

Vivi D.

Petaluma, CA

Untitled

Acrylic on canvas

For my final project I created these two interconnected canvases with acrylic paint. First is a human in a bathtub with small guava people. I experimented with repetition by drawing and painting this scene repeatedly. Now imagine if this naked person's bathtub water was drained, and they were left to shrivel up with no moisture in the closed expanse of this canvas. That would be sad, and they would likely die due to lack of moisture, just like vernal pools are. In the second panel there is a bush with amphibian eggs in its “mouth,” but one amphibian egg has an X on its surface, representing the decline of amphibians such as salamanders and frogs due to the rapid disappearance of vernal pools— temporary wetlands that are facing disappearance due to climate change. While my project started with research on vernal pools, the process ended up not having much to do at all with them besides the base premise. I decided to improvise and have fun in creating these paintings. It was quite enjoyable to use many random colors to construct my final project. I worked quickly and relatively unthoughtfully with great anger and contemplacy. Why? I am angry. I mostly feel angry and out of control. These paintings are unfinished and will be covered up once I leave Oxbow because vernal pools are dying, so I am dying.

I feel sad and hopeless about the world and myself. But I am still going to push forward and try to learn what I can do to improve these systems. I will continue to work on these paintings in the future, and am grateful for the textured canvases I got the opportunity to play with.

Tidepools of the Forest



Vivi D.

The Oxbow School

OS50

I. Introducing Vernal Pools

Vernal pools are a sanctuary for forest creatures seeking refuge from fish.

These are ephemeral pearl gush pockets of life
semi-permanent coming back awash every year

But they are often overlooked, and hence are dying by the heat of the sun and by the
unknowingness of us.

What can we learn about the slimy skittery creatures that live here, that prey here in an
unassuming ditch? Does every life have a value from the straddling frogs to the bristly shrimp
the birth to bursting they must endure that is consequential of a life? Are these creatures dying
telling of our own disrespect to earth? That will perhaps result in us shriveling up like an apple
core in the sun?

Would we laugh if humans were frogs and they were dying. Why is our lifespan so
undismissably long... what am I supposed to do in all of that time— roll myself in the mud,
eat cheese and suffer.

i would like to live in a vernal pool and dry up with the mud
pink bubble wand turned to snail shell come alive again when it is wet
inhaling a gas that makes me frail to existence

Caramelized onion

the l o n g

and the

Sticky

syrup-sugar-brown

dot in the red nest hair

Scrub jay who took hundreds of lives to build her nest in a tree box

The grass screams

Her mouth is salamander eggs

Nini ninin ininii

from beak to brow body-blocking glasses cover

She puts on the glasses with axes to block out the bodies

Then then there is only knowledge

And herself

Can we be open to the wandering pool

Sometimes in the sky and sometimes condensed

It has nothing to do with her or her nest

Punctured Nectarine

in the springtime it is hard and yellow

Draining the juice out

Of a hole

At night it sits on a gray cavity

The pulp

Peeling back her face

The hole where the pulp should be

Making a pool

You can't stitch it back up

voices muffled at night

“B o j i f h t o

B o i t i f i s j m g b “

Translating to...

“Hot space forever”

The ground which is holding sand is rolling and rolling rolling and rolling

White tiger eyes against long grass

If that's what you think is worthwhile, pretending to be ancient and jaded

I don't know anymore

alabaster faced man with a crimson stripe down his body licking the concrete in the middle of
traffic

What is he supposed to be saying? *i am white i don't know anything*

I am skin i don't know anything

Kindness, joy and playfulness do not deserve to dry up. There are beauty and lessons in these
lives that we can learn.

II. What is a Vernal Pool?

Vernal means spring, referring to how vernal pools fill in the spring. They are sometimes called ephemeral wetlands, because like a phantom they come in and out of existence— they are a bit like the tidepools of the forest. A vernal pool is a small indentation in the earth, where water collects. They form in the Mediterranean climate, where sea or pale mist is heavy in the air and condenses to form a small cavity of water. They may seem like ordinary puddles, but these

inconspicuous wetlands are hiding many lives. They can span from thirty feet to much larger. The inside is made up of bedrock or clay, which keeps the water inside. In a single season, a vernal pool may be full many months, or completely dry the whole year depending if there is a drought. Sometimes different pools connect to each other underground by something called a vernal swale, but they never connect to larger bodies of water like lakes (EPA). These small basins can be formed by melting glaciers, ditches, or water springs. Water fills them up when it rains but dries up in the warmer months. These natural phenomena form in forests all over the planet. On the North American continent, vernal pools occur in Mediterranean climates on the west coast, such as California where water can condense from the sky into the ground. They also occur in places that have had glaciers, such as the northeastern and midwestern states (EPA). Vernal pools go through four stages: the wetting stage, where the pool fills with water, the aquatic phase, where the pool fills with life, the waterlogged terrestrial phase, where the pool still has inhabitants but it is starting to dry out, and finally the drought stage where the pool has dried and appears to be nothing but a depression in the land (Los Huertos). Vernal pools are a crucial source of food and habitat for many organisms, some of them endemic.

III. Who Lives in a Vernal Pool?

The animals that inhabit the pools are well adapted to dormancy in the dry season, taking the form of seeds, eggs, cysts, and to growth and reproduction once the water returns when they transmute into a multitude of creatures. In the wet season when the pools teem with life, they are oases of food and water for egrets, ducks, hawks, and other birds (EPA).

The special habitat a vernal pool provides allows plants and animals in the forest to take refuge. Some organisms live only in vernal pools like the fairy shrimp. Fairy shrimp are tiny multicolored glassy bodied shrimp. You may only be able to see them by their white pronged tail. They are filter feeders—they eat microbes. Two species of fairy shrimp are known: *E. intricatus*, which is quite rare, and identifiable by its long curled antennae. The second is *E. vernalis*, whose antennae are small. Female fairy shrimp make eggs that are encysted and remain unbothered and dormant in drought, freezing temperatures, and being eaten by animals. These eggs need to be dried out and exposed to water before they know to hatch. To combat predators, fairy shrimp die before summer, once temperatures reach 50 degrees fahrenheit, so they have adapted to live only when a vernal pool is active (VPA).

Fish cannot survive in vernal pools since the water dries up. This makes the pools safe for small animals that would normally be vulnerable to fish, at least during certain points in their life cycle. Vernal pools make an especially perfect habitat for amphibians, as well as for invertebrates that need a place to lay their eggs or set their seeds without gloopy fish mouths sucking them up. While the amphibians and invertebrates are safe from fish, all their activity lures other predators in the form of snakes and birds to the pool to hunt (VPA). Wood frogs rely on vernal pools. The clay colored wood frog lives in the forest and is recognized for its black mask, which looks a bit like a raccoon's. These frogs, after being dormant during the winter, search for vernal pools so they can breed. If you hear frogs croaking in the springtime, it may be the male wood frog trying to attract a female. After breeding, wood frogs leave their jelly egg masses on sticks or moss in the pools. Once the little tadpoles hatch, they feed on algae and leaf litter in the pool. Tadpoles are eaten by water-dwelling insects such as diving beetles, snakes, turtles, and birds (VPA). In June, tadpoles that have completed their metamorphosis leave the pool in search of food to fuel

their adult frog bodies and the cycle repeats Another clamoring amphibian is the mole salamander, which has a stout gray brown body covered in light spots. These salamanders live in burrows most of the time, except for hunting and their trek to a vernal pool. Their diet consists of insects and other invertebrates. In the early spring on rainy nights they travel to vernal pools to mate. For spotted salamanders, as well as other salamanders, migration is a perilous journey because of human infrastructure like roads, and many lives are gooshed beneath car tires. For the spotted salamanders that do make it to a vernal pool, the males will perform a courtship dance with females and place their spermatophores (little bundles of sperm) on sticks in the water (Holland). Males will sometimes stack spermatophores on top of the last male's spermatophores, hoping the female will take their bundle and store it in her body. Salamanders can take any different species' spermatophores and use them, which is very unique. It is like having the DNA of a bonobo in a human ready to use at any time (Unisexuals). Besides these obligate species, other creatures who use the vernal pools but are not reliant on it include spotted salamanders, blue spotted salamanders, Jefferson salamanders, marbled salamanders, and many invertebrates (VPA). All of these creatures show us a deep history of coevolution with vernal pools and the marvels and beauty of adaption.

Another salamander friend is the marbled salamander, with a gray brown body and a pattern of white marble for a male, and gray marble for a female on its back. Mainly this salamander lives in animal burrows, or can sometimes be found underneath logs and rocks. They eat invertebrates (VPA). There are a host of invertebrates living in vernal pools besides the fairy shrimp-clams, tadpole shrimp, dragonflies, and mosquito nymphs. There are also worms and leeches, small crustaceans and molluscs, and water mites and spiders (Colburn). Unfortunately,

all of these organisms are threatened because vernal pools are rapidly disappearing due to human activity.

IV. The Many Ways They're Endangered

Over ninety percent of vernal pool habitat has been lost in California, and state agencies are working hard to protect the ones that are left (EPA). Despite vernal pools disappearing at an alarming rate, they are rarely considered for protection by the states. Either their existence goes unacknowledged, or they are too complicated to protect since they are only there half of the time (EPA). They sometimes manage to get protected by the Clean Water Act (VPA). Vernal pools can be contaminated by many substances, and in New England especially they are damaged by ice-melting salt that is put on the roads and then washes into vernal pools (VPA). Also vernal pools can be lost to ditch-digging or by farmers draining the pools. Ditching is done deliberately to dry the soil and help forests grow more abundantly, but this practice destroys vernal pools. Besides this though, vernal pools are most vulnerable to climate change because they are shallow and ephemeral so a warming climate means that the pools have no chance of keeping their water (VPA).

V. Concluding Thoughts: Protecting Vernal Pools and Loving the Animals in Them

I believe it is necessary to protect these valuable and often misunderstood semi-wetlands. In order to do this, it is critical that vernal pools are considered in wetland and habitat protection (VPA). The second step would be to educate citizens, perhaps in school about vernal pools and their significant symbiotic species and interrelationships (Holland). Local, state, and federal governments need to increase regulatory protections for vernal pools (Calhoun). Also, generally

we need to foster an attitude of being actively climate conscious and pollution conscious, which would reduce our waste and impact on the world. Learning about and caring for vernal pools will strengthen our ethics and our relationship with nature and bring to light the disrespect we have inflicted on many vulnerable ecosystems. We need to appreciate what they do for us and cultivate the beauty they offer.

Works Cited

- Calhoun, Aram J.K. et al. “Temporary Wetlands: Challenges and Solutions to Conserving a ‘Disappearing’ Ecosystem.” *Biological Conservation*, Vol. 211, Part B, p. 3-11. July 2017. <https://www.sciencedirect.com/science/article/pii/S235198942100408X?pes=vor>
- Colburn, Elizabeth A. Diversity and Ecology of Vernal Pool Invertebrates. PDF.https://www.researchgate.net/profile/Stephen-Weeks/publication/300353610_Diversity_and_Ecology_of_Vernal_Pool_Invertebrates.pdf
- Dixneuf, Charly, et al, “Vernal pools enhance local vertebrate activity and diversity in a boreal landscape.” *Global Ecology and Conservation. Science Direct*, Vol 31. November 2021. <https://www.sciencedirect.com/science/article/pii/S235198942100408X?pes=vor>
- EPA.gov. “Vernal Pools.” US EPA. <https://www.epa.gov/wetlands/vernal-pools>
- Holland, Mary. “Spotted Salamander Spermatophores,” *Naturally Curious with Mary Holland*. Web. April 23, 2015
<https://naturallycuriouswithmaryholland.wordpress.com/2015/04/23/spotted-salamander-spermatophores/>
- Los Huertos, Marc, “The Stage: Typologies of Aquatic Systems–Vernal Pools, in *Ecology and Management of Inland Waters*, 2020.
<https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/vernal-pools>
- “More than a Mud Puddle: The Exciting World of Vernal Pools.” *Backyard Ecology*. Podcast. *Audible.com*.
<https://www.audible.com/podcast/More-than-a-Mud-Puddle-The-Exciting-World-of-Vernal-Pools/B08VG6S7G5>

The Unisexals: A Story of Salamanders and Sex. *Sci Fri*. Video. 2020.

<https://www.youtube.com/watch?v=Vl428UmlazA>

Vernal Pool Association. 2022. <https://www.vernalpool.org/>