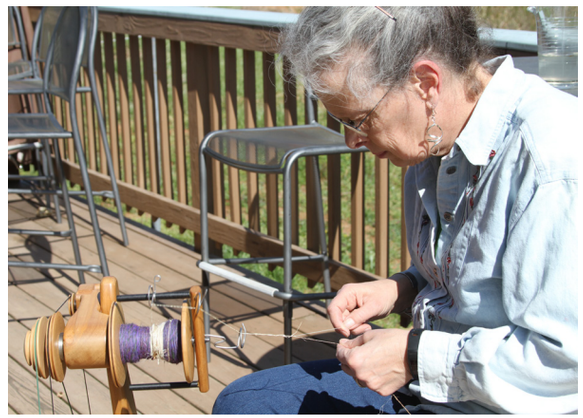






Fiber artist and experienced Kudzu weaver, Junco Sato Pollack, shared invaluable quantitative, cultural and technical knowledge that greatly informed the project and helped establish parameters for the final design iteration.







Kudzu fiber samples sent to a team of chemists at Hydrolink, a lab in Quebec, and experiments conducted with local fiber artist and master spinner, Vickie Watts, further proved Kudzu's capacity as a viable source for textiles.











Pueraria montana var. lobata (Kudzu)









Plant specimens collected on site to be further dissected in studio.



Given the rapid growth rate and intrepid nature of invasives, could they provide an alternative resource for the production of textiles, geotextiles, and/or paper?

Could collections be developed that engage with and reflect plant growth cycles of abundance but also accept their limits? Could such collections help shift views of that which is considered a nuisance in the environment?

Could shifted attitudes then contribute to the maintenance of the landscapes where these intrepid travelers establish their new homes, making them accepted guests that we are willing to work with?

PART III
DESIGN

METHODOLOGY

Through a multimodal way of working, a site-specific design proposal is conceived via multiple iterations to ground research and to further test the spatial, logistical and socio-cultural dimensions of my work. Parameters were developed that combine knowledge of Kudzu growth, the requirements for fiber production and ecological concerns.



Masi cloth made from Paper Mulberry fibers in Fiji.

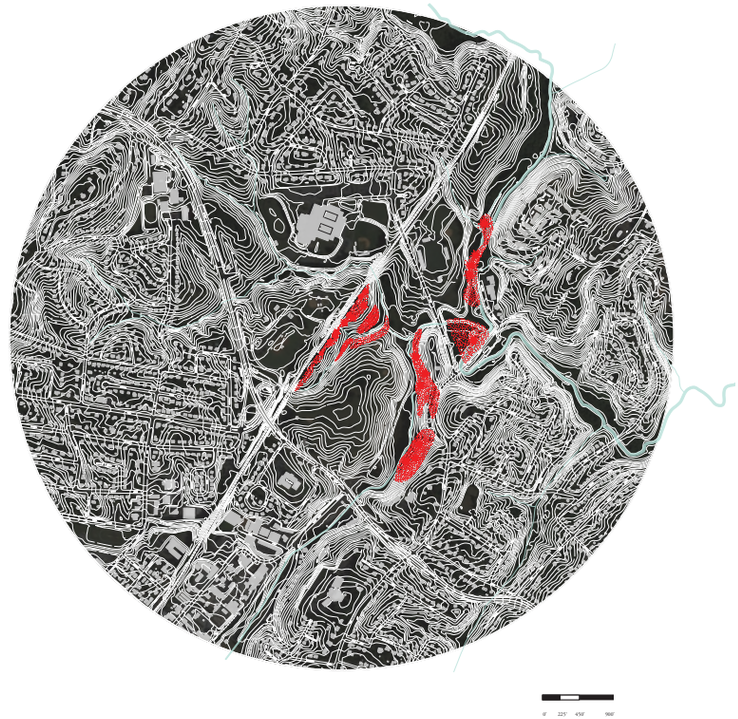
VII. RESITUATING KUDZU

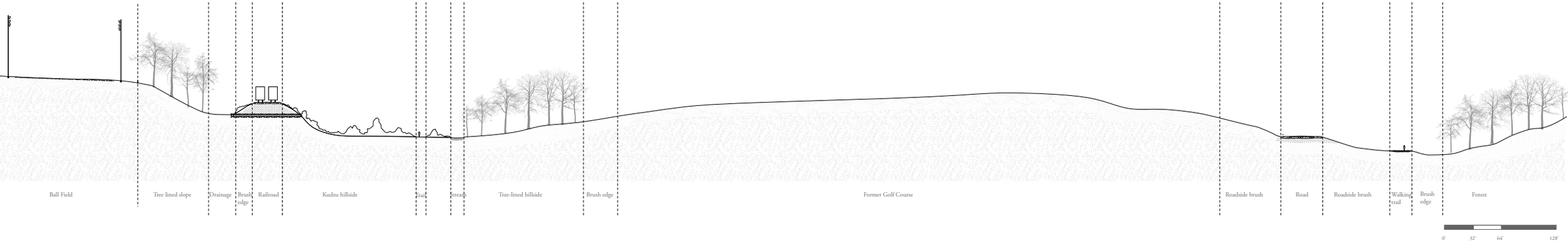
"...The whole point is to describe active relationships in flux—to think about processes of organizing as much as formal and individuated organisms… Such assembling is always in the making but never complete or finished as cultural, political, and material borders open and close and the domains of floral/ fauna continually collide and reassemble."

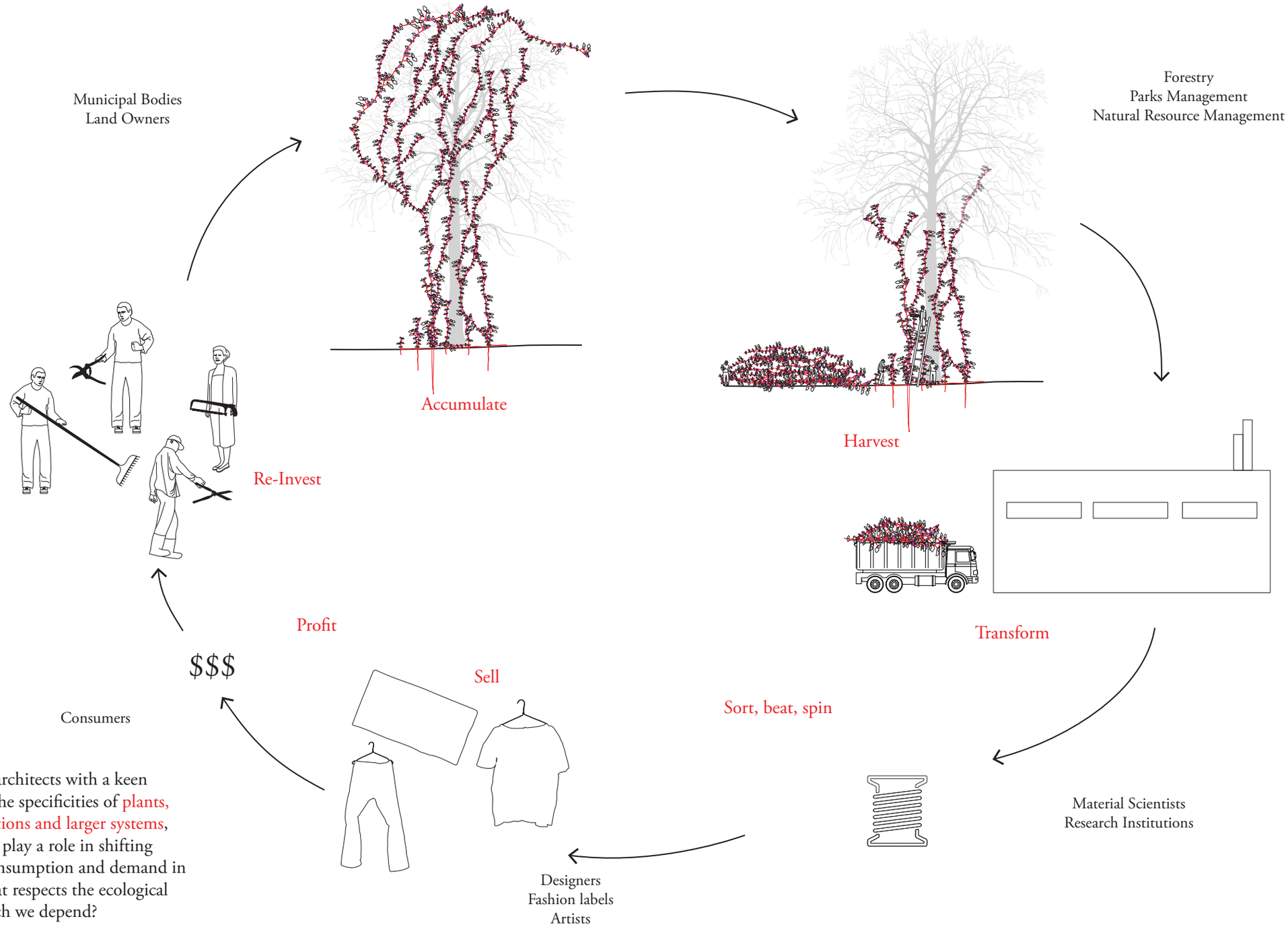
- Karen Cardoza and Banu Subramaniam, "Assembling Asian/American Naturecultures: Orientalism and Invited Invasions," 4.

PROPOSED

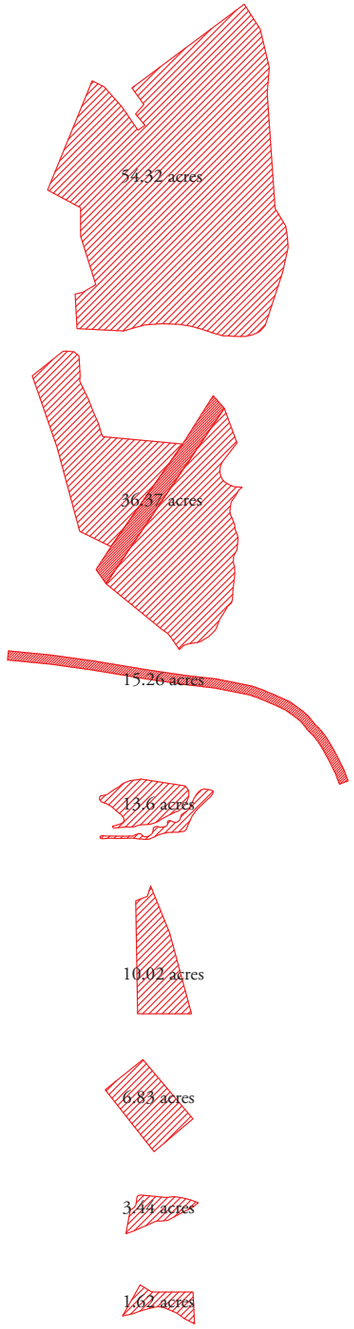
Proposed harvesting method relies on varied landscapes often with steep slopes and diverse vegetation and can be applied in both rural and urban settings. Edges are blurred and abundant vegetation is edited from landscape as it offers its “gifts” to be put to new use.







As landscape architects with a keen awareness of the specificities of plants, ground conditions and larger systems, how could we play a role in shifting patterns of consumption and demand in a direction that respects the ecological cycles on which we depend?

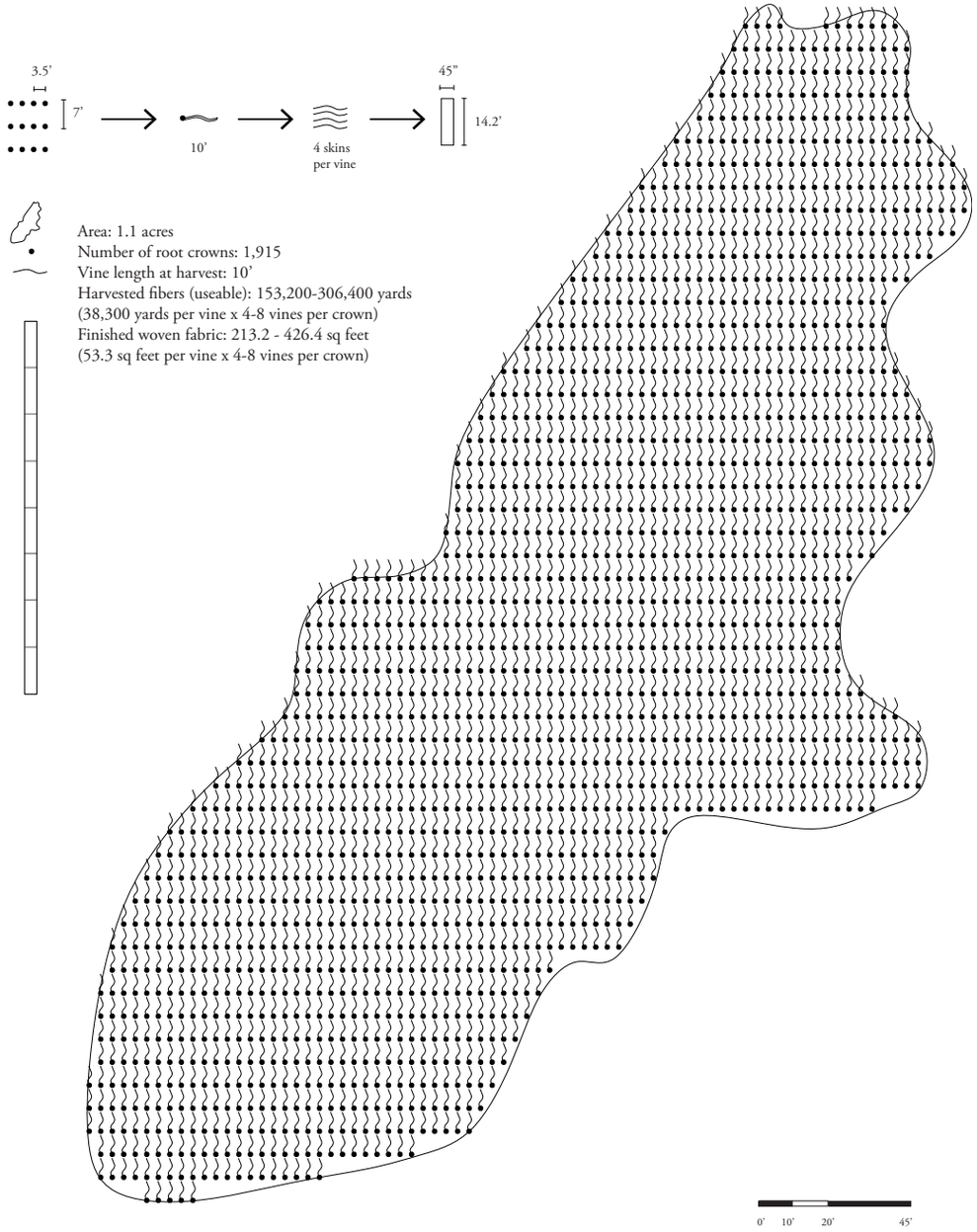


Zones of extensive Kudzu growth



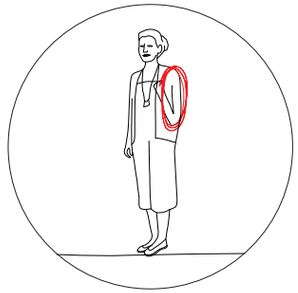
Kudzu zones as identified by City Parks department

CHARLOTTESVILLE PARKS + RECREATION | EXISTING MANAGEMENT PRACTICES AND COSTS
Current management practices attempt to control and eventually eradicate invasive plant species. The City of Charlottesville spends around $430,000 annually combating invasive species over 141 acres of public park land.





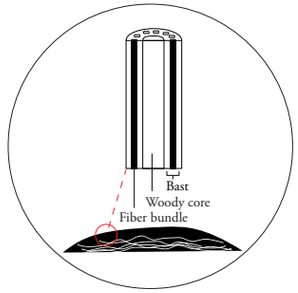
Leaves are stripped from vine.



20-30 vines are then wound into 18-24" coils and secured with twine. Cut vines should be kept in the shade during harvesting process.



Vines are boiled for two hours to release bacteria in vine that start fermentation process. This helps to separate bast fibers from vine skin.



Vines are drained and wrapped in black polyethylene in a sunny, warm spot for a week. Alternatively, they can be covered with humus gathered from ground surrounding Kudzu which speeds up the fermentation process. They are then pressure sprayed to throughly clean the fibers and finally soaked in fresh water.

Fiber Processing

FIBER TO FABRIC

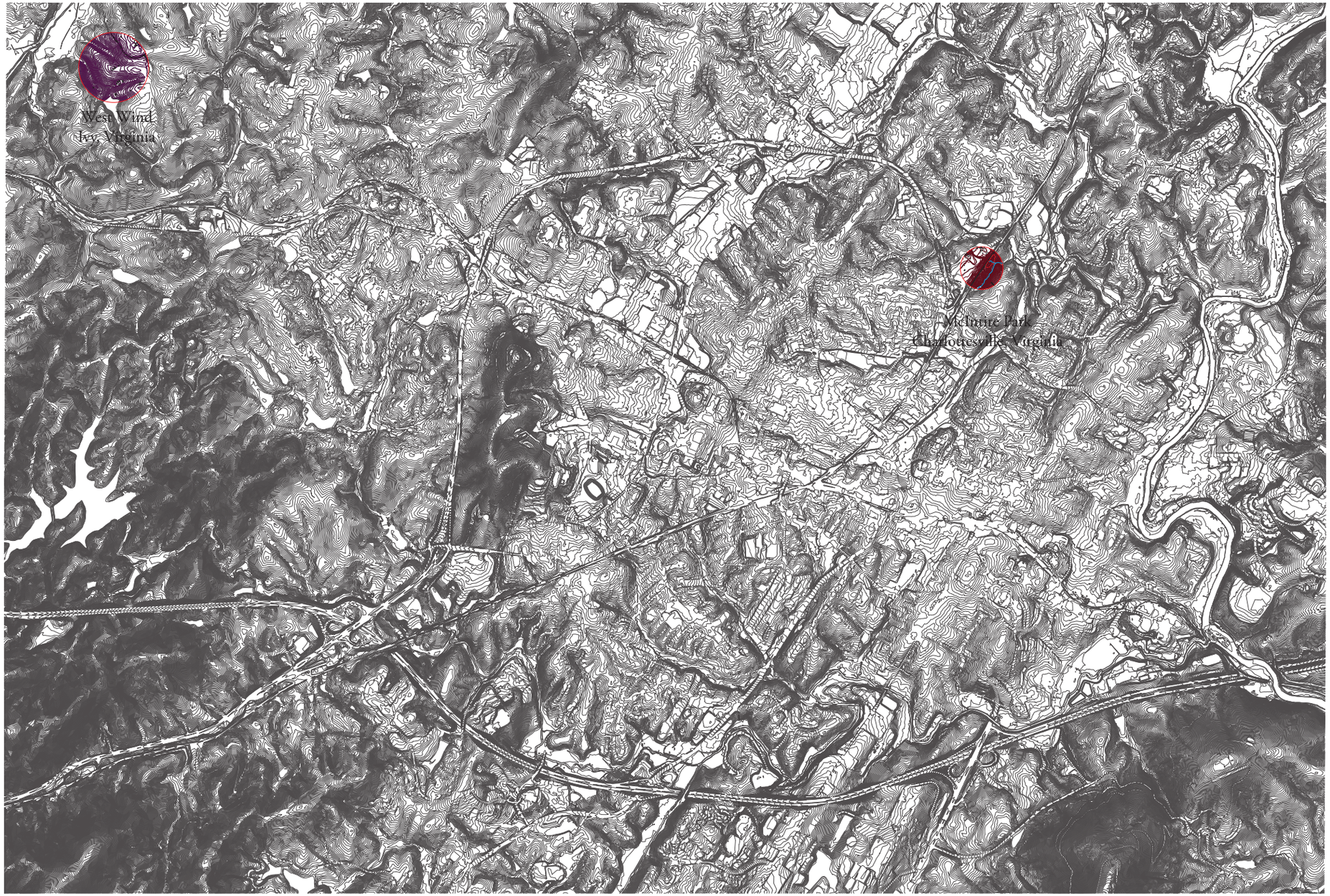
For calculation purposes, Kudzu root crown spacing is based on standards developed by the Soil Conservation in Charlottesville, fibers would be harvested three times per growing season with final woven cloth being sold with harvesting and processing the fibers.

Society. Kudzu produces bast fibers derived from the inner bark of the vine. To meet existing management costs for around $15 per foot. This does not include the additional labor and energy costs that would be associated



LOGISTICAL COORDINATION

Kudzu is cultivated and harvested on site by local workers who collaborate with Charlottesville Parks and Recreation. Material is then brought to a nearby innovation hub for processing and distribution.

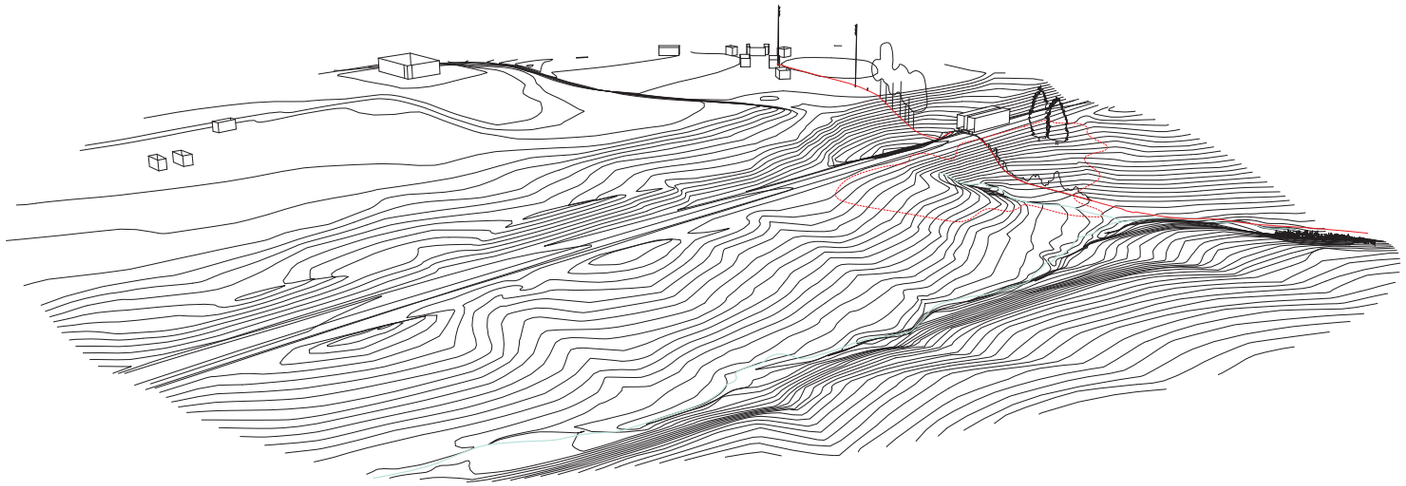


Albermarle County, Virginia

LIVING LABORATORY

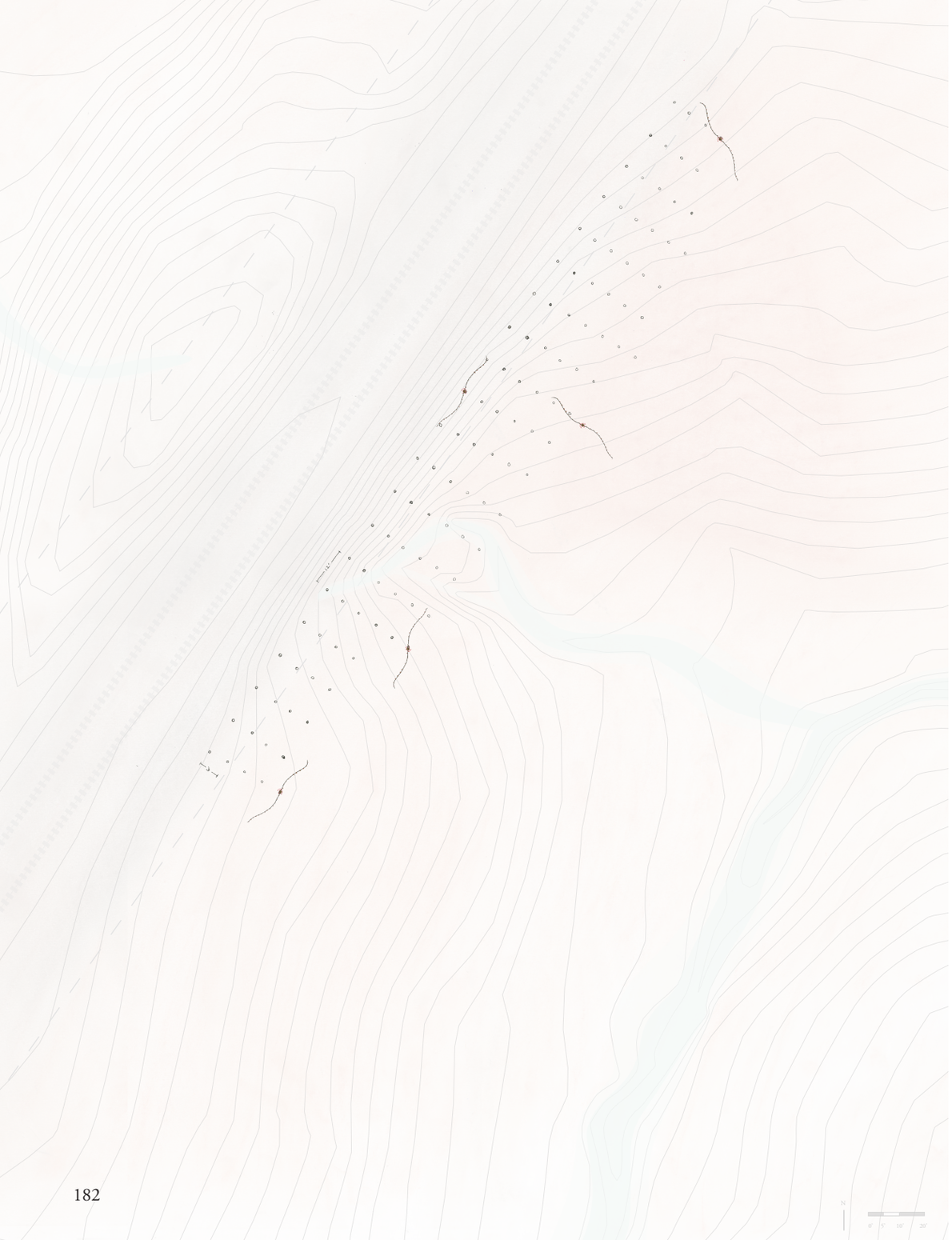
Combining theoretical research and tactile engagement with the material world provides the basis for a design proposal. Test plots were established at West Wind in Ivy, Virginia and at McIntire Park in Charlottesville, Virginia to allow for the continual analysis of ecological dynamics.

The design iteration serves as one of many possible scenarios and, along with the research, serves as a reference for those in the fashion and textile industry pushing for alternative sourcing models, for land managers looking to broaden notions of management, and for the general public hoping to see their surroundings anew.



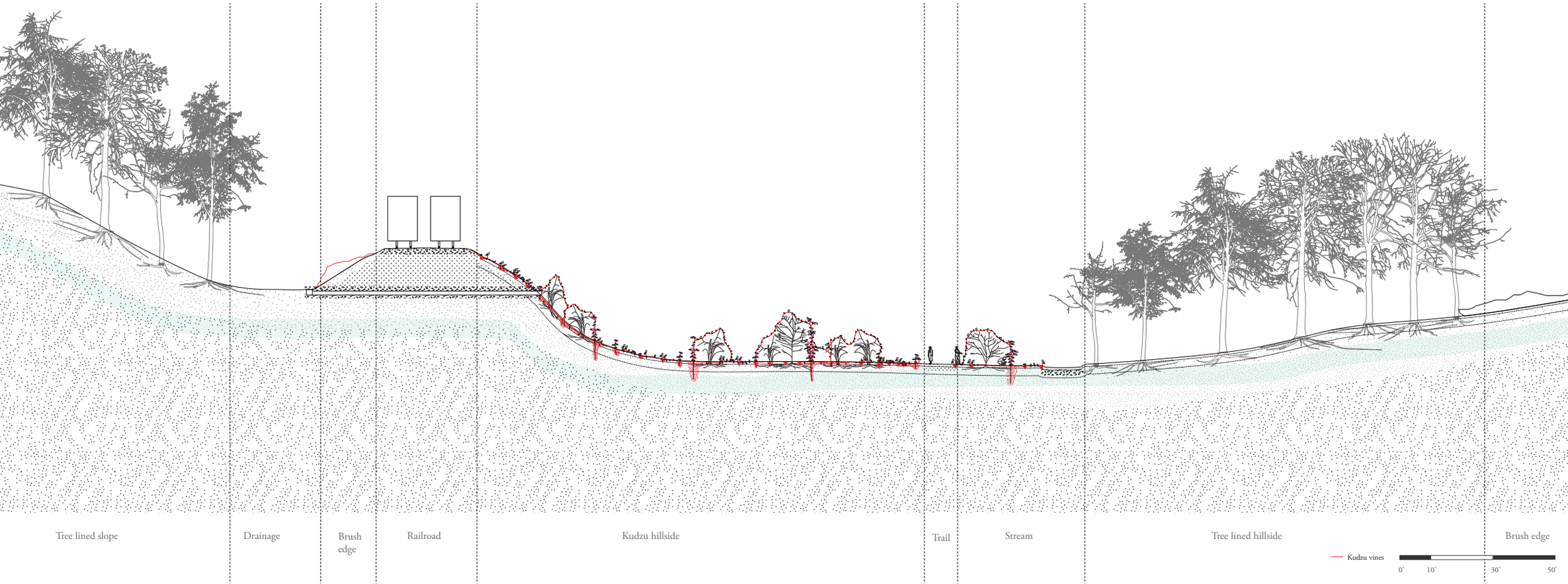
McIntire Park
Charlottesville, Virginia
Study area: 1.1 acres





EXISTING CONDITION

McIntire Park was established in 1933 and made possible by the Works Progress Administration. Because the Soil Conservation Society was promoting Kudzu as a form of erosion control during this time, it is likely to assume that Kudzu may have been planted along the steep slopes surrounding the Norfolk Southern Railroad tracks. The SCS suggested planting Kudzu in rows spaced 10’ apart with root crowns spaced every 6-8’. Over time, this created this network expanded.



EXISTING CONDITION

Kudzu dominates the hillside south of the railroad tracks. It weaves its way over existing vegetation and its deep, taproots can reach water and nutrients unavailable to vegetation with shallower root systems.



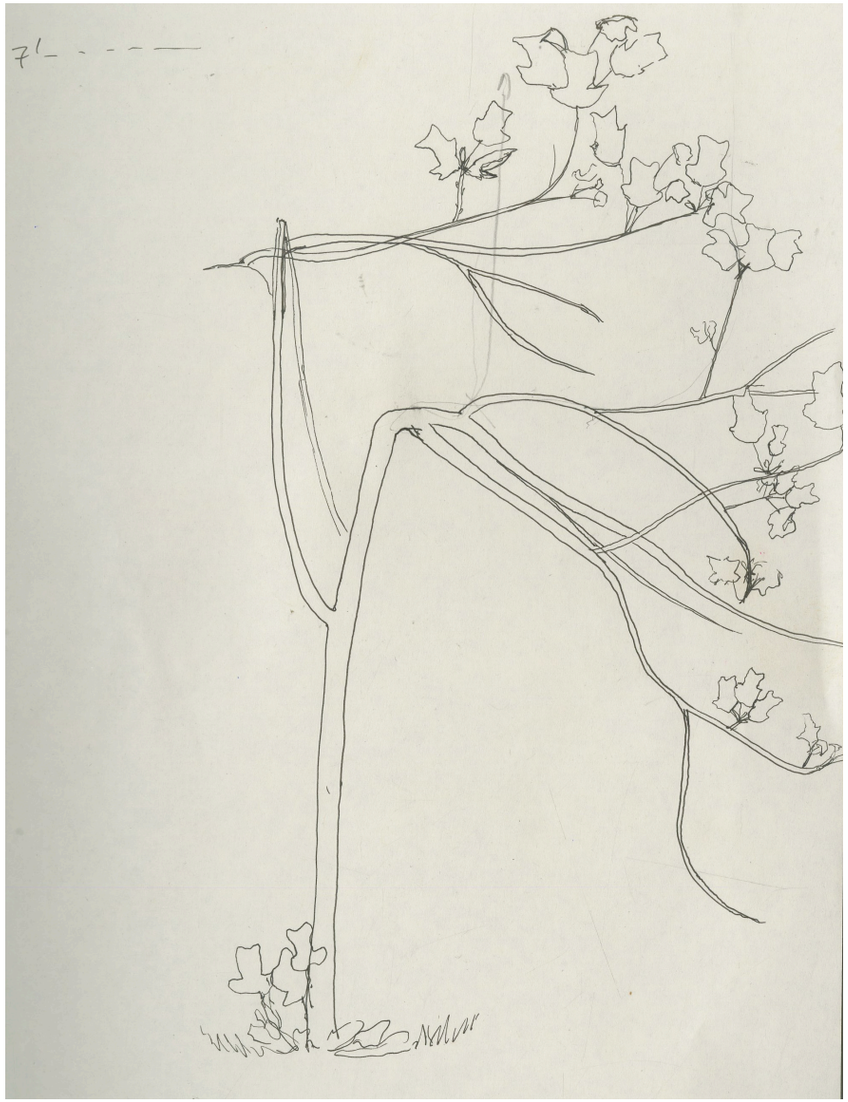
March 2016



April 2016

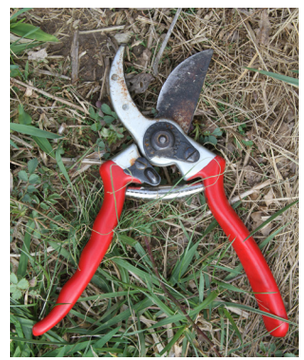


May 2016



OBSERVATIONS
Juvenile *Liriodendron tulipifera's* (Tulip Poplar) form is informed by presence of Kudzu.



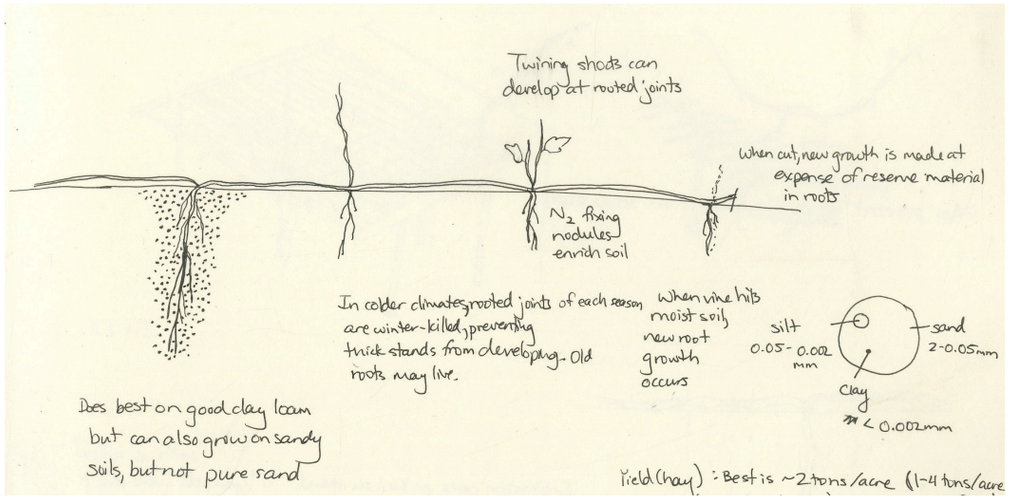


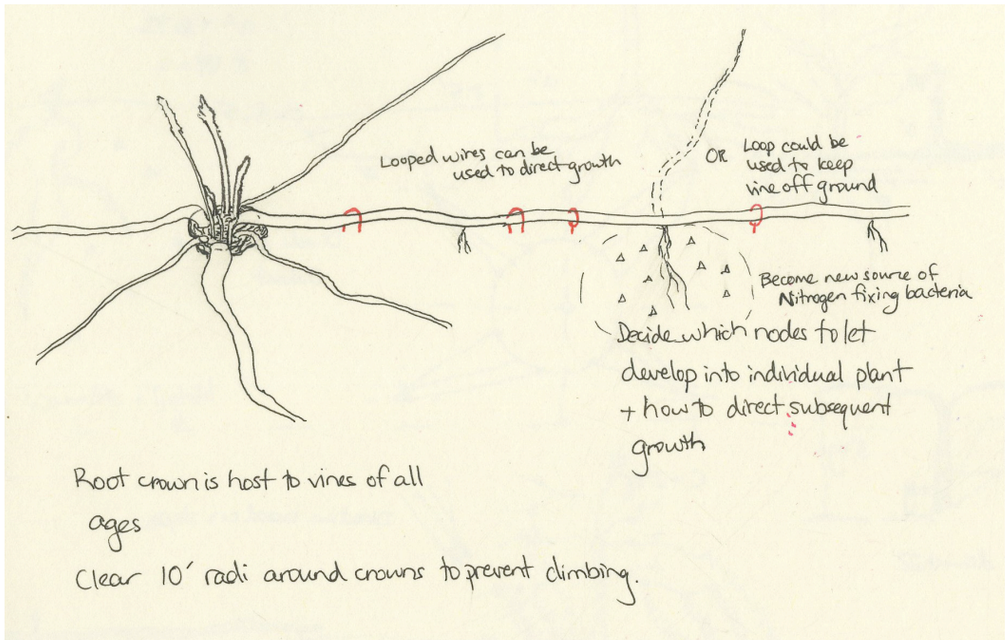


TOOLS AND TECHNIQUES
Hand pruners, a sketchbook, pen, camera, and measuring tape serve as the primary tools. Dried vines are trimmed 4' from ground to release saplings from Kudzu vines and monitor response with onset of new growth.



ROOT CROWN GROWTH

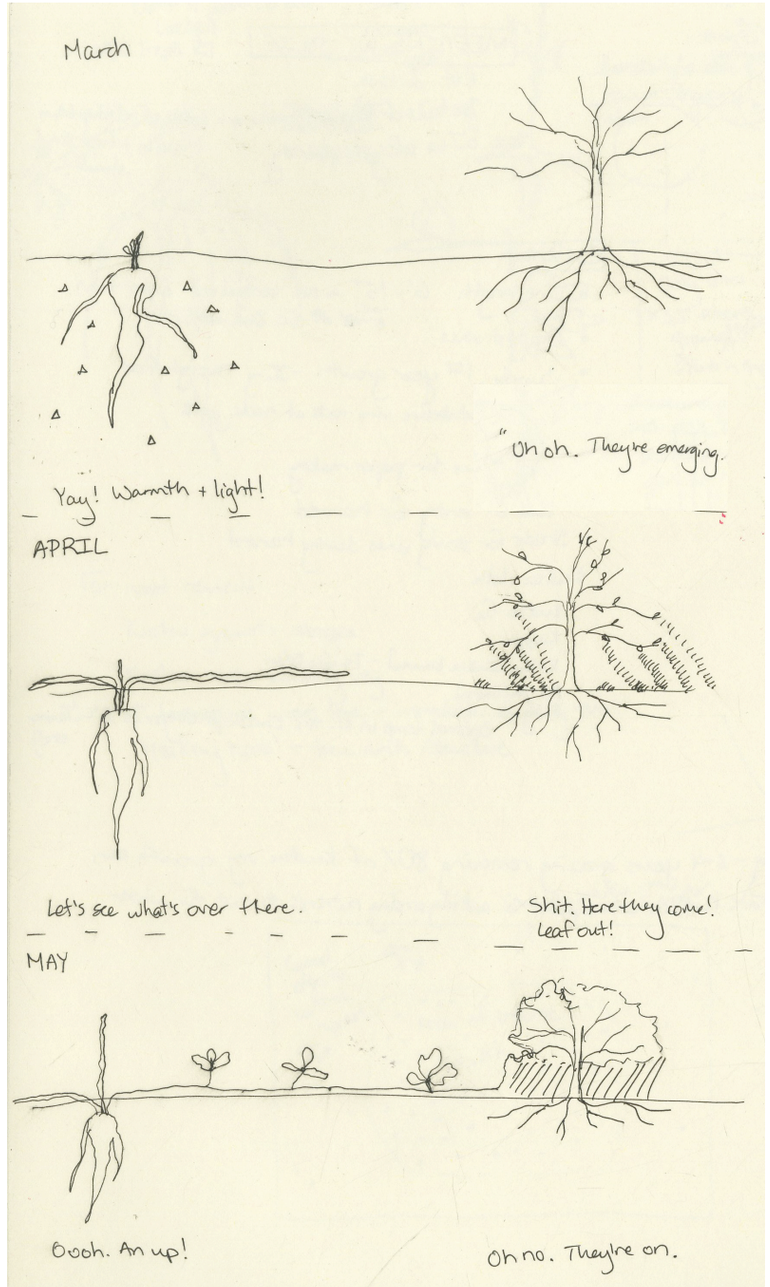






KUDZU-HOST RELATIONS

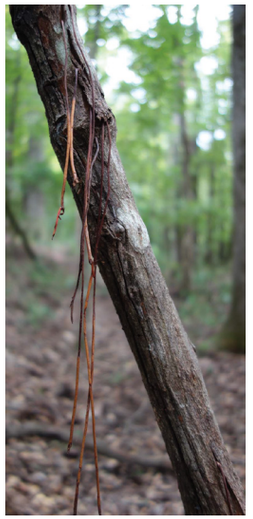
Kudzu can grow 3’ to 4’ vertically before it requires additional support and it cannot wrap around anything larger than 4” in diameter. It requires full sun, with photosynthesis happening most efficiently at temperatures around 86 F, and strives to reach the upper canopy level, using anything in its reach to get there. The following pages offer a list of species that aid Kudzu in its growth to the top.







Wisteria sp.
Wisteria





Vitis rotundifolia
Grape





Lonicera japonica
Japanese Honeysuckle





Hedera helix
English Ivy



Smilax
Greenbrier



Eleagnus umbellata
Autumn Olive



Ligustrum sp.
Privet



Celtis occidentalis
Hackberry



Rosa multiflora
Multiflora Rose



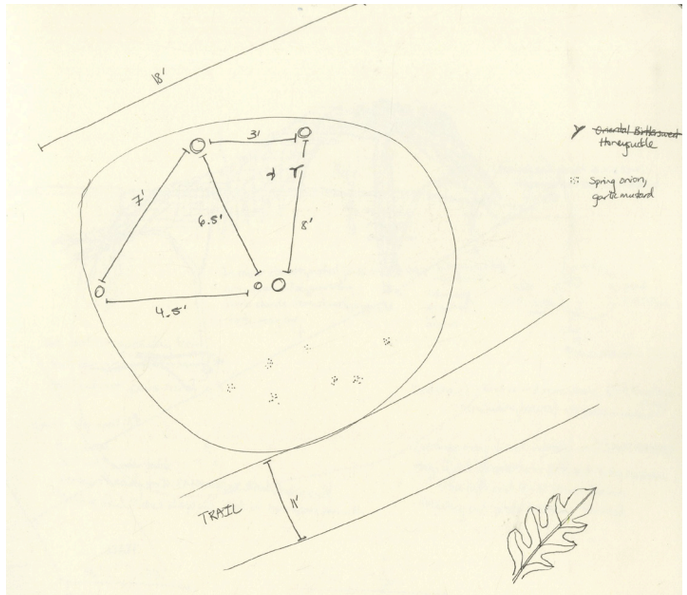
Ilex sp.
Holly



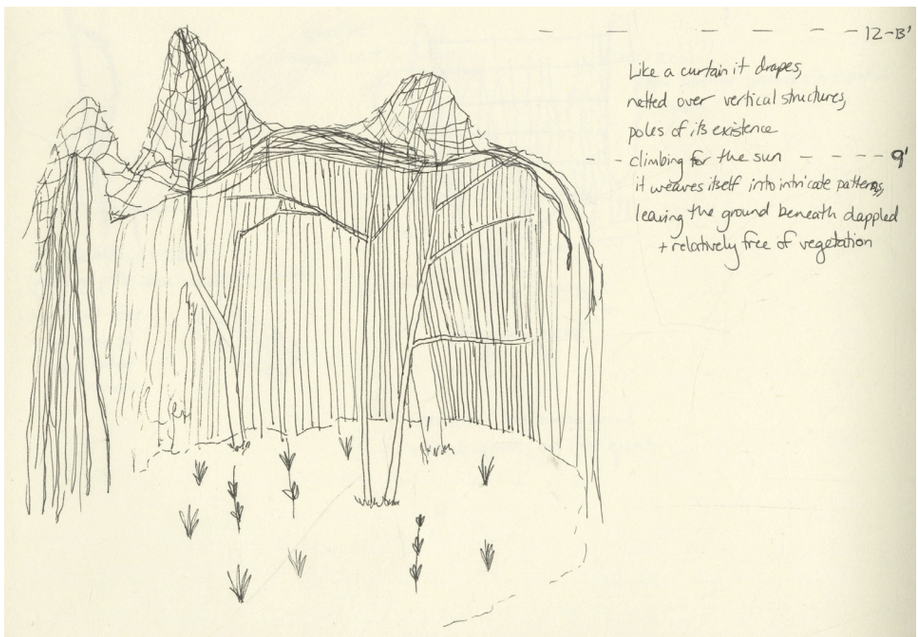
Rubus fruticosus
Blackberry



Liquidambar styraciflua
Sweetgum


18'
3'
7'
6.5'
8'
4.5'
~~Oriental Bittersweet~~
Honeysuckle
Spring onion,
garlic mustard
TRAIL
11'




12-13'
Like a curtain it drapes,
netted over vertical structures,
poles of its existence
- - climbing for the sun - - - - 9'
it weaves itself into intricate patterns,
leaving the ground beneath dappled
+ relatively free of vegetation



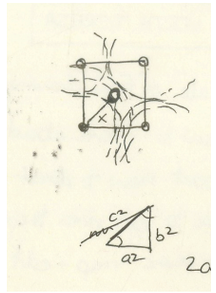
DESIGN CRITERIA

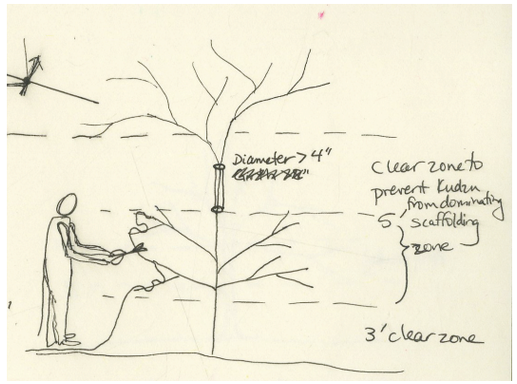
PARAMETERS

- Vines should be 6'-15' long.
- Vines should be fairly straight.
- Vines should be supple, in their first year of growth.
- Vines should be harvested before they root at node joints.
- vines should be accessible to workers.
- Kudzu should be allowed to grow over host vegetation in select areas to maximize vertical growing plane and provide shaded structures. These could serve as a refuge from the hot summer sun, a playhouse for children, or an area to store harvested vines so they remain supple during harvesting process.

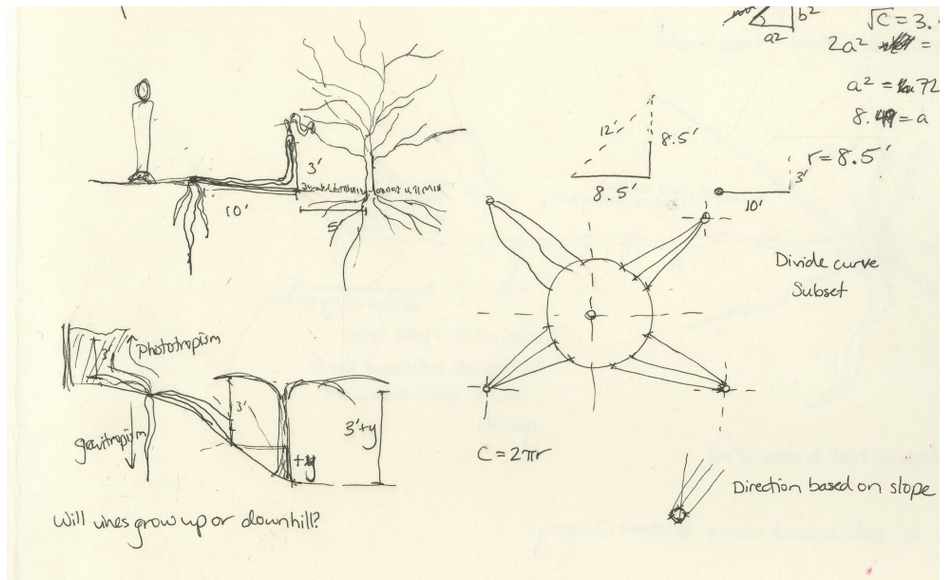
OTHER CONSIDERATIONS

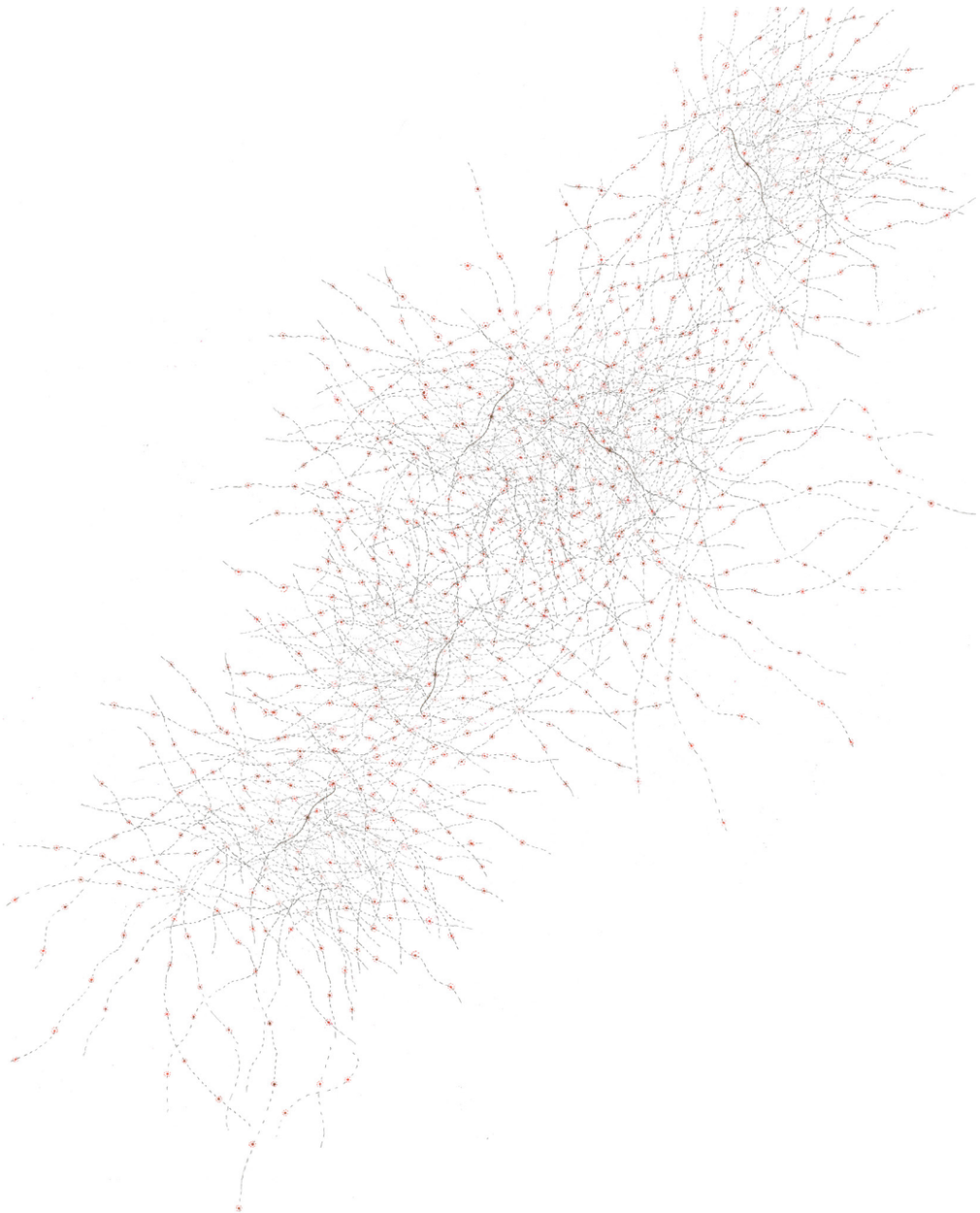
- Temperature
- Slope
- Ground patterning (vine weaving)
- Productive potential
- Smell (flowers in late summer)
- Sound (leaves rustling, crunching of brittle, old vines)
- Sense of enclosure



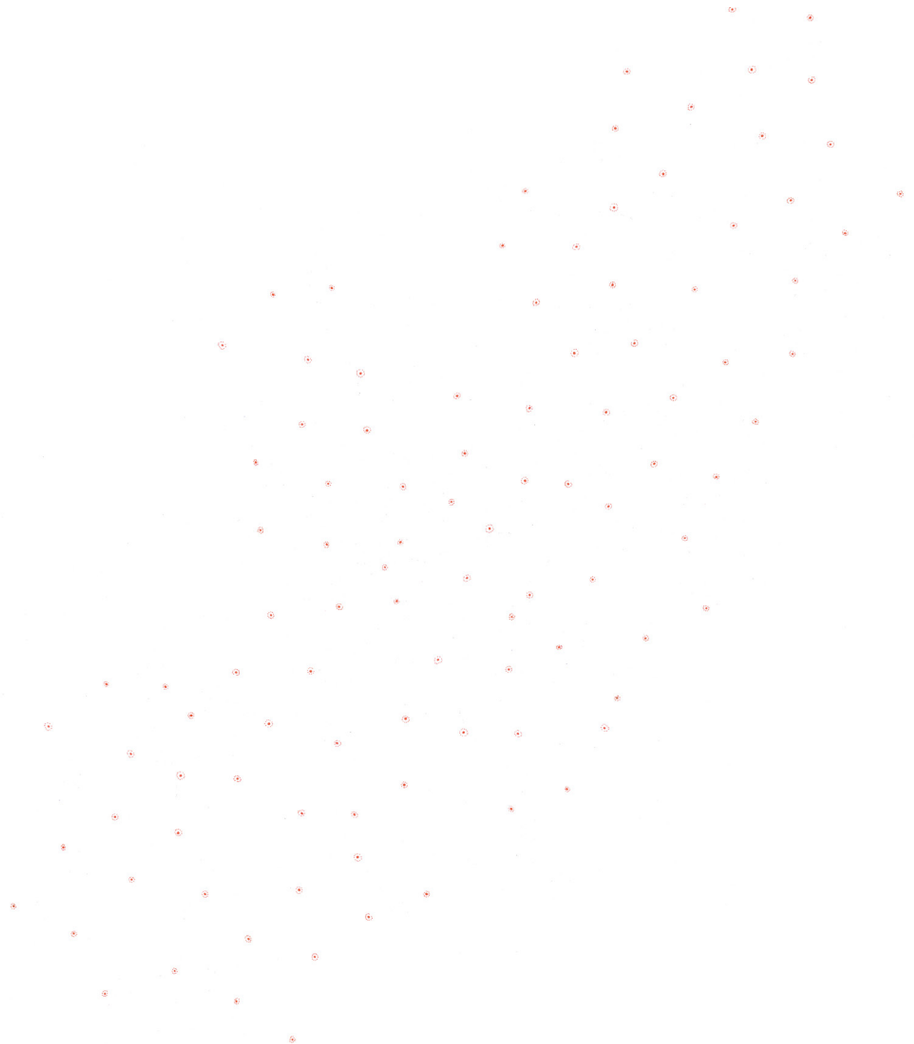








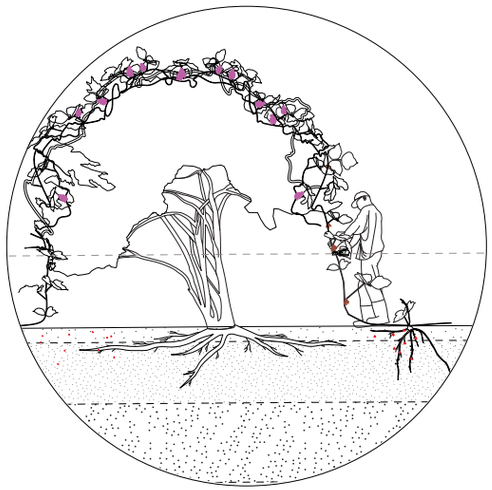
EDIT
Design draws on existing condition, editing root crown and vine network.



Radii are drawn around existing root crowns to create a system with crowns spaced at 10’ and 20’ intervals depending on slope, sun exposure and existing vegetation.

I. CLEAR + HAUL

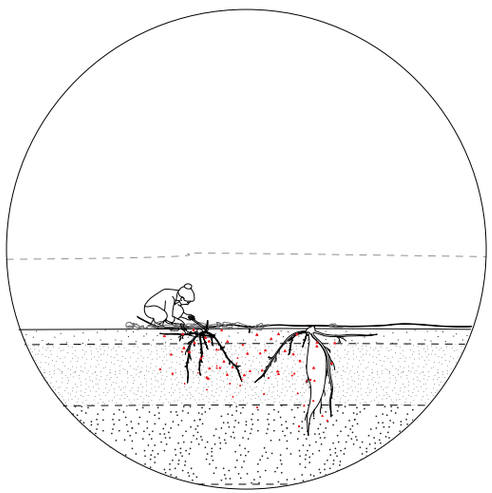
July-October



Existing vines should be cut at least 4' to free host vegetation from Kudzu hold. Vines should not be removed from canopy until dry to prevent damage to host.

II. EDIT

November - February

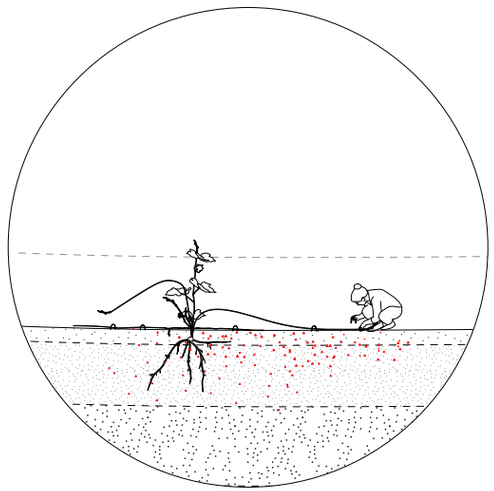


Root crowns should be surgically removed. Severing the crown from vines and roots kills the rooted plant. Vines do not bud from roots. It is unnecessary to dig up the taproot, which can be long, deeply buried, and heavy.

TRANSITION
Steps are established to transition from existing to designed condition.

III. CHOREOGRAPH

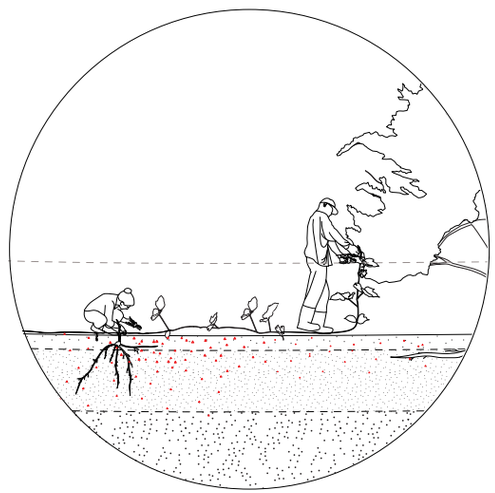
March-May



As new vines emerge, growth should be directed to keep vines from intertwining and create a woven pattern along the ground.

III. HARVEST

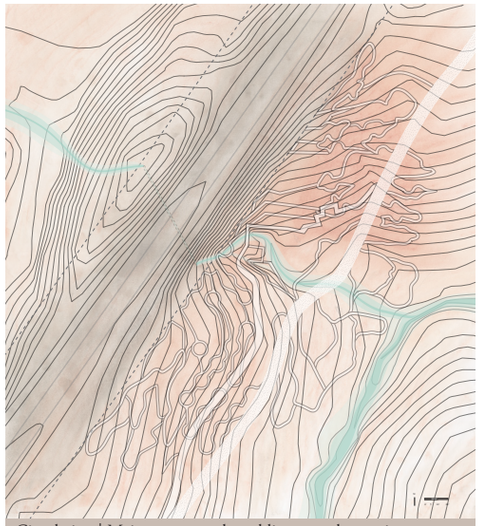
June-July



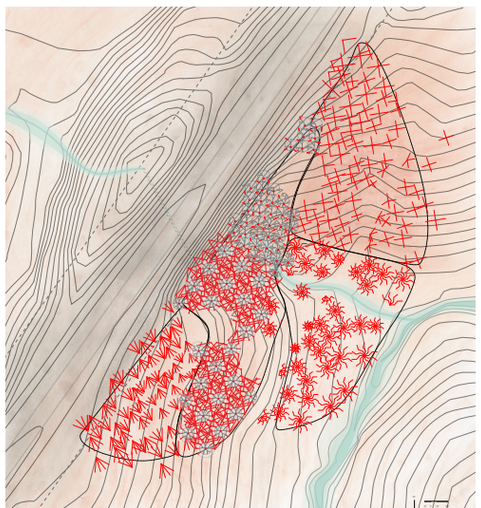
1st year vines should be cut near the base of the root crown and before reaching the upper canopy. Hand pruners can be used on supple vines. Vines should be at least 6' long, but 12-15' is preferable.



Existing vegetation | Kudzu network and trees



Circulation | Maintenance path, public access, harvesting routes



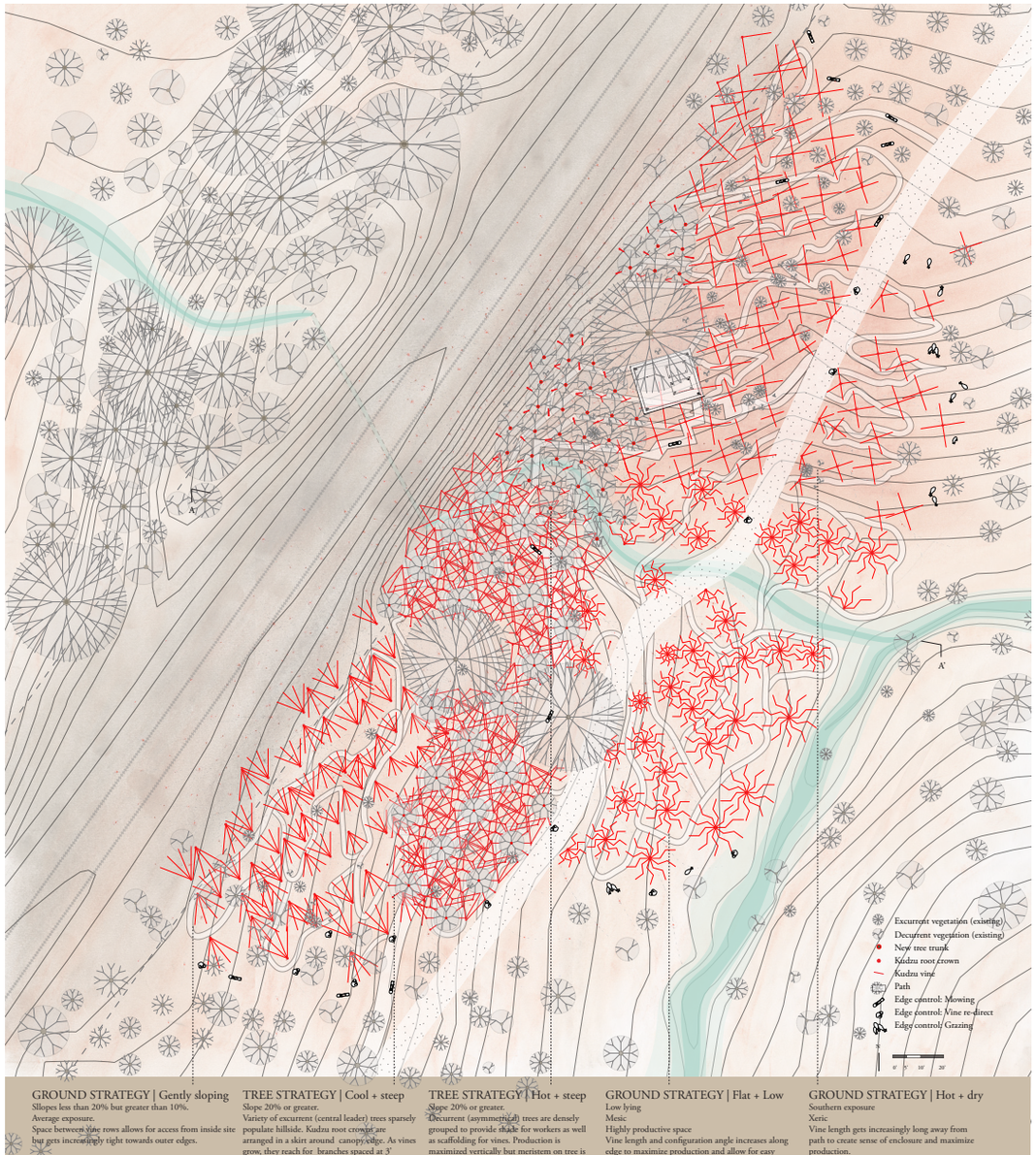
Design Strategies | Vine-host configurations



Edge Control | Mowing, grazing, vine re-direct

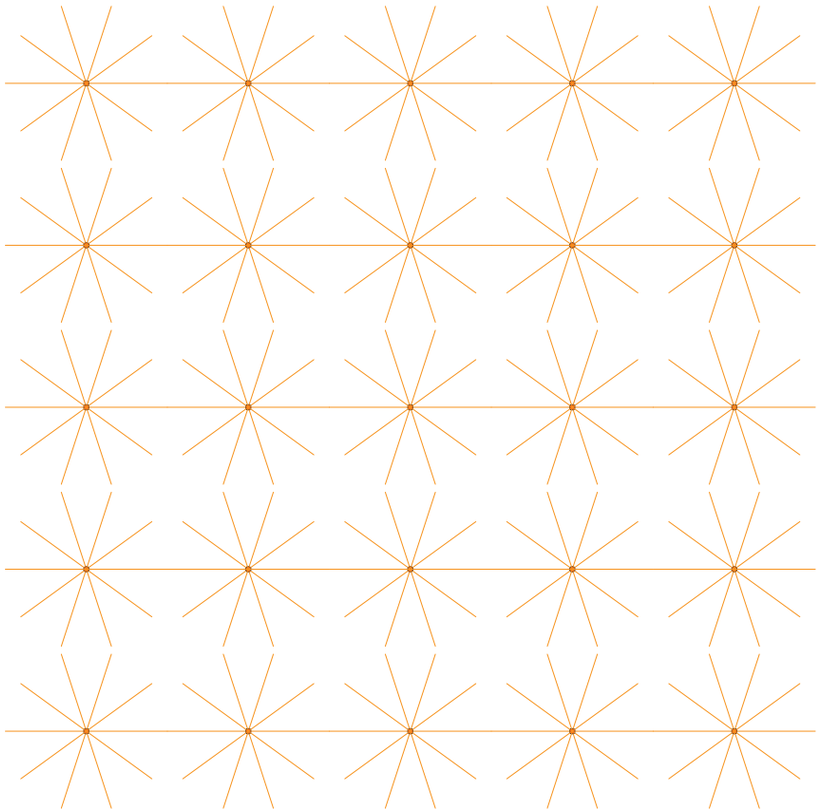
VINE HARVESTING STRATEGY

Tree and ground strategies rely on slight edits to existing Kudzu root crown network and are informed by slope, hydrology and host vegetation.



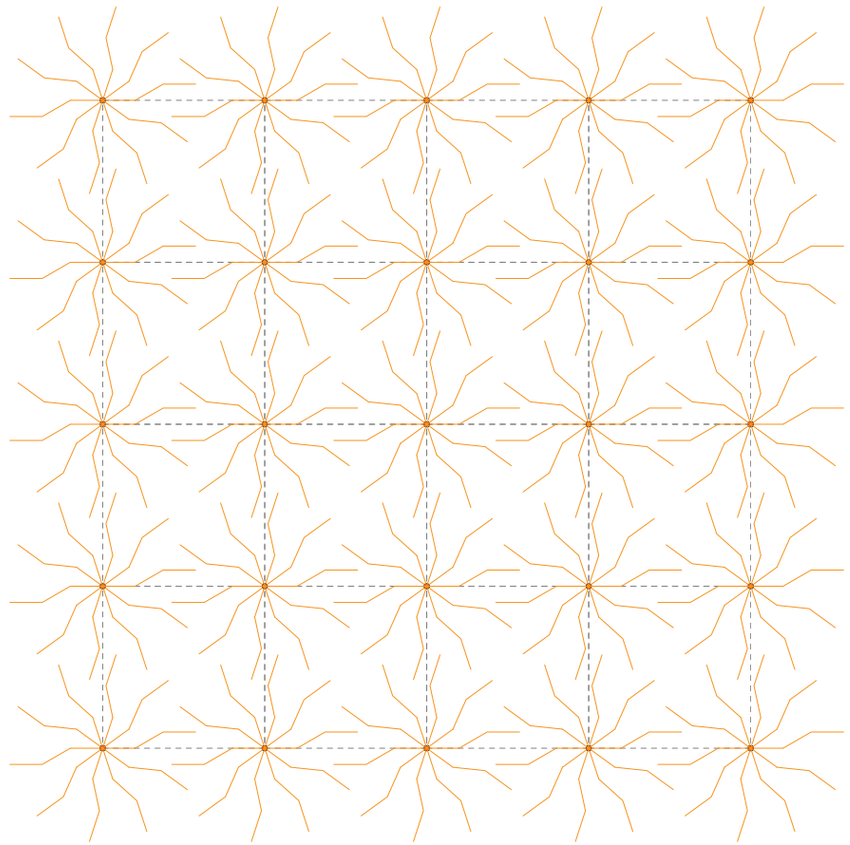


Models test different vine configurations.



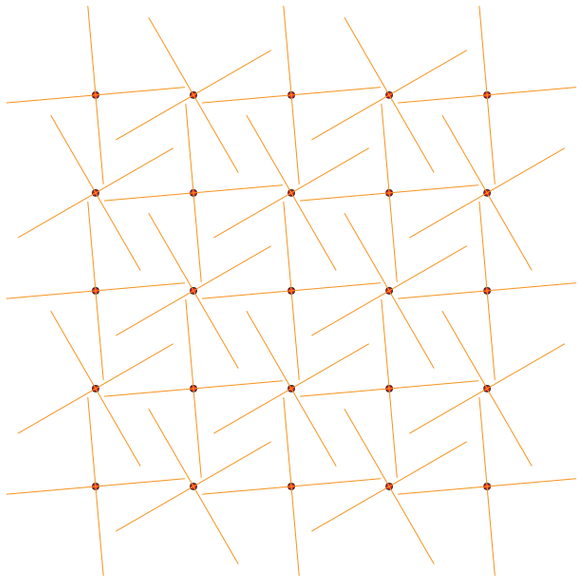
GROUND STRATEGY | Flat + Low

Kudzu root crowns are spaced at 20' intervals to allow vines to grow to 10'
before interfering in next root crown's radius of influence.
Yield: 100'/20 sq ft (10 vines, 10' each per 20 sq ft.)



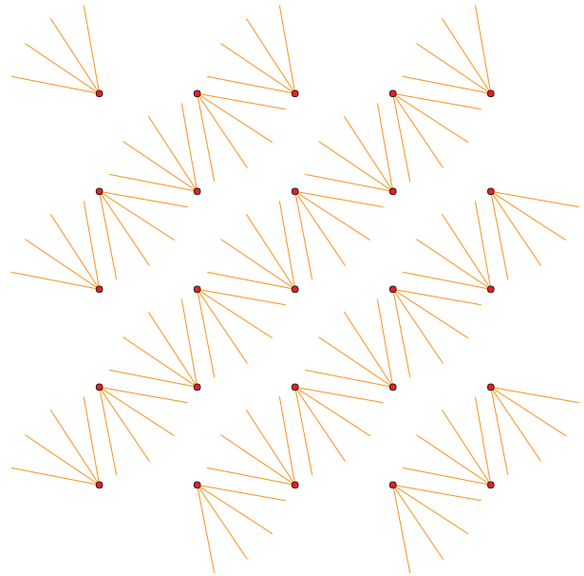
GROUND STRATEGY | Flat + Low

Kudzu root crowns are spaced at 20' intervals. Every four feet, growth is
re-directed to maximize space.
Yield: 120'/20 sq ft (10 vines, 12' each per 20 sq ft.)



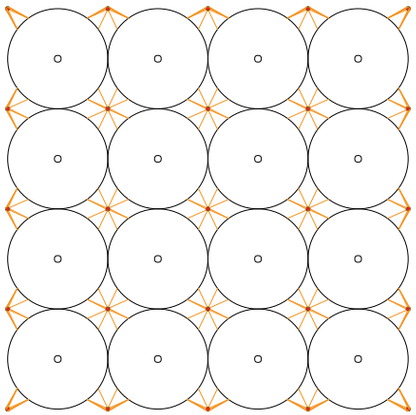
GROUND STRATEGY | Hot + Dry

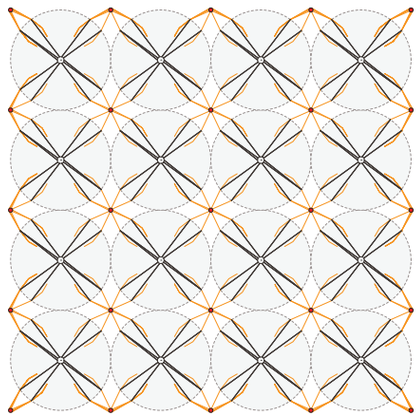
Kudzu root crowns are spaced 10' apart. Four vines are allowed to grow per root crown and angled to maximize available space.
Yield: 160'/20 sq ft (16 vines, 10' each per 20 sq ft.)



GROUND STRATEGY | Gently sloping

Kudzu root crowns are spaced 10' apart. Four vines are allowed to grow per root crown and angled to allow for easy access for harvest.
Yield: 160'/20 sq ft (16 vines, 10' each per 20 sq ft.)

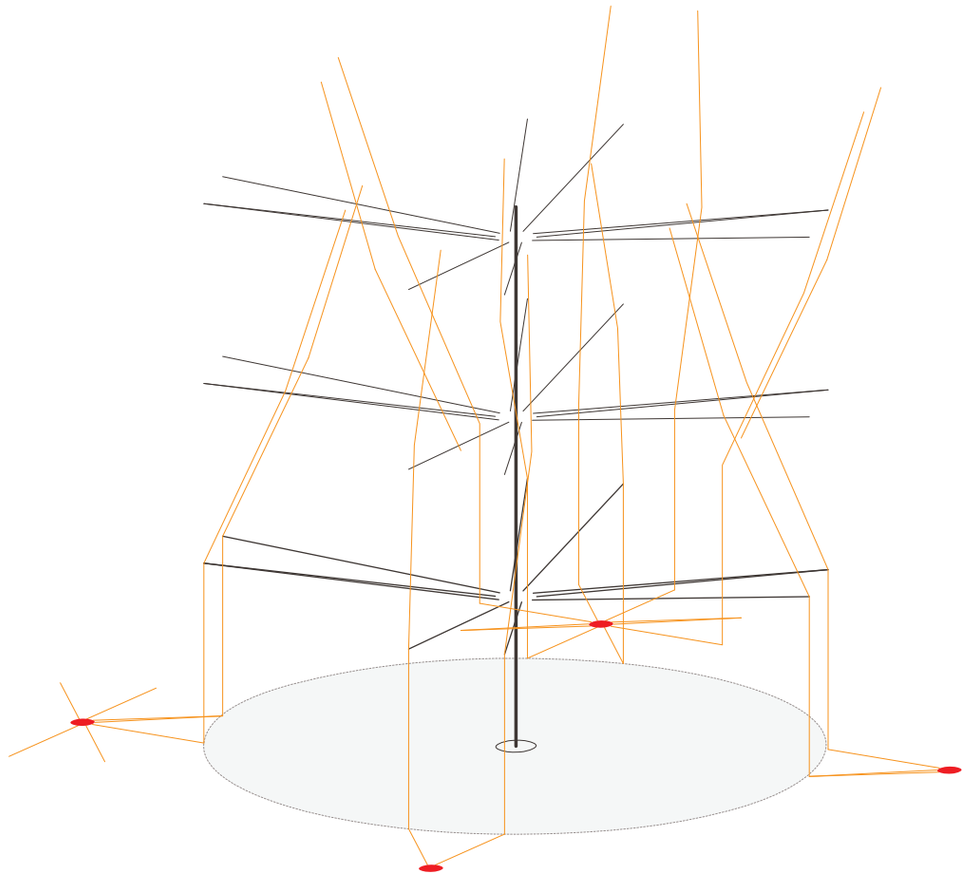


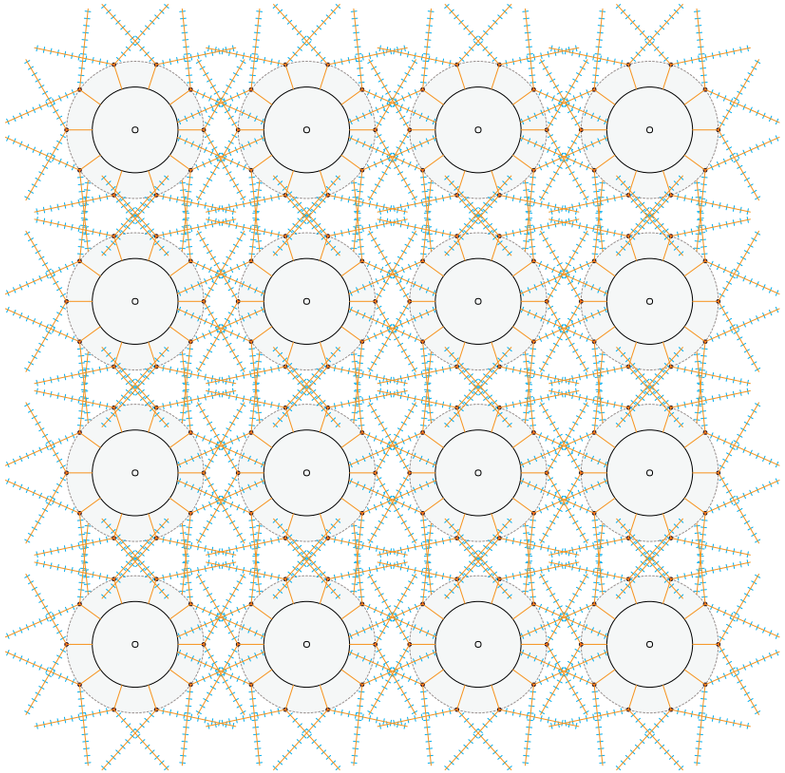




TREE STRATEGY | Hot + Steep

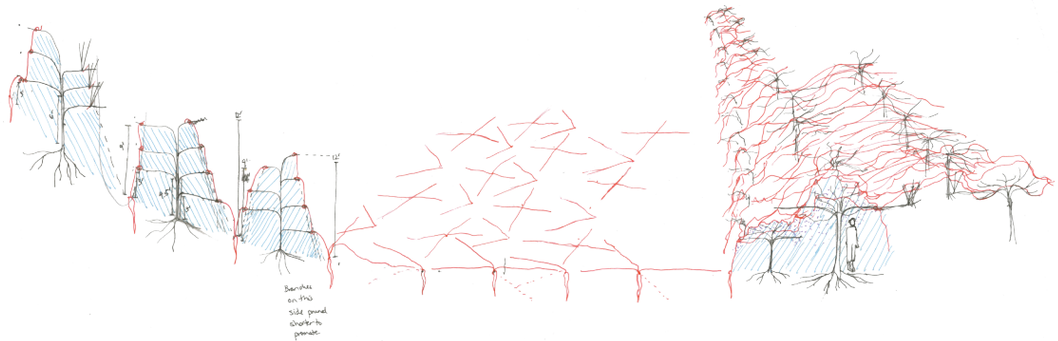
Kudzu root crown is left between each group of four trees. The vine is directed towards scaffolding branches and climbs up into tree.

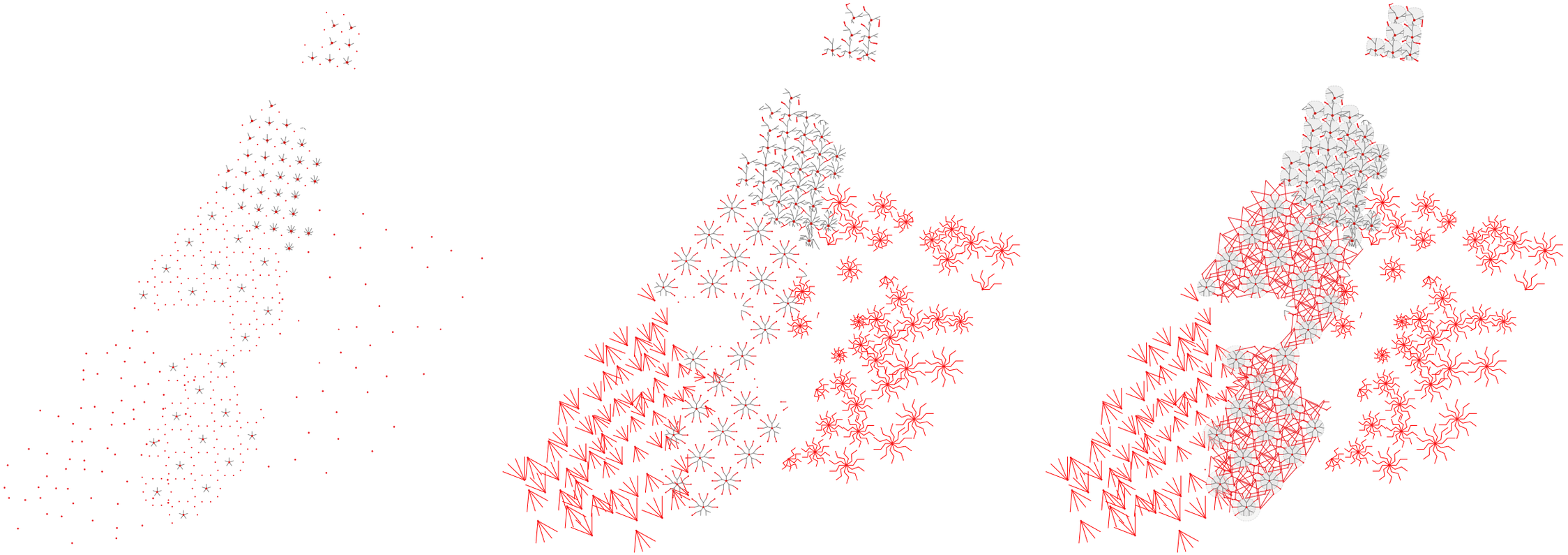




TREE STRATEGY | Cool + Steep

Kudzu root crowns are left around "skirt" of tree canopy shaded area.
Vines grow up towards first level of scaffolding at 3', twine around and continue up to next layer of scaffolding, spaced in 3' intervals.
Yield: 440'/20 sq ft (40 vines, 11' each per 20 sq ft.)

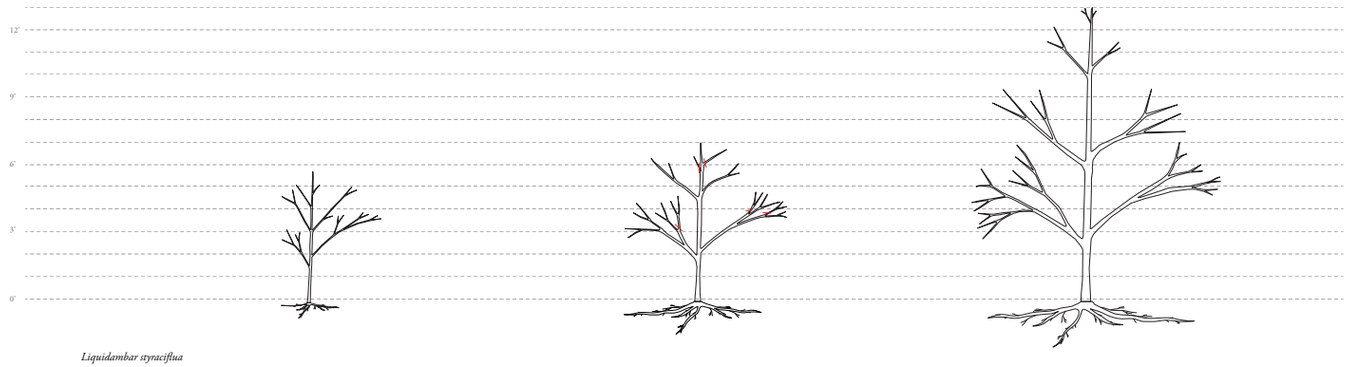




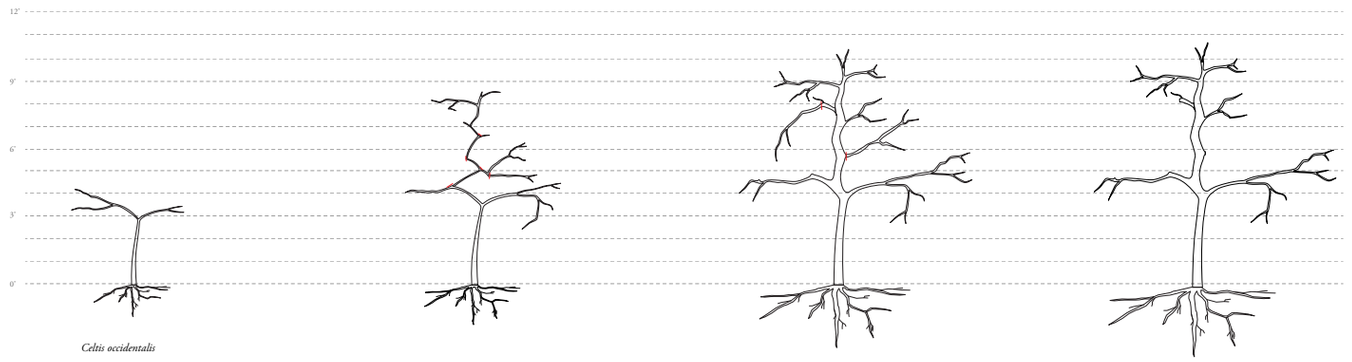
Design evolution

TREE PRUNING STRATEGIES

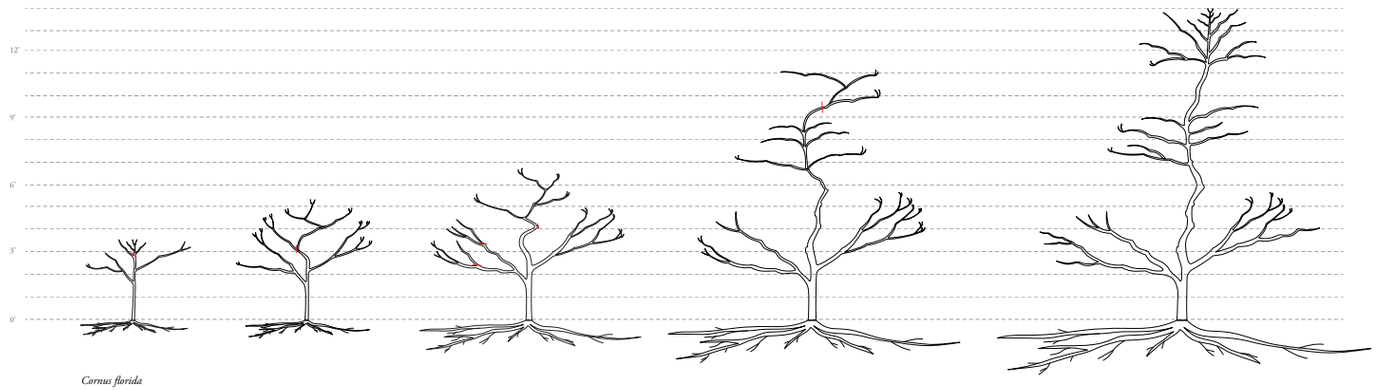
In order to ensure the continued life of host trees, the design creates a scaffolding strategy for Kudzu vines whereby the tree's apical meristem takes priority. Therefore tree branches in the upper most canopy are pruned to maintain vertical gaps larger than 4', while lower branches are pruned at 3' intervals and serve as supportive scaffolding for Kudzu vines. This maximizes relatively straight, vertical vine growth between lower branch levels which is a requirement for fiber production. Vines are allowed to grow until they reach 6' to 15', the optimal range for fiber use, at which time they are harvested. In doing so, relationships between host and "invader" are reshaped, transforming perceptions of Kudzu from that of intrusive to that of resituated gift.



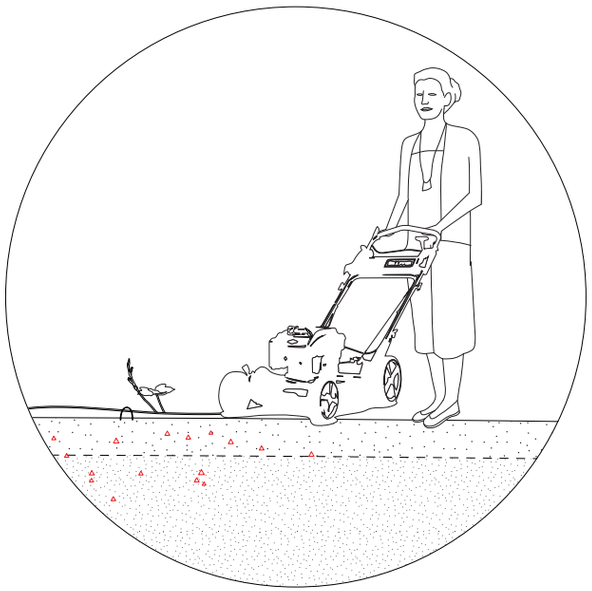
Liquidambar styraciflua



Celtis occidentalis

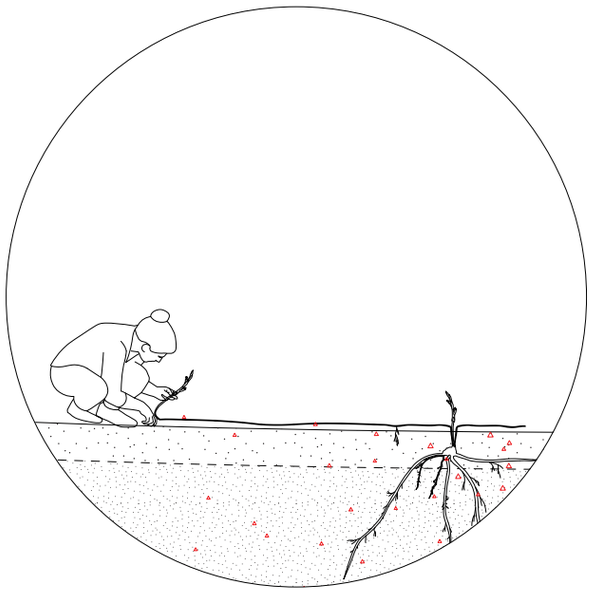


Cornus florida



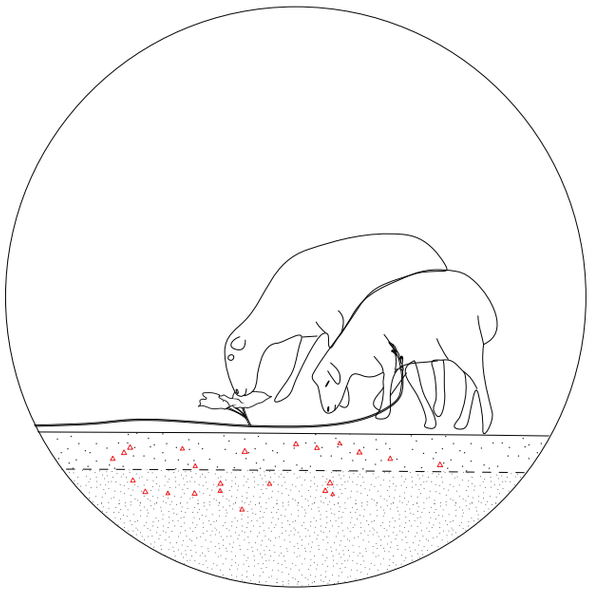
MOW

Edges of patch can be mowed to help keep growth from spreading.



VINE RE-DIRECT

Vine growth can be redirected to contain growth and limit spread. This needs to be repeated every two weeks during growing season.

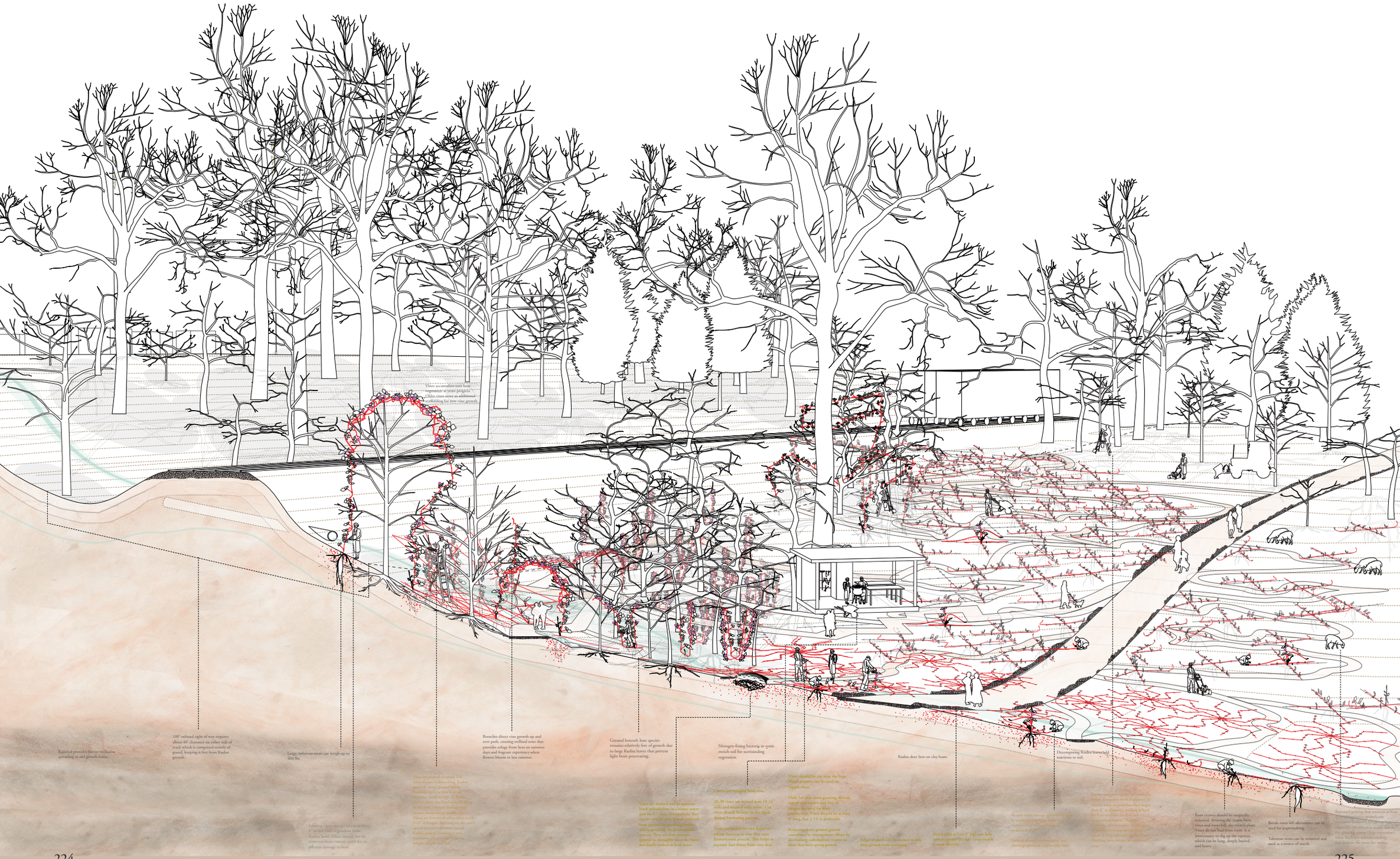


GRAZING

Sheep, goats, cows and horses can help control Kudzu growth and spread. Repeated grazing that removes at least 80% of vegetative growth can eliminate Kudzu in 3-4 years. It is especially effective if done late in the growing season (July-September) when Kudzu is actively sending nutrients to its roots for winter.

EDGE CONTROL

Through regular acts of maintenance, edges are monitored to keep Kudzu growth within desired area.


Vines accumulate root bole vegetation 2 years prior to harvest. Older vines serve as additional scaffolding for new vine growth.
Railroad provides barrier to Kudzu spreading to add growth foster.
100' railroad right of way requires about 40' clearance on either side of track which is comprised mainly of gravel, keeping it free from Kudzu growth.
Large, tuberous roots can weigh up to 400 lbs.
Existing vines should be cut at first 4' to limit vegetative front. Kudzu hold. Vines should not be removed from canopy until dry to prevent damage to host.
Trees are pruned to create 3-4 vertical steps in hemp-hog. Kudzu vines are trained to grow on the leading step 3' to the west of host tree. Small shoots are left to grow on the next step to the west. Of these remaining shoots, the largest is trained to the next step. Vines are harvested when vines reach 5-12' in length, focusing on the tree's central structure. Prevents loss of Kudzu growth creating a new resistance, reduces the recovery, simplifies the next year.
Branches direct vine growth up and over path, creating trellised zone that provides refuge from heat on summer days and fragrant experience when flowers bloom in late summer.
Ground beneath host species remains relatively free of growth due to large Kudzu leaves that prevent light from penetrating.
Vines are dechained and stripped in black polyethylene in a watery, warm spot for 5-7 days. Alternatively they can be covered with biomass gathered from ground surrounding Kudzu, which speeds up the fermentation process. There are three primary sprayed to thoroughly clean the fibers and finally soaked in fresh water.
Nitrogen-fixing bacteria in spots enrich soil for surrounding vegetation.
Leaves are stripped from vine.
20-30 vines are wound into 18-24" coils and secured with twine. Cut vines should be kept in the shade during harvesting process.
Vines are boiled for two hours to release bacteria so vine that start fermentation process. This helps to separate bast fibers from vine skin.
Vines should be cut near the host. Hand pruners can be used on supple vines.
Only 1st-year vines growing directly out of root mass and free of runners are used for fiber production. Vines should be at least 6' long, but 2-15' is preferable.
Recharges above ground growth contributes to management efforts by decreasing carbohydrate reserve in roots that fuels sprout growth.
Edges of patch can be mowed to help keep growth from spreading.
Kudzu does best on clay loam.
Mulch piles at least 2' high can help contain growth at edge. Grass mulch is most effective.
Decomposing Kudzu loosens soil nutrients to soil.
As new vines emerge, growth should be monitored and limited to 3 vines per host tree. Vines should be trained to grow on the host tree's central structure. Vines should be pruned to limit growth to the host tree's central structure.
Kudzu can spread by seed, but primarily by rhizome. A rhizome is a horizontal underground stem that sends out roots and shoots from its nodes. Rhizomes can grow to be 6" in diameter, making it hard to remove. Kudzu rhizomes can be found at depths of 6-10' in clay soil. Kudzu rhizomes can be found at depths of 6-10' in clay soil. Kudzu rhizomes can be found at depths of 6-10' in clay soil

CONCLUSION

My interest in the intersection of rural and urban landscapes as embodied by textiles began long ago and will extend far beyond the completion of my thesis.

As landscape architects, we cannot ignore the economic concerns that drive decisions or the human acts that continuously shape our ecosystems. Rather than placing blame on plant species, we must take responsibility for the human migration patterns that disseminated many of these gifts over the course of history. In doing so, the landscape architect assumes the role of translator, visionary and collaborator, disrupting the status quo to bring to life new configurations that shift cultural expectations, values and future trajectories.

DISRUPTIVE STIMULI: WORK PLAN

2013-2014

Apply for and receive grant from Center for Global Health.
Preliminary research and fieldwork conducted in Kumasi, Ghana.
Deliverables: Written report delivered to CGH, blog posts, public presentations

FALL 2015

September

II: Identify research topic and relevant contemporary projects and groups
Readings: Gyau and et al, "Landscape Approaches to Sustainable Supply Chain Management..."
Freeman et al, "Operationalizing the Integrated Landscape Approach in Practice."
Guillén et al, "Social Capital in Small-Scale Forestry..."
Consultations: Matthew Jull, Beth Meyer, Leena Cho

III: Develop research question; establish list of keywords
Readings: Scherr et al, "From Climate-Smart Agriculture to Climate-Smart Landscapes."
Gale, Fred P. "Economic Specialization versus Ecological Diversification..."
Marrati, Paola. "The Natural Cyborg..."
Consultations: Erin Root, Brian Osborn, Michael Lee, Dean Dass

IV: Revise CGII grant; map disciplines; read contextual material
Readings: Beardsley, John. *Designing Wildlife Habitats*.
Consultations: Jenny Roe, Lucia Phinney, Melissa Goldman, Jeana Ripple

October

I: Develop content diagram to guide research; outreach- email Invasive Species Initiative, Eileen Fisher, Textile Futures (CSM)
Readings:
Consultations: Margarita Jover, Asher McGlothlin (Kudzu Thesis)
Deliverables: CGII grant application

II: CONTEXT- map relationship to global trade, project to future, gather data related to global spread, write chapter text; email Dr. Laura Galloway (UVA Bio dept), Dr. Yael Grushka-Cockayne (Darden), Dr. Andrea Larson (Darden)
Readings: Seebens et al, "Global Trade Will Accelerate Plant Invasions..."
Consultations: Erin Spencer (Invasive Species Initiative)

III: TYPES- define invasive species, diagram growth patterns and distribution of Kudzu + Mulberry and its history of introduction to US
Readings: Dalmazzone and Giaccaria, "Economic drivers of biological invasions..."
Bradley et al, "Global change, global trade, and the next wave of plant invasions."
Consultations: Shiqiao Lee
Deliverables: Timeline and content diagrams; SARC Thesis grant application

IV: Complete text, charts and diagrams from weeks II + III.
Readings:
Consultations: Leena Cho
Deliverables: Design research book in progress- physical copy

November

I: MANAGEMENT- Research emergence of scientific forestry, history of management and current practices
Readings: Paquette and Messier, "The role of plantations in managing the world's forests in the Anthropocene"
Vezzoli et al, "New design challenges to widely implement 'Sustainable Product-Service Systems'."
Thoren, "Deep Roots: Foundations of Forestry in American Landscape Architecture."
Consultations:

II: Diagram management practices; identify links between management and industry; history of management and industry at Biltmore; links between design and management
Readings: World Business Council for Sustainable Development, "A Changing Future for Paper."
Cranz and Boland, "The Ecological Park as an Emerging Type."
Verburg et al, "Methods and approaches to modelling the Anthropocene."
Consultations: Carly Griffith (MAH student)

III: CASE STUDIES- Diagram Kumasi Papermaking Project
Readings: Opoku-Asare and Yeboah, "Hand Papermaking with Waste Fabrics and Paper Mulberry Fibre."
Fick, David. "Ch. 3: Ghana" from *Africa: Continent of Economic Opportunity*.
Consultations: Nancy Takahashi

IV: Local context- Kudzu + Mulberry in VA; fiber properties and potential applications
Readings:
Consultations: Erin Root

December

I: PROJECTIONS- Identify and map possible collaborators; diagram fashion industry data related to waste and demand for responsible sourcing
Readings:
Consultations: Abigail Doan

II: Compile book
Consultations: Leena Cho
Deliverables: Design research presentation and bound book

Winter Break

Presentation to Eileen Fisher Material Research team led by Inka Apter in New York City.

SPRING 2016

January-February

Research conventional fibers, existing practices + evolution of textile industry.
Consultations: Dr. David Green (Chem Eng), Michael Lee, Chris Gensic (Cville Parks), Seth McDowell
Deliverables: Fiber catalogue, systems diagram, map of existing fiber production

March

Develop parametric tool to assess invasive biomass in given area and its quantitative potential for fiber production. Identify and map "misplaced" fiber producing plants in Piedmont and visit NC Textile Lab for material research. Site visit to Cotton Plains Farm and Fibershed + presentation at CCA.
Consultations: Lynda Grose, Sasha Duerr, Rebecca Burgess, Shelley Barlow, Suzanne Moomaw, Cassandra L. Fraser (Chem Eng.)
Deliverables: Parametric model, "misplaced" palette catalogue, CCA presentation

April

Develop proposal + continue research.
Deliverables: Axonometric drawing, "misplaced" landscape typologies, catalogue of harvesting techniques

May

Finalize proposal and present for final review.
Deliverables: Sections, axons, fiber catalogue, technique for assessing plants in the field, plant specimens/material samples

UVA PAST

2010-2013

Writing, photography and industry collaborations related to responsible practices and sourcing within fashion industry
Deliverables: Published articles

FUTURE

20XX...

Expanded material explorations. Establish partnerships between industry leaders looking for "mobile sourcing" approach, forestry agencies, small-scale farmers and designers.
Deliverables: Innovative fiber applications, mobile sourcing model that supports new partnerships for ecosystem management

RELATED RESEARCH INITIATIVES

INVASIVE SPECIES



Invasive Species Project, USA

http://www.invasivespeciesinitiative.com/

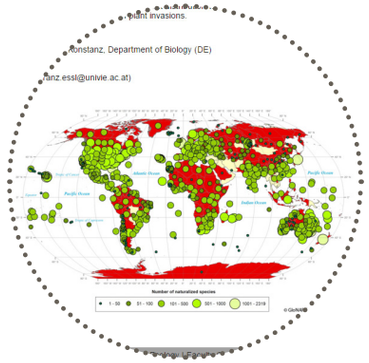
Focus: Initiative led by Erin Spencer to highlight creative management solutions to invasive species worldwide with a strong media and communications component. Erin has a background in Ecology and Marine Science and was awarded a National Geographic Young Explorers Grant to pursue her work.



EDD MapS, USA

http://www.eddmaps.org/

Focus: Web-based mapping system for documenting invasive species distribution established in 2005 by the Center for Invasive Species and Ecosystem Health at the University of Georgia.



Global Naturalized Alien Floras [GloNAF], Austria

http://cvl.univie.ac.at/department/project-details.cfm?id=132

Focus: Database run by the Universitat Wein that focuses on alien vascular plant species distributions worldwide.



Blue Ridge PRISM, USA

http://www.blueridgeprism.org/

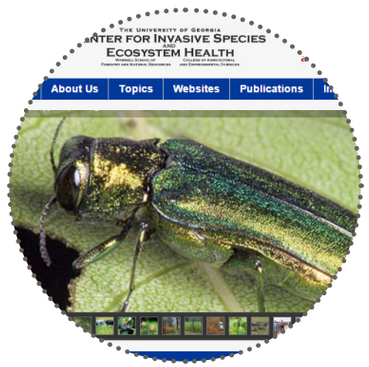
Focus: Cooperative weed management program to reduce the impact of invasive species in 10 counties along the Blue Ridge Mountains.



National Invasive Species Information Center, USA

http://www.invasivespeciesinfo.gov/

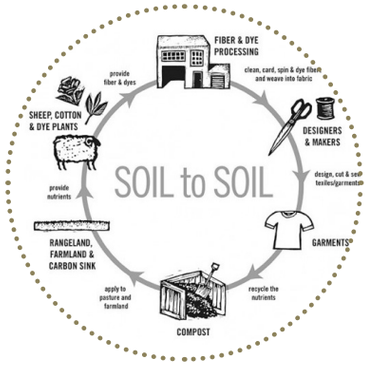
Focus: Clearinghouse for information on grants and federal, state, local and international sources related to invasive species.



Center for Invasive Species and Ecosystem Health, USA

http://bugwood.org/

Focus: Research group at the University of Georgia that plays a lead role in the development, consolidation and dissemination of information and programs focused on invasive species, forest health, natural resource and agricultural management.



Fibershed, USA

http://www.fibershed.com/

Focus: Develops regenerative textile systems that are based on carbon farming, regional manufacturing, and public education.



Eileen Fisher, USA

http://www.eileenfisher.com/

Focus: Vision 2020 aims to get to 100% sustainability in five years. EF is a leader in the industry that is pushing for change in the fashion industry and pays close attention to supply chains, material research and local, female-led community initiatives.



World Resources Institute, USA

http://www.globalforestwatch.org/

Focus: International research organization that focuses on six critical issues at the intersection of environment and development: climate, energy, food, forests, water, and cities and transport.

MATERIAL RESEARCH



Mediated Matter, MIT, USA

http://matter.media.mit.edu/about (Neri Oxman)

Focus: Conducts research that seeks to establish new forms of design and novel processes of material practice at the intersection of computer science, material engineering, synthetic biology, design and ecology, with broad applications across multiple scales.



Textile Toolbox, Central St. Martins, UK

http://www.textiletoolbox.com/exhibits/detail/sp-paper-cloth/

Focus: Design research group that focuses on how to decrease impact in the design industry and how to apply evolving technologies to textile practices. Particular research focuses on paper in collaboration with Innventia, a Swedish research institute innovating new materials derived from forest ingredients.



Innventia, Sweden

http://www.innventia.com/

Focus: Innventia is a world-leading research institute that works with innovations based on forest raw materials.

PROJECT LEXICON

bonding social capital: Trust based on personal and individual connections and exclusive networks. (Guillen et al.)

bridging social capital: "Trust among people when they take part in open and inclusive networks providing collective benefits." (Guillen et al.)

Corporate Social Responsibility (CSR): "... social responsibility of business, which encompasses the economic, legal, ethical and discretionary expectations that a society has of organizations at a given point" (Gyau et al., 297)

degraded landscape: A landscape in which biodiversity and ecosystem functioning decrease because of poor management or exploitation. (Naeem)

ecological/landscape approaches: Require a holistic and integrated approach that goes beyond the level of individual production units and takes into account multiple stakeholders from the public, private, and civil society sectors. (Gyau et al., 296)

ecologically poor: The majority of species who consume and control relatively few of the world's resources. (Naeem)

ecologically rich: A relatively few number of species who consume the majority of the world's resources. Parallels could be drawn to human society. (Naeem)

gardening: "… the intelligent and creative management of communities of species to create healthy and self-sustaining relationships among all parts." (Beardsley, "Introduction", p 3)

integrated landscape approach: "...Holistic and takes a transdisciplinary approach to landscape challenges. It incorporates ecological, economic, social and cultural considerations and accounts for change in future visions." (Freeman).

invasion debt: "Lag time between increases in trade value and alien species accumulation." (Sebeens et al.)

invasive species: "Invasive species are plants, animals, or pathogens that are non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause harm." (http://necis.wpengine.com/invasive-species-basics/)

managed landscape: A landscape managed for biodiversity or ecosystem functions or services (often provisioning services). Often either highly productive or a total failure. Subsidies, such as fertilizers, irrigation and biocides, are often used to avoid failure and manage contingency. (Naeem)

naturalized species: An intentionally or unintentionally introduced species that has adapted to and reproduces successfully in its new environment. (http://iufro-archive.boku.ac.at/silvavoc/glossary/34_0en.html)

novel ecosystem: Ecosystems that self-organize in response to human-induced changes. (from "Green Form and Function" article- http://www.thenatureofcities.com/2015/11/05/green-form-function-versus-green-nativism-in-changing-urban-spaces-full-of-novel-ecosystems-and-natural-assemblages-is-native-purity-a-viable-option/)

restored landscape: A landscape that has is recovering from a managed or degraded state and has achieved some level of biodiversity or ecosystem targets. (Naeem)

ruderal species: A species, especially a plant, that colonizes or thrives in disturbed areas.

supply chain: entails a vertical sequence of events that lead to the delivery, consumption and maintenance of goods and services (Gyau et al., 296)

sustainability: Meeting the needs of the present without compromising the ability of the future generation to meet their own needs (Brundtland, World Commission on Environment and Development, 1987). (Gyau et al., 297)

sustainable supply chain: The management of material, information and capital flows as well as cooperation among companies while incorporating goals from all the three dimensions of sustainable development, i.e., economic, environmental and social, which are derived from customer and stakeholder requirements (Seuring and Müller (2008)). (Gyau et al., 297)

sustainable supply chain management: The management of material, information and capital flows as well as cooperation among companies while incorporating goals from all the three dimensions of sustainable development, i.e., economic, environmental and social, which are derived from customer and stakeholder requirements (Seuring and Müller (2008)). (Gyau et al., 297)

seed bank: Living but dormant seeds that lay below the soil surface, sometimes for years or decades, that, through disturbance, are brought to the surface where germination can occur.

unmanaged landscape: A landscape that is not intentionally managed. In such scenarios, species are allowed to compete, increasing in density until they exhaust their most limiting resource and become stable.

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Image © Daniel Bastidas

Amanda Silvana Coen

The direction I have taken is strongly influenced by my background, experiences and travels throughout life. I am driven by a desire to re-configure human relationships to the surrounding landscape and resources. By observing, digging, drawing on multiple disciplines and learning from other cultures, slight edits to existing conditions invite new forms of engagement and create cultural associations that change the way we manage, use, see and experience our immediate environments. Landscape architecture is not a static practice of laying formal lines across the ground. Rather, it is a dynamic process that relies on TRANSLATION, VISION AND COLLABORATION to bring life to that which often remains hidden to the average eye.