

TERM PROJECT & SUMMARY

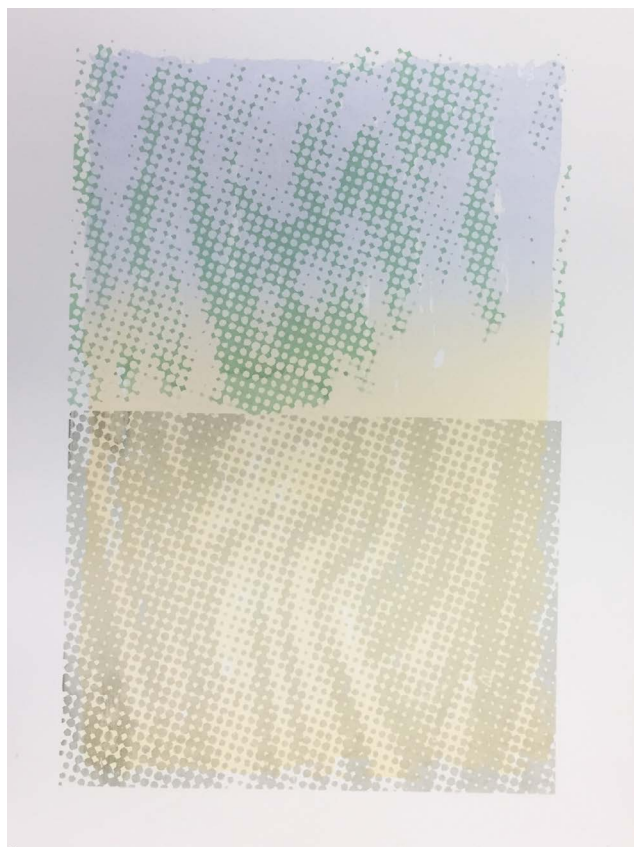
# **THE PINE BARK BEETLE EPIDEMIC AND HOW CAPITALISM BREEDS PARASITISM**

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12-layer silkscreen print on paper





A few snapshot photos of silkscreen process



Installation on Pratt Institute campus









Classon  
Avenue





Installation at Classon Ave subway station (video)



## **The Pine Bark Beetle Epidemic and How Capitalism Breeds Parasitism**

The pine beetle outbreak in the forests of western North America from Mexico to central British Columbia is a huge epidemic threatening “over four million hectares” [3] of forest, with an increasing beetle population that has major implications on current and future timber supplies. Endemic beetle populations have the characteristics of infesting weak/decaying trees, which happens mainly during drought [3]. The harm that the bark beetles cause mostly happens on the inner bark, also referred to as “phloem tissue”. By creating galleries under the bark which they lay their eggs in, the larvae steal nutrients from the tree in order to thrive. Their feeding on the tree cuts off the flow of nutrients from the leaves to the other parts of the tree [4]. Causes of the current beetle outbreak include a combination of factors including: drought, dense forest stands, and shallow/rocky soils. These factors are amplified by various human activities including: fire suppression, forest management practices, grazing practices, and ongoing urbanization. Human factors have significantly contributed to current conditions. Trees not receiving enough water, light and nutrients become stressed, and bark beetles can detect stressed trees and respond by beginning to colonize them [4].

One of the things that is inescapable when considering the reason for this massive outbreak is human value. Human values influence factors that further affect the bark beetle epidemic because human-caused events, such as deforestation, are one of many acts that fuel the outbreak. A specific group of people whose human values revolve around money are capitalists. In our world, the quickest and most efficient way to gain money is through resource exploitation. This value of considering natural resources solely as tools to make money overrides preserving healthy ecosystems and in turn preventing massive parasitic outbreaks. The rise and growth of capitalism uses nature at its disposal and natural resources are currently the most powerful way that it thrives. Capital accumulation depends on nature, but has a parasitic feature of giving nothing in return [6].

For my term project, I’m focusing on the bark beetle attack and its effect on forests, but also honing in on the parasite-like tendencies and parallels between the capitalistic system and a parasite exploiting their host. In order for capitalism to survive, it is dependent on hosts (workers) to provide profit for the people owning the means of production. This is also the case for a parasite, although money is replaced by nutrients or other benefits of life. There is also a connection between the rise of bark beetles and capitalists paving the way for the epidemic to happen, and that is through devaluing protection of the environment and valuing money.

Through my research, I found the definition of tolerance versus resistance to be very helpful in order to distinguish how a host responds to the parasite. Tolerance is the ability to limit the harm caused by a given burden (parasite), while resistance is the ability to completely limit the parasite burden. When these two components are combined, they measure how well a host is protected from the effects of a parasite [7]. Given the drought-stricken current conditions for trees in forests from Mexico to

Canada, the trees have little defense against the tiny but powerful beetles, measuring as small as a grain of rice. The warmer winters are failing the trees by not killing enough bark beetle populations, resulting in a larger bark beetle to tree ratio than ever [2].

The creative piece of this project is a thirteen-layer silkscreened print. I chose to heavily layer this piece because of the host-parasite system that emerges from the confluence of many factors. In this way, it is a complicated process which relies on more than one factor for the parasite to thrive. The print is read vertically, going from a healthy ecosystem at the top to an unhealthy environment clouded by many negative factors at the bottom.

The very first layer is a gradient, indicating the blurry line between a healthy ecosystem and an unhealthy one. A human/capitalist view on a healthy ecosystem may include deforestation, but still have enough stable trees to sustain a certain amount of income. From the trees perspective, a healthy ecosystem may sustain a certain amount of stable trees and a balance between host and parasite, but no activity of deforestation, fire suppression, urbanization, etc. In this way, the capitalists and trees (hosts) are at odds with one another.

The second and third layers show a half-tone bark texture, showing one of them a healthy green and the other a dull gray color. This is indicative to the bark beetle infesting the phloem tissue and using it to breed more parasites, with one ecosystem heavily influenced by the excess beetles, and the other sustaining a healthy amount. The fourth and fifth layers are two different tones layered on top of the bark. This is to emphasize the effect that global warming has on the trees. The layer in the healthy ecosystem is a very translucent green, while the layer on the bottom is a warm red tone, showing the drought and warmer temperatures adding to the epidemic. The red also serves as a warning for an unnatural amount of tree killings and the implications that this has on other ecosystems.

The sixth, seventh and eighth layers serve as the representation of the trees. I have first filled in the shapes of the trees, with the branches towards the top sprouting out expressively and the branches towards the bottom portrayed as more damaged. Then I have silkscreened a darker layer on top with a stylistic rendering of the bark and making the trees look more alive. The eighth layer is a brighter layer of the stylistic tree lines which allude to the beautiful abstract lines created by the bark beetle galleries in a way that covers the whole tree instead of just one part, since this epidemic is widespread and no longer a small issue.

The ninth layer shows a very light transparent area indicating the galleries that the beetles bore into the trees to raise their offspring. On top of this layer, there is a tenth layer of the actual beetles crawling along the trees.

The eleventh and twelfth layers are a representation of the capitalistic human factors which provoke the bark beetle epidemic. It shows a base layer and an outline on



top of faint dollar bills which fade into the background of the damaged branches on the bottom. Finally, the thirteenth layer is an arrangement of healthy leaves at the very top of the healthy ecosystem which represents a stabile population of forest trees.

I have printed multiples of these posters and hung them up in different spaces including Pratt hallways, the subway station, and various trees on campus. Displaying the posters in multiples like this is a way for the poster to “infect” the space and use it as a host itself. These installations can be shown anywhere and are not only specific to forests that are infected by bark beetles; natural resource exploitation is widespread and exists on a large scale. My ideal audience involves locals, not because my analog process is limited to an in-person experience with the artwork, but because I believe expressive local activists are a big part of policy change and reconsideration. A viewer may not realize the artwork is specifically about a bark beetle epidemic, but the colors evoking an unhealthy balance of one of our natural resources and the parasitic placement may evoke some thought about what place art has in science and why artists need to respond. Art and activism is a huge part of science, especially now that the evidence is clear and there is still backlash against scientific data showing the detrimental results of excessive exploitation and careless use of our earth’s resources. As an art student and future cultural influencer, I believe we are at a point as a society where we can’t ignore our creative work’s implications on the earth and it is important to keep in mind which human values will sustain both healthy ecosystems and economic systems around the world.

## BIBLIOGRAPHY

- 1 *Anderson, Roy M., and Robert M. May. "Coevolution of Hosts and Parasites." Parasitology 85.2 (1982): 411-26. Cambridge Core. Cambridge University Press.*  
This text helps define the extent to which parasites take advantage of their hosts. It includes viruses, bacteria, protozoans, and helminthes. It explores the rate at which a parasite induces its hosts mortality, which shows that it is usually coupled with the amount of time taken by the host to recover (when the infection isn't lethal). This text also argues that in most other texts, it's assumed that host and parasite generations live through the same life cycle (which may be true for certain plant/parasite relationships) but the parasites of many animals cycle through many generations in one single generation of the host. This means that parasites evolve rapidly compared to their hosts. This information is important for my comparison because it directly correlates with benefit in the form of a rapid increase of money for the owners of the means of production in a capitalistic system.
- 2 *Bark Beetles in California Conifers: Are Your Trees Susceptible? San Francisco, CA: Forest Service, Dept. of Agriculture, Forest Health Protection, 2009. Forest Service. Web.*  
This informational text was helpful in my understanding of how the bark beetles are affecting trees individually. I learned about the galleries they create for their eggs and how they steal the nutrients from the tree. They attack trees under stress which happens during drought. There were many helpful visuals of what the different types of beetles look like and how small they are, along with what an affected tree looks like versus a healthy one. This was helpful for planning some of the visuals I will replicate in my silkscreened print.
- 3 *Brooks, J.E., and J.E. Stone. "Mountain Pine Beetle Symposium: Challenges and Solutions." Ed. T.L. Shore. Natural Resources Canada (2003): n. pag. Print.*  
The pine beetle outbreak in British Columbia is a huge epidemic threatening "over four million hectares" of forest in the area, with an increasing beetle population that has major implications on current and future timber supplies. Endemic beetle populations have the characteristics of infesting weak/decadent trees, which can correlate to exploiting the weak in a purely capitalistic society. It's also interesting to note the rate at which they infest the forest; initially, the beetle population grows slowly so that over a number of generations the rate of increase doesn't kill off the host (forest). Consequently, there might not be noticeable change for five or more years. Although eventually, there will be an increase in number and size of infested spots, which will coalesce into larger areas and mark the beginning of an epidemic level infestation.

- 4 *DeGomez, Tom. "Bark Beetle F.A.Q." Arizona Forest Health. University of Arizona, Aug. 2010.*  
This source provided most of the backbone for my print layers and deciding what each layer represented and how it connected to the bark beetle epidemic. The website had very helpful answers to the questions I was asking including what the infected trees actually look like (since I have never personally seen one). It also listed proposed "natural" causes for the outbreak and separated these from the human activity which amplifies the outbreak in a different way.
- 5 *Kochin BF, Bull JJ, Antia R. "Parasite Evolution and Life History Theory." PLoS Biol 8(10). 2010.*  
This text outlines how parasites are prone to rapid evolution (quicker than their hosts). This can be related to the "parasites" benefitting from the capitalistic system and adapting to changes in the world while gaining more profit.
- 6 *Moore, Jason W. Capitalism in the Web of Life : Ecology and the Accumulation of Capital. New York: Verso, 2015. Print.*  
The rise and growth of capitalism uses nature at its disposal and natural resources are the only way that it thrives. Capital accumulation depends on nature, but gives nothing in return. This relates to parasites because they give nothing in return to their hosts, but instead harm them.
- 7 *Råberg, Lars, Andrea L. Graham, and Andrew F. Read. "Decomposing Health: Tolerance and Resistance to Parasites in Animals." Ecological Immunology 364.1513 (2009): n. pag. Biological Sciences. The Royal Society.*  
In this text, it differentiates tolerance and resistance. Tolerance meaning the ability to limit the harm caused by a given burden, and resistance meaning the ability to limit parasite burden. These two components measure how well a host is protected from the effects of a parasite. One piece of information that is compelling in this text is that through distinguishing the difference between these terms, it recognizes that hosts can be best at controlling parasite burdens, but not necessarily the healthiest. Looking at the correlation with effects of capitalism, this supports the notion that humans can "survive" under capitalism, but not necessarily live a healthy life.
- 8 *Windsor, Donald A. "Parasites Benefit Their Hosts - at the Species Level." Theoretical Ecology (2014): n. pag. Frontiers. Loop, 16 Mar. 2014. Web. 05 Nov. 2016.*  
I found this blog post useful because the author explained his beliefs for some parasites being useful to the larger species of animals, although still detrimental to the individual animals. He uses the example of anthrax: a bacterial disease infecting cattle and sheep. The anthrax lays dormant in the soil until a grazer pulls up the whole root of a plant, causing the spores to contaminate the plant and enter the animal. His view is that although the anthrax will kill that animal, it will protect the plants on the land from overgrazing.