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CONTENTS

RUDERAL MATERIAL PROJECT

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Abstract
What do the creeping thistle (*Cirsium arvense*), curly dock (*Rumex crispus*), and American pokeweed (*Phytolacca* americana) have in common? They are all ruderal plants that thrive within North American urban ecological wastelands. This community of wild, pioneering plants – a mix of native and invasive species – are the first to lay root to land that has been laid to waste by natural or man-made destruction. They are the change makers: adapting, surviving, and growing in the most barren of soils within our cities.

This paper reflects on the relationship between the material taxonomies of ruderal flora specifically colonizing Detroit's historic Belle Isle's Wet-Mesic Flatwoods – home to some of Michigan's most endangered plant species – currently disrupted by flooding, human disturbance, deforestation, and pollution. The methodology of the project focuses on observation through field work, cartographic snapshots, and material sample-making. The project explores how these disturbance-adaptive species integrate with native species to conceptualize future scenarios through a series of *material landscapes* to present a framework of opportunity, extinction, adaptation, and renewal.

If "environmental stability is an illusion, and an unpredictable future belongs to the best adapted" (Botkin, 1990; Del Tridici, 2014), what is the potential for these ruderal species to act as models to inform adaptive design practices? How could these design practices produce new material applications? And how do we – artists, designers, and humans – learn the ways of *ruderal thinking* to foster adaptive material systems? This project looks at these signals to coalesce into an interactive, bio-diverse dialogue designed around these inquiries.

Author Keywords
Ruderal plants; wastelands; disturbance-adaptive design; material landscapes.

Introduction
The Wet-Mesic Flatwoods is a unique ecosystem on the eastern side of Detroit's third largest island, Belle Isle, "a swampy type of forest that the Michigan Natural Features Inventory lists as 'imperiled' in Michigan" (Allnutt, 2020). The Flatwoods, as they are commonly referred to, are home to several colonies of native trees, including pumpkin ash (*Fraxinus profunda*), red mulberry (*Morus rubra*), and Shumard oak (*Quercus shumardii*), all currently on the Michigan Natural Features Inventory (MNFI) threatened species list, the last of special concern (Slaughter et al., 2010). Beneath their canopies lies a low-growing range of flora – a mix of species identified as native and non-native, the latter having the potential to be considered invasive if their growth causes harm to humans, the economy,

or the environment. Due to natural and man-made disturbances – including flooding, human excavation, fires, and pollution – many native communities of plants have been removed or displaced, only to be replaced by the more adaptive colonies of *ruderal* plants.

Patches of native soil are still viable to provide support to the vestiges of a native ecosystem through dormant seed banks, but in the case of Belle Isle, large areas of non-native soil have been brought in as fill. The idea that communities can be restored to their original ecosystems by removing ruderal colonization and reseeding with native plants is an overly simplistic view (Del Tridici, 2014) in the wake of climate change, with rising waters, warmer temperatures, and continued human intervention to restore the environment to what it once was. Notable French biologist Antoine Laurent de Lavosier stated, "In nature, nothing is created and nothing is destroyed, but everything is transformed." If disturbance is a part of nature, learning to adapt is therefore the best way forward.

Adaptive Design Practices Through Ruderal Thinking

Ruderal plants thrive in anthropogenic habitats, pushing up through wastelands to colonize disordered communities, rising as the harbingers of changing ecosystems. As Susan Cowles (2017) states in *Brooklyn Says, "Move to Detroit": Ruderal Aesthetics*, ruderals are "metaphorically paradoxical: indexing catastrophe and abandonment, yet conversely representing resilience and renewal." The paradox of ruderal thinking permeates the work of contemporaries, seen in Ben Hartley's (2020) *Ruderal*, where he "explores the parallels between ruderal plant species with the processes of gentrification and urban renewal"; *Ruderal Consciousness*, a collection of works by artist Sam Schmitt at Hartslane Gallery, London, including an installation "encouraging plants to sprout in unexpected places" (Akriditis, 2020); and Margaret Haugwort and Oliver Kellhammer's (2021) *Ruderal Witchcraft*, a project that considers a "set of practices specific to planetary, weedy natures that work their way at edges and interstices of public and private property, and which are entangled with a range of other human and non-human outcasts of capitalist modernity." Designers and artists pursuing ruderal thinking in original design outcomes necessitate the creation of these new principles that exhaust all assumptions, whereby all solutions are measured. As a designer with a specific focus on natural or waste materials with a sense of place, "new materials can offer new, unique combinations of properties which enable original design" (Ashby, 1992, p. 5), yet initiating *small* modifications, shifts, and changes is the approach to considering larger adaptive material systems.

Throughout this project – uniting field study and exploratory creative practice – a collection of ruderal plant species has been observed, collected, and synthesized to create a series of hypothetical landscapes, speaking to the potential for adaptive, ruderal thinking in material design.

Methodology

Field Research

This project originated from the cartography of Belle Isle, observed prior to a guided walk hosted by the Belle Isle Nature Center in the fall of 2020. The *Ruderal Material Project* officially kicked off a few months later with an interview and guided tour of Belle Isle's Wet-Mesic Flatwoods with Amy Emmert, Director of Education at the Belle Isle Conservancy, in November of 2021. This was followed by repeated visits throughout the winter to become familiar with the environment, document points of interest, and select sites for the spring of 2022.

The Wet-Mesic Flatwoods are cartographically divided into eight cells outlined by a series of winding "roads and trails that play a significant role in shaping the current characteristic of the flatwoods" (Slaughter et al., 2010). This mapping strategy presented eight unique contact points of discovery (Figure 1). Within each cell, a single one-foot-square site was selected based on 1) observed natural or human disturbance to the land and 2) the diversity of flora within the perimeters.

Figure 1. Map of Belle Isle highlighting the eight cells of the Wet-Mesic Flatwoods with sites marked. Map courtesy of Michigan Natural Features Inventory (MNFI).

Figure 2. Cell sites with material landscape snapshots. (left to right): Cell 3, Cell 5, and Cell 7.

Making Material Samples: Aerate, Perforate, and Disperse

The taxonomy of each ruderal plant sample was classified through a virtual dichotomous key – a combination of digital apps, including *PictureThis, PlantNet,* and *Seek by iNaturalist,* to identify, cross-reference, and archive each species. While every attempt was made to properly identify the species, this was an exercise in curiosity and investigation and was not intended to reflect the rigorous standards of scientific botany. Each material snapshot was used as a framework for conceptualizing mechanical attributes, material substance, color, and texture. Additionally, each material sample explored the strengths and weaknesses of the ruderal material to provoke concepts for adaptive outcomes.

A strength among the ruderal species became a common narrative: the ability to thrive in compacted, low-oxygenated soil. Heavy machinery used for building and paving leads to compacted ground, while flooding caused by climate change and human intervention can produce further oxygen deprivation in soil. Many ruderal plants have the ability to adapt to low soil oxygen by changing their root anatomy and architecture in a process called aerenchyma (Yamauchi, 2021). Using aerenchyma as a foundation for structure, a series of multi-material samples were ideated to show adaptation through perforation: foamed sponges for hydrophobic aeration, hydro-gels for protective organic films, and waxes for heat-triggered, form-shifting surfaces. This process of creating space – or pockets of air – was applied to all samples within the material landscapes.

Several methods were used to process the materials – drying, shredding, and grinding – to make pastes, powdered pigments, and shavings for dispersion within the samples. Each sample was bio-based, with the intent of reintroducing the material back into the landscape in its new form to modify, adapt, and decompose within the environment.

Figure 3. Ruderal material samples.

Results

Material Landscapes

The material samples and final material landscapes are abstract concepts for future artifacts and surfaces. They are considerations for opportunities and innovations for material adaptations. Of the eight cells, three were selected to create final landscapes: Cell 3, Cell 5, and Cell 7 (see Figure 4). Multiple experiments were performed to iterate a body of samples for consideration for each cell.

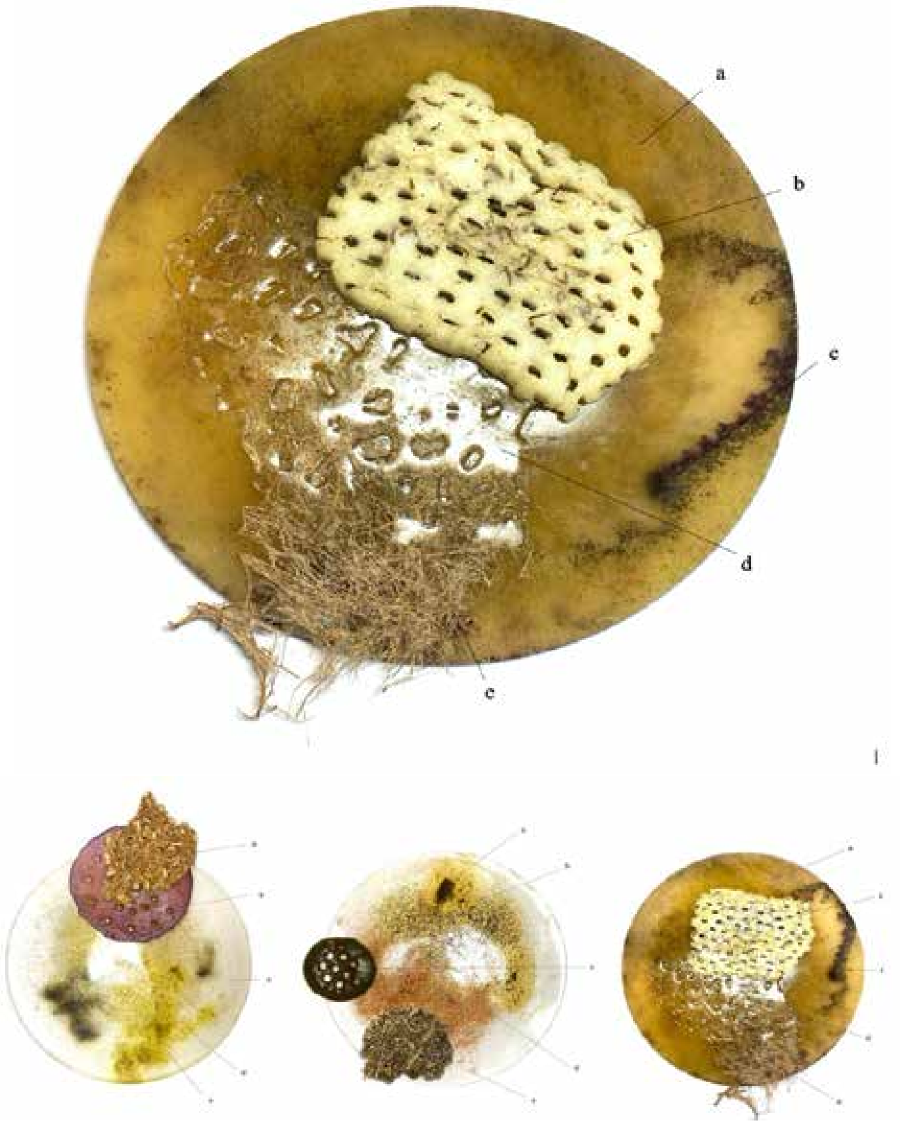

Figure 4. Ruderal Material Landscapes, Wet-Mesic Flatwoods. (top): Cell 7; (bottom, left to right): Cell 3, Cell 5, and Cell 7. Dimensions: original 7 inches, 6 inches after shrinkage.

Cell 3

Cell 3 is surrounded by Central Avenue, the Sylvan Canal, the Wildwood Pass, and the Oakway Trail. The Oakway Trail was paved until its recent removal in 2021 to increase hydrology and create a natural footpath. The site selected (42.346893, -82.965965) included lambsquarters *(Chenopodium album),* lady's thumb (*Persicaria maculosa*), field pennycress (*Thlapsi arvense*), cattail (*Typha*), fox sedge (*Carex vulpinoidea*), curly dock (*Rumex crispus*), and pokeweed (*Phytolacca americana*).

From these materials, several iterations were explored, with the final landscape represented by a brittle sponge of dried cattail (*Typha*) and curly dock (*Rumex crispus*); a perforated hydrogel of American pokeberry (*Phytolacca americana*), water, glycerin, and carrageenan; and a hydrogel slab, intended to protect and hydrate, with embedded powdered pigments of lambsquarters *(Chenopodium album),* lady's thumb (*Persicaria maculosa*), water, glycerin, and agar.

Cell 5
Cell 5 is located south of Central Avenue, where the soil has been disturbed by an unpaved road leading south toward Shadownook Street. The site selected (42.343686, -82.974061) included American burnweed (*Erechtites hieraciifolius)*, lady's thumb (*Persicaria maculosa*), yellow rocket (*Barbarea vulgaris*), lambsquarter (*Chenopodium album*), reed canary grass (*Phalaris arundinacea*), and creeping thistle (*Cirsium arvens*).

From these materials, several iterations were explored, with the final landscape represented by a perforated hydrogel – intended to protect and hydrate through fluctuating saturation and dehydration – with the embedded powdered pigments of American burnweed (*Erechtites hieraciifolius)*, yellow rocket (*Barbarea vulgaris*) flowers, and lady's thumb (*Persicaria maculosa*); a perforated bio-textile which dehydrates and re-hydrates to promote aeration, consisting of dried and powdered lambsquarter (*Chenopodium album*) leaves, water, glycerin, and carrageenan; and a brittle sponge made of shredded reed canary grass (*Phalaris arundinacea*), water, and carrageenan.

Cell 7
Cell 7 is located along the Hiking Trails Trailhead, surrounded by the Nashua Canal and Vista Drive. The site was selected (42.327425, -82.978987) for flooding due to a combination of natural and manmade disturbances. The ruderal plants include the invasive European honeysuckle (*Lonicera periclymenum*), annual bluegrass (*Poa annua*), lambsquarter (*Chenopodium album*), common dandelion (*Taraxacum officinale*), eastern annual saltmarsh aster (*Symphyotrichum subulatum),* Virginia creeper, garlic mustard (*Alliaria petiolate*), lady's thumb (*Persicaria maculosa*), and prostrate knotweed (*Polygonum aviculare*). The competitive saturation of flora in such a small footprint shows the potential for ecological succession, changing the environment for future generations.

From these materials, several iterations were explored, with the final landscape represented by 1) a hydrogel, intended to protect and hydrate, with embedded powdered pigments from the eastern annual saltmarsh aster (*Symphyotrichum subulatum)* powder (leaves), Virginia creeper (*Parthenocissus quinquefolia*) powder (leaves), lady's thumb (*Persicaria maculosa*), treacle mustard (*Erysimum cheiranthoides*), dried and powdered, prostrate knotweed (*Polygonum aviculadre*), dried and powdered, water, agar, and glycerin; 2) an herbal bio-foam made of common dandelion (*Taraxacum officinale*) seeds and pappas (fluff), water, glycerin, agar, and surfactant; 3) an embossed biofilm made of lambsquarter (*Chenopodium album*), water, agar, glycerin; and 4) a bio-textile – as a potential natural replacement for geotextiles – made of dried annual bluegrass (*Poa annua*).

Conclusion

The Ruderal Material Project was initiated to bring awareness to the unique ecosystem that is the Wet-Mesic Flatwoods through observing the attributes and relationships of adaptive ruderal plant species. The intent was not to create singular solutions, but to conceptualize potential ways of thinking and designing that could be applied to new artifacts, systems, and environments. Consideration of these material samples begins as starting points for adaptive future materials, ones that might require you to remain hydrated to fit, spend time in nature to shift color, or provide aeration where space is needed to breathe.

This project is an invitation to look at disturbance, wastelands, and weeds as indicators of change, considering these changes as potential for adaptation and innovation. Change does not require complete destruction, as disturbance is an essential part of the working order of nature: working incrementally forward, adapting through small shifts, and moving through extinction into the direction of renewal.

Future steps for the Ruderal Material Project include working with the Belle Isle Conservancy and the Department of Natural Resources to collect ruderal, non-native plants from each of the cell sites to curate a series of larger-scale material landscapes. The goal is for these landscapes to be exhibited within the natural landscape of Belle Isle for the purpose of education, discovery, and awareness of the changing environment, opportunities for adaptation, and recognition of resilience.

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References

Akritidis, N. (2020). *Ruderal consciousness.* SWMS. https://www.samschmitt.org/ruderal-consciousness.html

Allnutt, B. (2020, September 29). *How has flooding impacted Belle Isle's 'imperiled' Wet-Mesic Flatwoods forest?* Planet Detroit. https://planetdetroit.org/2020/08/did-belle-isles-flood-impact-the-islands-imperiled-wet-mesic-flatwoods-forest/

Antonelli, P., & Myers, W. (2018). *Bio design: Nature + science + creativity* (expanded, revised ed.). Museum of Modern Art, New York.

Ashby, M. F. (1992). *Materials selection in mechanical design*. Butterworth-Heinemann.

Dunne, M. (2018, September 13). *Bioplastic cook book.* FabTextiles. http://fabtextiles.org/bioplastic-cook-book/

Bostick, J. (2021, March 23). *Belle Isle's unique ecosystem faces a changing climate.* Detroit Is It. https://detroitisit.com/belle-isle-and-the-threat-of-a-changing-climate/

Botkin, D. (1990). *Discordant harmonies: A new ecology for the twenty-first century*. Oxford University Press.

Buscher, B., & Fletcher, R. (2020). *The conservation revolution: Radical ideas for saving nature beyond the Anthropocene*. Verso.

Carlson, A. (2000). *Aesthetics and the environment: The appreciation of nature, art, and architecture*. Routledge.

Cowles, S. (2017). *Brooklyn says, "Move to Detroit": Ruderal aesthetics.* School of Architecture, University California.

del Tredici, P. (2014, April). The flora of the future. *Places Journal*. https://doi.org/10.22269/140417

Elliot, P., Hare, B., & Wilson, A. (2003). *Boyle family* (1st ed.). National Galleries of Scotland.

Franklin, K., & Till, C. (2020). *Radical matter: Rethinking materials for a sustainable future*. Thames & Hudson.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*, *23*, 109-123.

Hartley, B. (2020). *Episode 4: Ruderal* [Video]. Bricks St. Anne's House Public Art in Bristol. YouTube. https://www.bricksbristol.org/2020/12/episode-4-ben-hartley-ruderal

Kerns, B., & Guo, Q. (2012). *Climate change and invasive plants in forests and rangelands.* U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. https://www.fs.usda.gov/ccrc/topics/invasive-plants

Huaghwout, M. (2021, October 28). *Margaretha Haughwout at Ruderal Ecologies II "Ruderal Witchcraft"* [Video]. Media Sanctuary. YouTube. https://www.youtube.com/watch?v=5OEocKuqZlA

Potts, R., & Simms, A. (2012). *New materialism: How our relationship with the material world can change for the better*. Schumacher College, England: Bread Print and Roses.

Slaughter, B., Cohen, J., & Kost, M. (2010). *Natural community abstract for wet-mesic flatwoods* [Report]. Michigan State University Extension, Michigan Natural Features Inventory. http://dx.doi.org/10.13140/RG.2.1.1390.2886

Sweetser, R. (2021, November 24). *What weeds tell you about your soil.* Almanac. https://www.almanac.com/what-weeds-tell-you-about-your-soil

Wilton, C. M., Enander, H. D., & Korroch, K. M. (2020). *Michigan natural community classification.* Michigan Natural Features Inventory, Michigan State University Extension, Lansing, Michigan.

Yamauchi, T. (2021). *Climate-smart crops: Key root anatomical traits that confer flooding tolerance*. Japanese Society of Breeding. https://www.jstage.jst.go.jp/article/jsbbs/71/1/71_20119/_article/-char/ja

Yelavich, S., & Adams, B. (Eds.). (2014). *Design as future making* (pp. 198-214). Bloomsbury Publishing.