

# INVADERS

A ZINE ABOUT ECOLOGICAL RHETORIC

El Green

welcome to wind



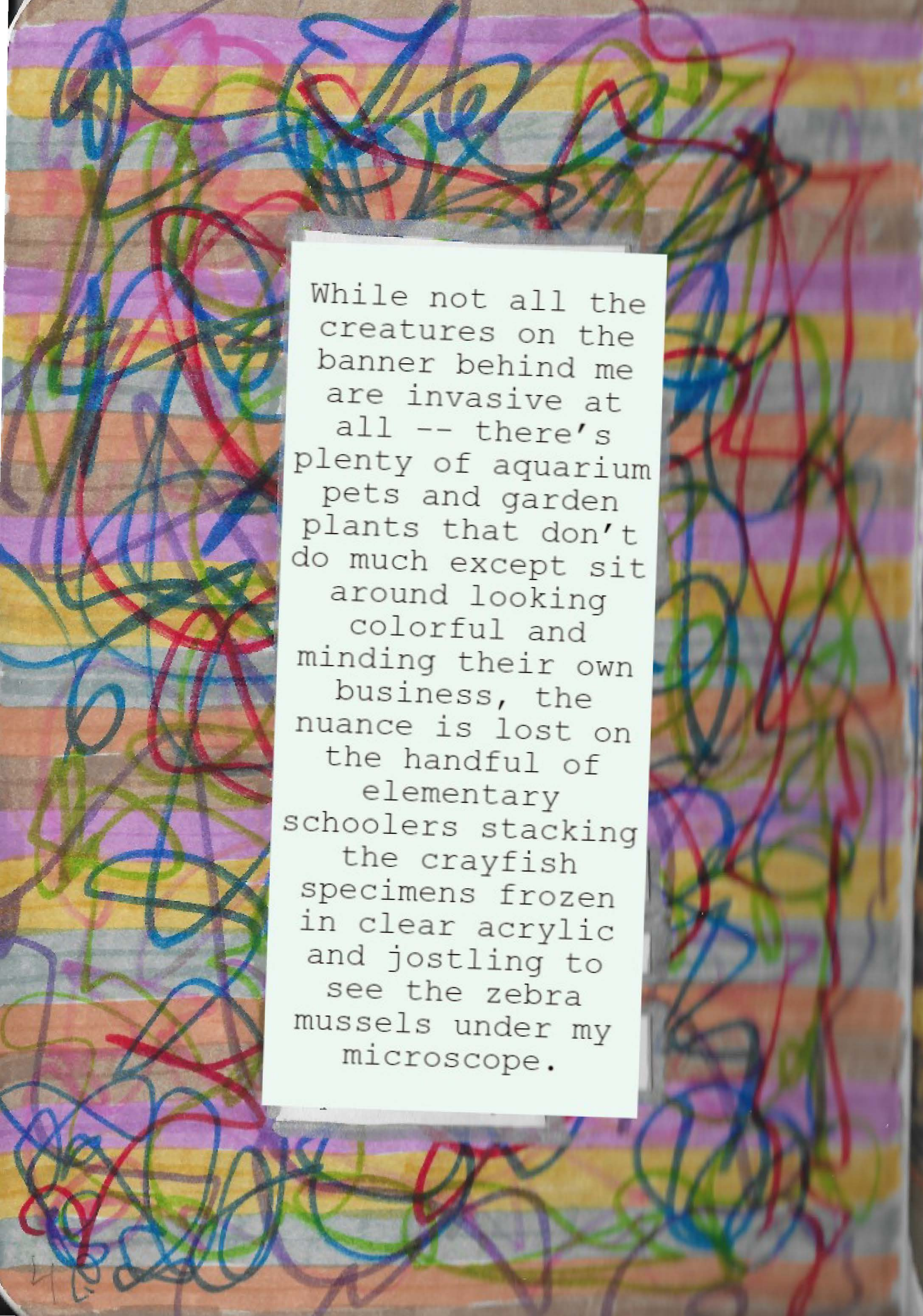
It's a cool gray morning at the top of the state, and as tanker ships as big as skyscrapers cruise past on either side of the artificial island we've assembled on, I am telling children about alien invaders.



I am not a sci-fi author or a conspiracy theorist. I study nonindigenous species in the Great Lakes, and part of my job is teaching citizens how to identify invasive plants and animals that have made their way into the region.



These creatures come from all over the world, and while many of them are harmless, some of them eat, beat, or out-compete the native flora and fauna here in the Great Lakes. We call these harmful species "invasive".



While not all the creatures on the banner behind me are invasive at all -- there's plenty of aquarium pets and garden plants that don't do much except sit around looking colorful and minding their own business, the nuance is lost on the handful of elementary schoolers stacking the crayfish specimens frozen in clear acrylic and jostling to see the zebra mussels under my microscope.



# Picky Invasive Mussels

PROMOTE HARMFUL ALGAL BLOOMS IN LAKE ERIE



I describe the round goby as a bully who eats other fishes' eggs and kicks them out of their homes, and a small girl nods solemnly while swishing an alcohol-bleached goby around in its jar. That's a mean fish, she says with a frown. I agree.



A pair of boys attempt to duel each other with my wooden lamprey model after I tell them that it's a vampire that sucks the blood of other fish like Dracula, then bolt off to see the real live lampreys in the tank that Fish and Wildlife have set up across the aisle.



What is an ammoo? ...



Clean Lakes ...



SBALAMPREY IN THE GREAT LAKES - YOU TUBE ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Species Profile ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea Lamprey ...



Sea lamprey population abundances ...



Featured Species: Invasive Sea Lamprey ...



Sea lampreys gaining ground in Lakes ...



Researcher studies vampiric silver lamprey ...



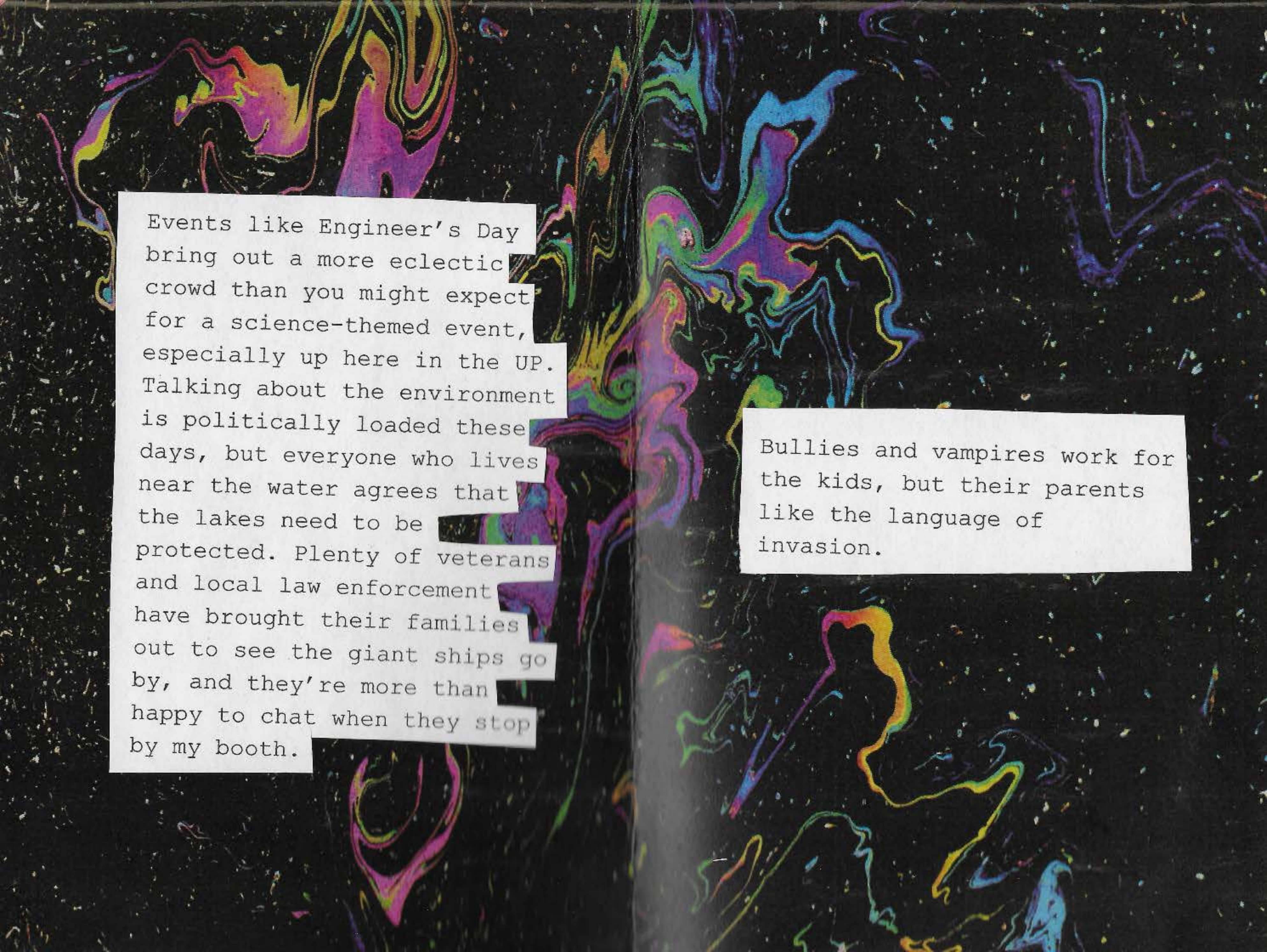
Genetic mapping of sea lamprey may ...



How are monitoring juvenile sea lampreys ...

The lampreys whip around their tank before latching onto the glass to rest, toothy suction cup mouths looking like something out of a horror film.

The kids and their parents alike let out theatrical eeeeeews.



Events like Engineer's Day  
bring out a more eclectic  
crowd than you might expect  
for a science-themed event,  
especially up here in the UP.  
Talking about the environment  
is politically loaded these  
days, but everyone who lives  
near the water agrees that  
the lakes need to be  
protected. Plenty of veterans  
and local law enforcement  
have brought their families  
out to see the giant ships go  
by, and they're more than  
happy to chat when they stop  
by my booth.

Bullies and vampires work for  
the kids, but their parents  
like the language of  
invasion.



Asian Carp  
aquarium.gov



Asian Carp - Ontario Invasive  
ontario.ca



An early lot of Great Lakes  
fish



Asian Carp Invasive to Lake Erie  
erie.gov



Asian Carp Invasive to Lake Erie  
erie.gov



Asian Carp  
aquarium.gov



Asian Carp  
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Asian Carp  
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Asian Carp  
aquarium.gov

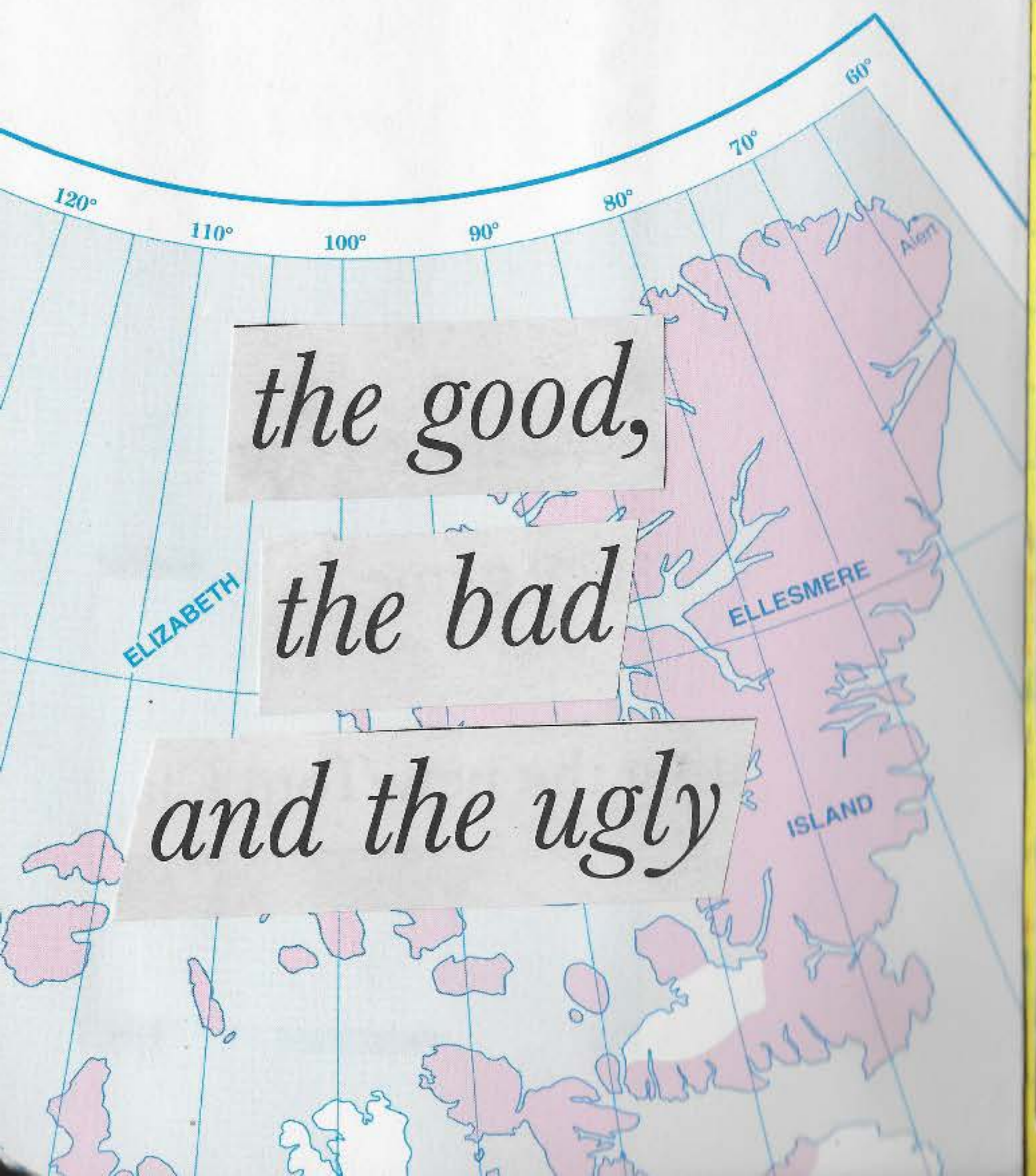


Asian Carp  
aquarium.gov



They ask about the Asian carp coming up the Mississippi, and if they've made it to Chicago yet. Time will tell, I answer honestly. It's keeping us on our toes.





*the good,*

*the bad*

*and the ugly*

They ask how we're controlling the carp and I joke about fish fries big enough to feed the whole Midwest. If you can't beat 'em, eat 'em!



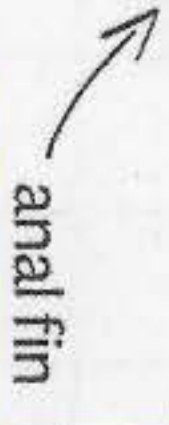
dorsal fin



pelvic fin



keel



anal fin

no barbels  
eye below  
centre of body



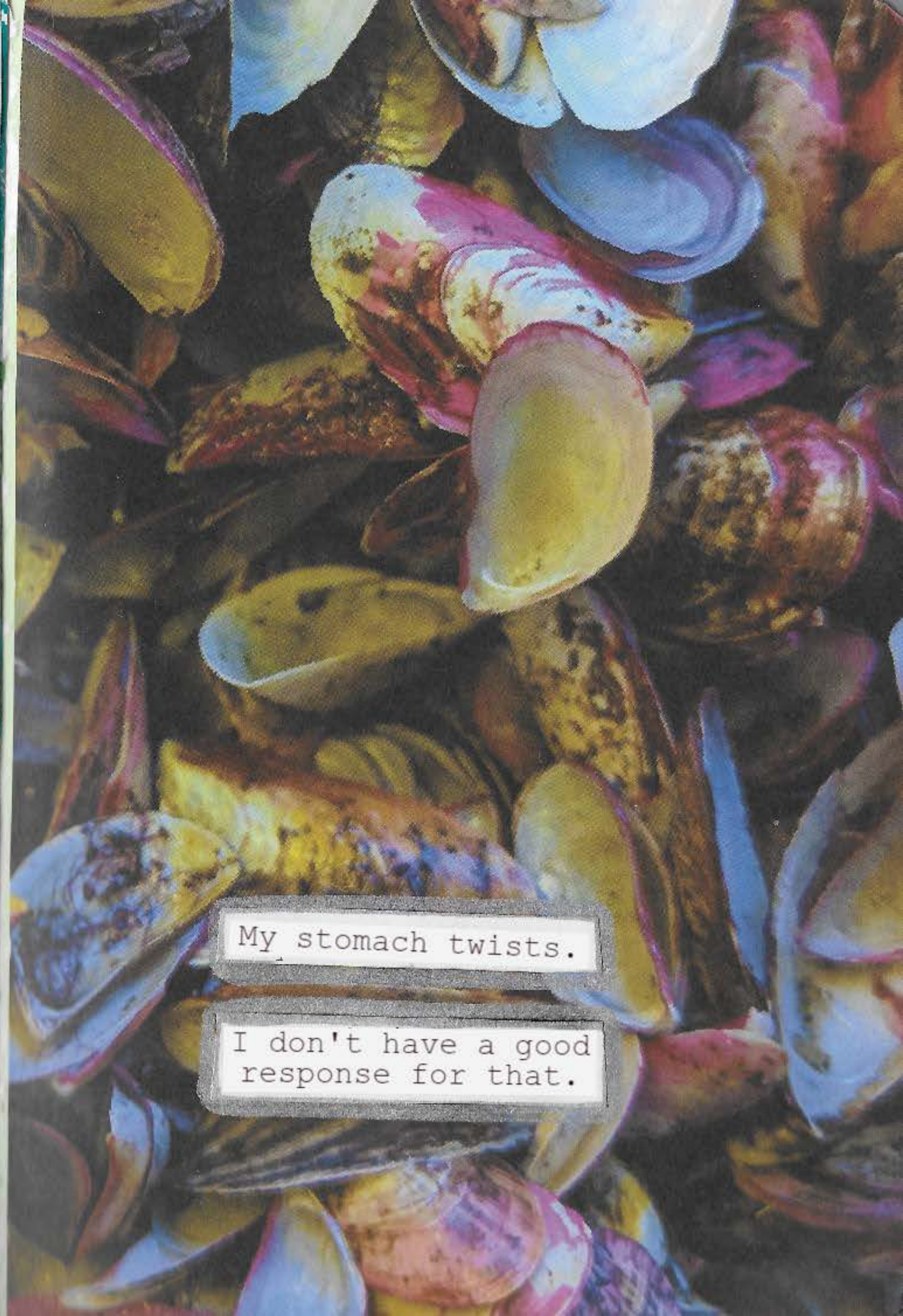
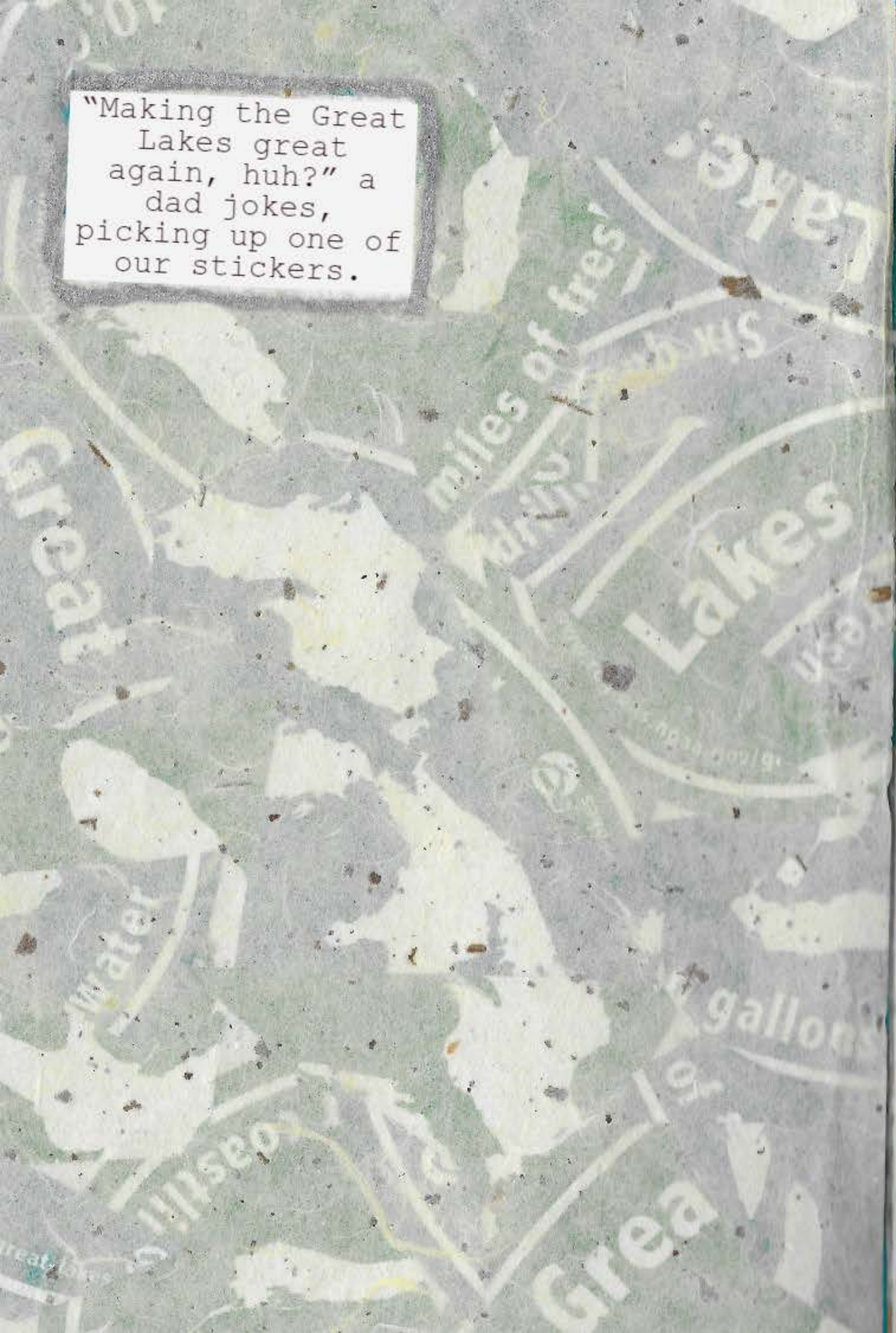
The words we use  
are cheerfully  
military. We  
talk about rates  
of invasion,  
fortifying  
barriers,  
electrified ship  
canals, new  
chemical weapons  
we're using  
against the  
onslaught.

The dads and vets  
and retirees are  
excited to hear  
about these  
technologies,  
amazed to hear  
that we've reduced  
the lamprey  
population by 90%  
with pheromones  
and  
species-specific  
poison.

They talk frankly  
about executing  
gobies by tossing  
them ashore to  
suffocate when  
caught and laugh  
over the videos  
of the boaters  
armed with  
helmets and  
baseball bats  
taking swings at  
the 30-pound  
silver carp  
leaping out of  
the rivers en  
masse.

Some folks have  
gotten creative in  
how they defend  
the lakes.

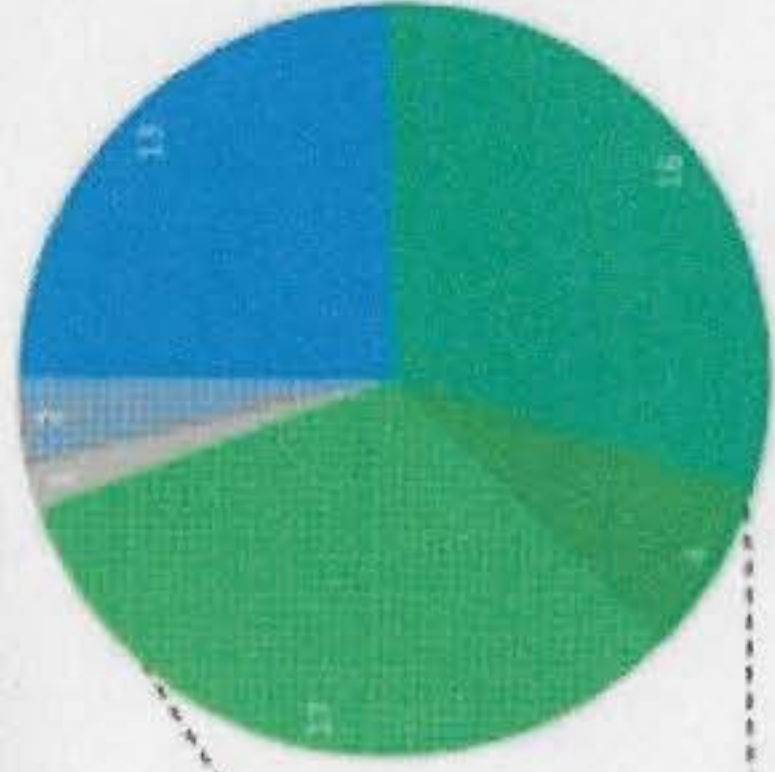
"Making the Great Lakes great again, huh?" a dad jokes, picking up one of our stickers.



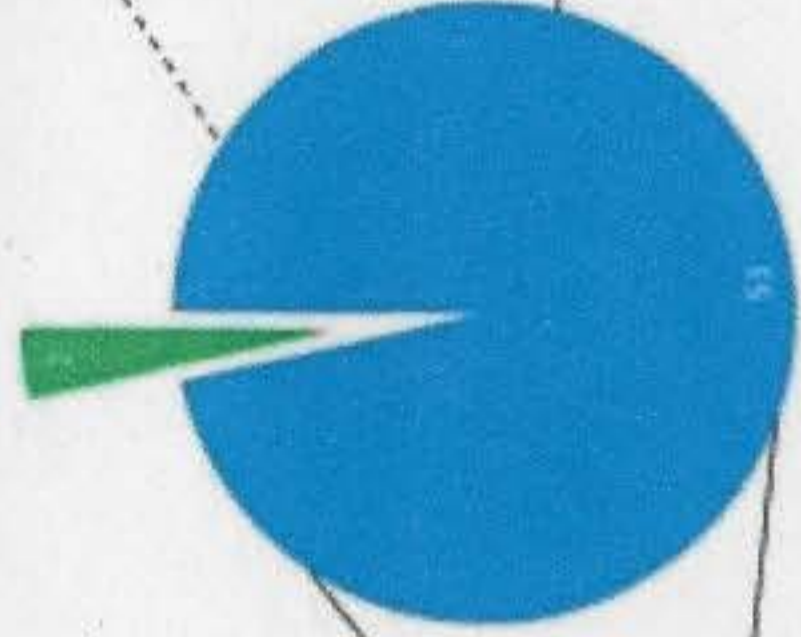
My stomach twists.

I don't have a good response for that.

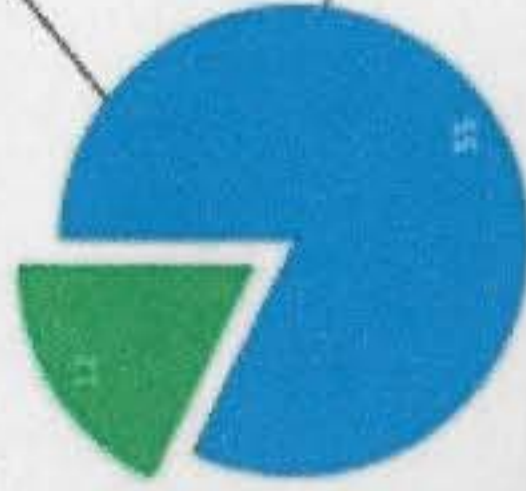
Environmental/Socioeconomic Impact Potential of High Risk Species



Establishment Potential of High Risk Species



Introduction Potential



■ High/Moderate ■ High/Moderate & Low ■ Low ■ Low & Unknown ■ Unknown ■ High/Moderate & Unknown

"High Risk Species" refers to Watchlist species with a high-to-moderate potential for introduction and establishment in the Great Lakes basin. High and moderate ratings are aggregated into one category for this figure (High/Moderate). Solid colors represent species that have equally scored potentials for environmental and socioeconomic impacts (e.g. The solid green slice indicates species with Low Environmental AND Low Socioeconomic impact potentials). Patterned-colors represent species that have unequal environmental + socioeconomic impact potentials (e.g. The blue/green patterned-slice indicates species that have the potential for High/Moderate environmental impact with Low socioeconomic impact OR Low environmental impact with High/Moderate socioeconomic impact).

I'm not at all the first person to find this rhetoric troubling.

A number of other ecologists and science communicators have written at length about the language of invasion biology, and the metaphors we use that color our collective conversations with each other and the public.

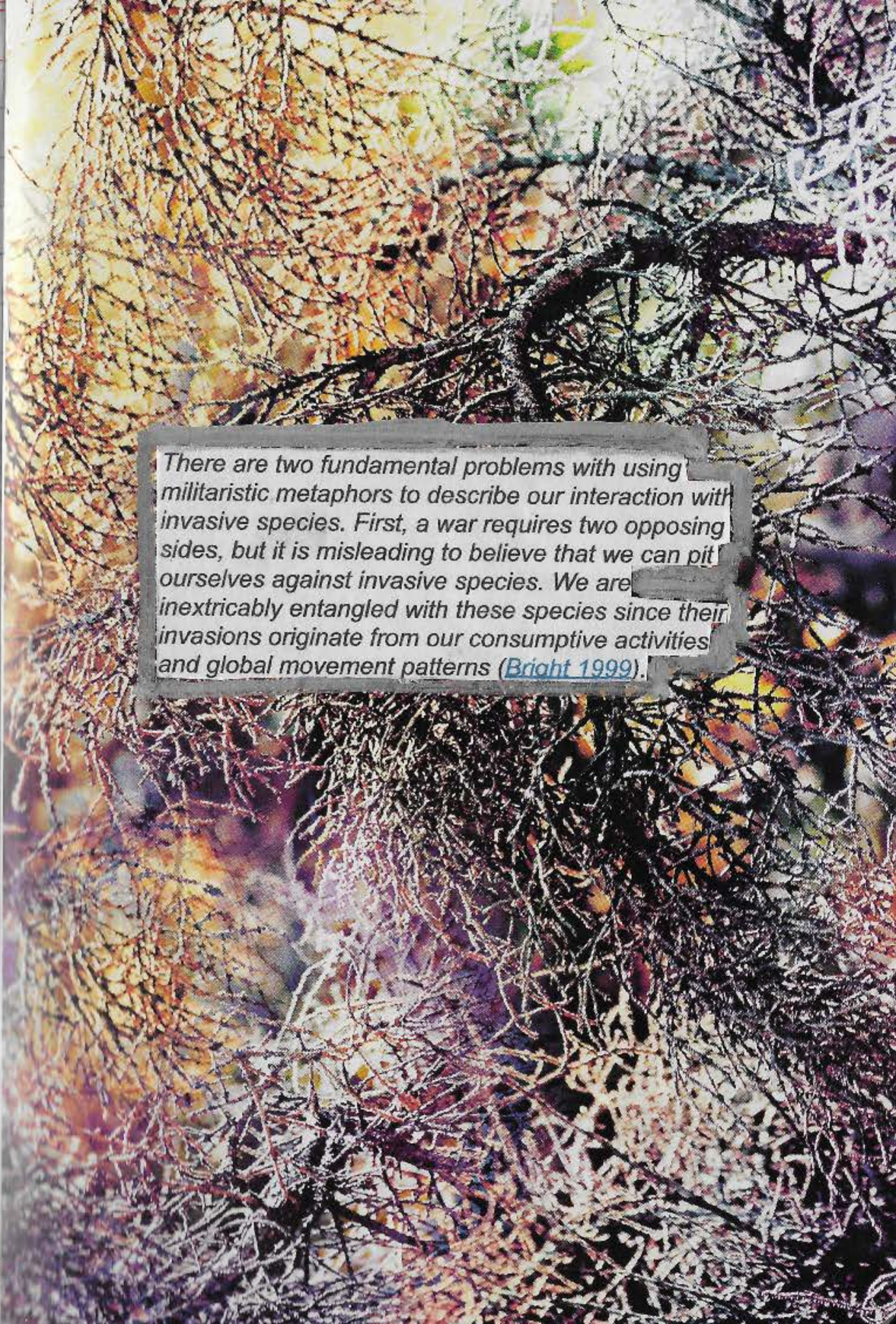
Some citations are in order:

**From *The War of the Roses: Demilitarizing Invasion Biology* (Larson 2005):**

*Every metaphor harbors inaccuracies, yet by attending to these we are better able to understand how particular metaphors engender certain ways of conceptualizing a situation, often by blinding us to alternative ways of relating to them and acting (Schön 1993). Militaristic metaphors harbor inaccuracies that contribute to public misunderstanding of invasive species and even to misperception by conservationists themselves. These metaphors also invoke militaristic ways of thinking that are inconsistent with a sustainable relation between humans and the natural world. Together, these factors may impair the efficacy of these metaphors in the long run.*

*There are two fundamental problems with using militaristic metaphors to describe our interaction with invasive species. First, a war requires two opposing sides, but it is misleading to believe that we can pit ourselves against invasive species. We are inextricably entangled with these species since their invasions originate from our consumptive activities and global movement patterns (Bright 1999).*

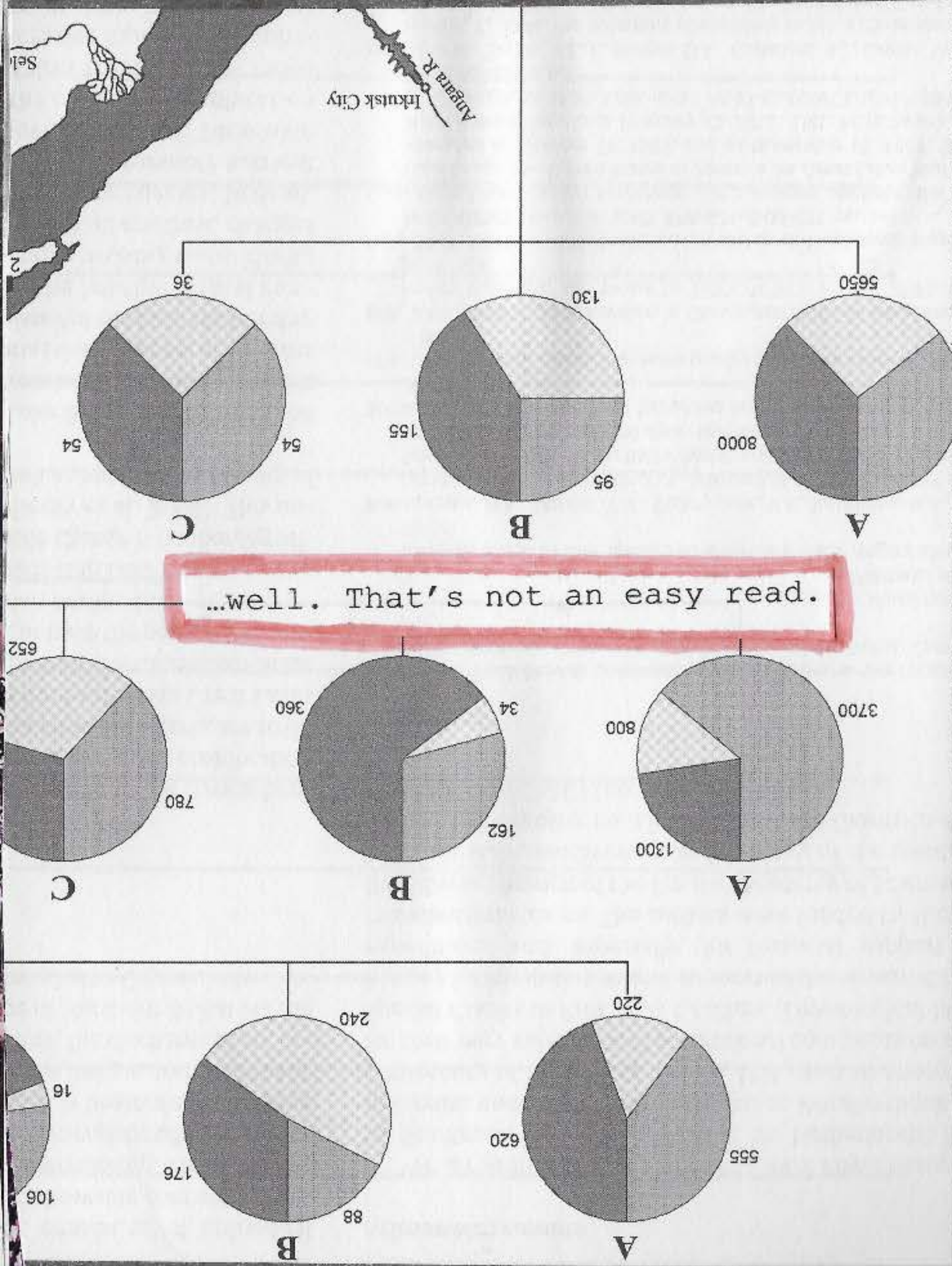
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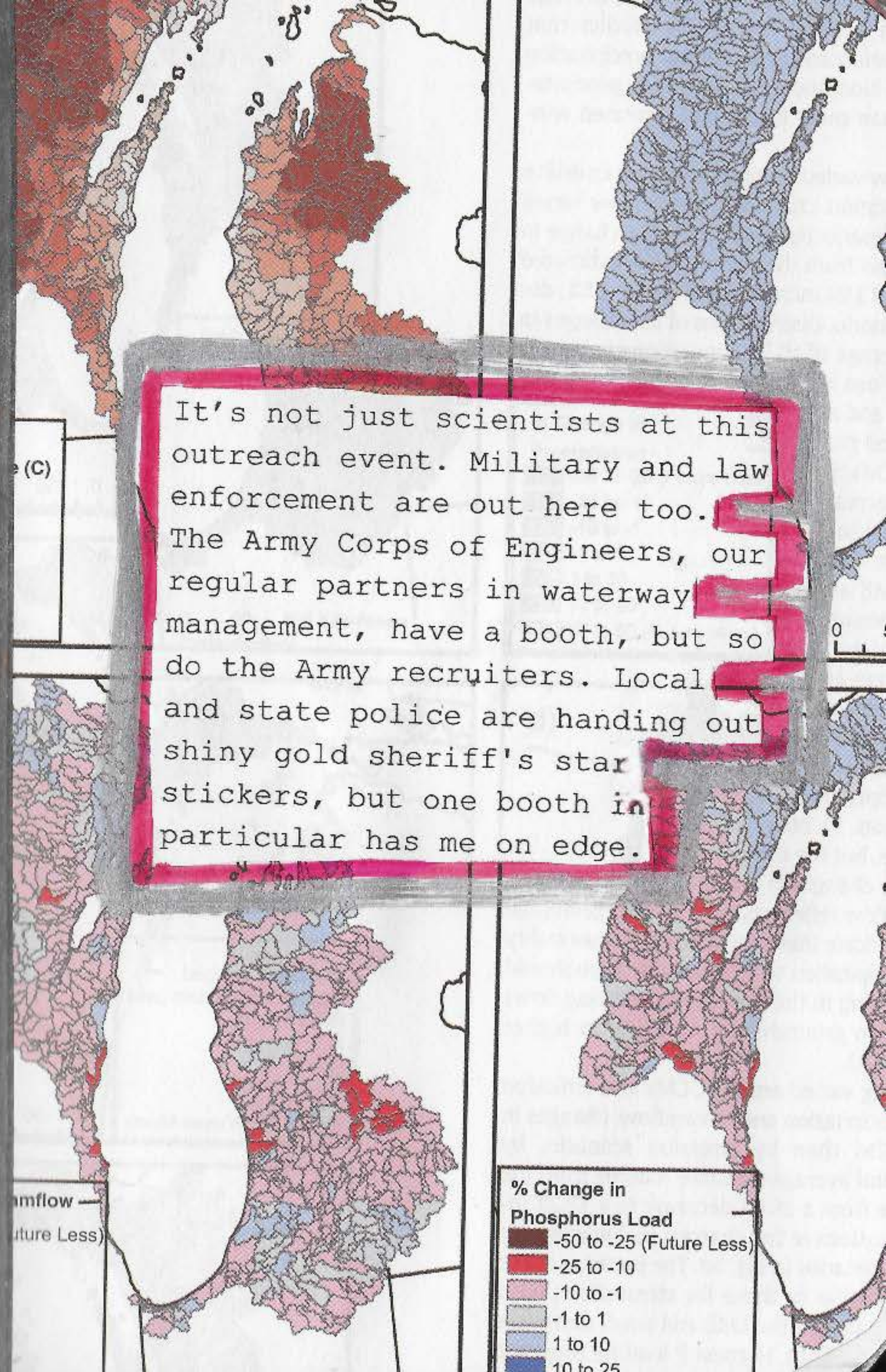
*Second, wars are staged on the assumption that good will triumph over evil, but we will never win this war and return ecosystems to a pristine state. As many conservation biologists have pointed out, we will have to accept that native and non-native species will intermingle in recombinant systems of the future (Soulé 1990).*

*Current metaphors may contribute to a potentially greater problem for invasion biology, namely a loss of scientific credibility. By using loaded language, invasion biologists may erode public trust in their objectivity.*





...well. That's not an easy read.




It's not just scientists at this outreach event. Military and law enforcement are out here too. The Army Corps of Engineers, our regular partners in waterway management, have a booth, but so do the Army recruiters. Local and state police are handing out shiny gold sheriff's star stickers, but one booth in particular has me on edge.

Customs and Border Patrol has a table set up behind Fish and Wildlife, and I can see the agents standing at their booth through the glass of the lamprey tank. I go to text a joke about bloodsuckers to my wife, but think better of it and switch to Signal to encrypt it instead.

See, I have to head to Canada again next week, and if I get pulled into secondary inspection for any reason it seems wise not to mock border agents anywhere where they might see.

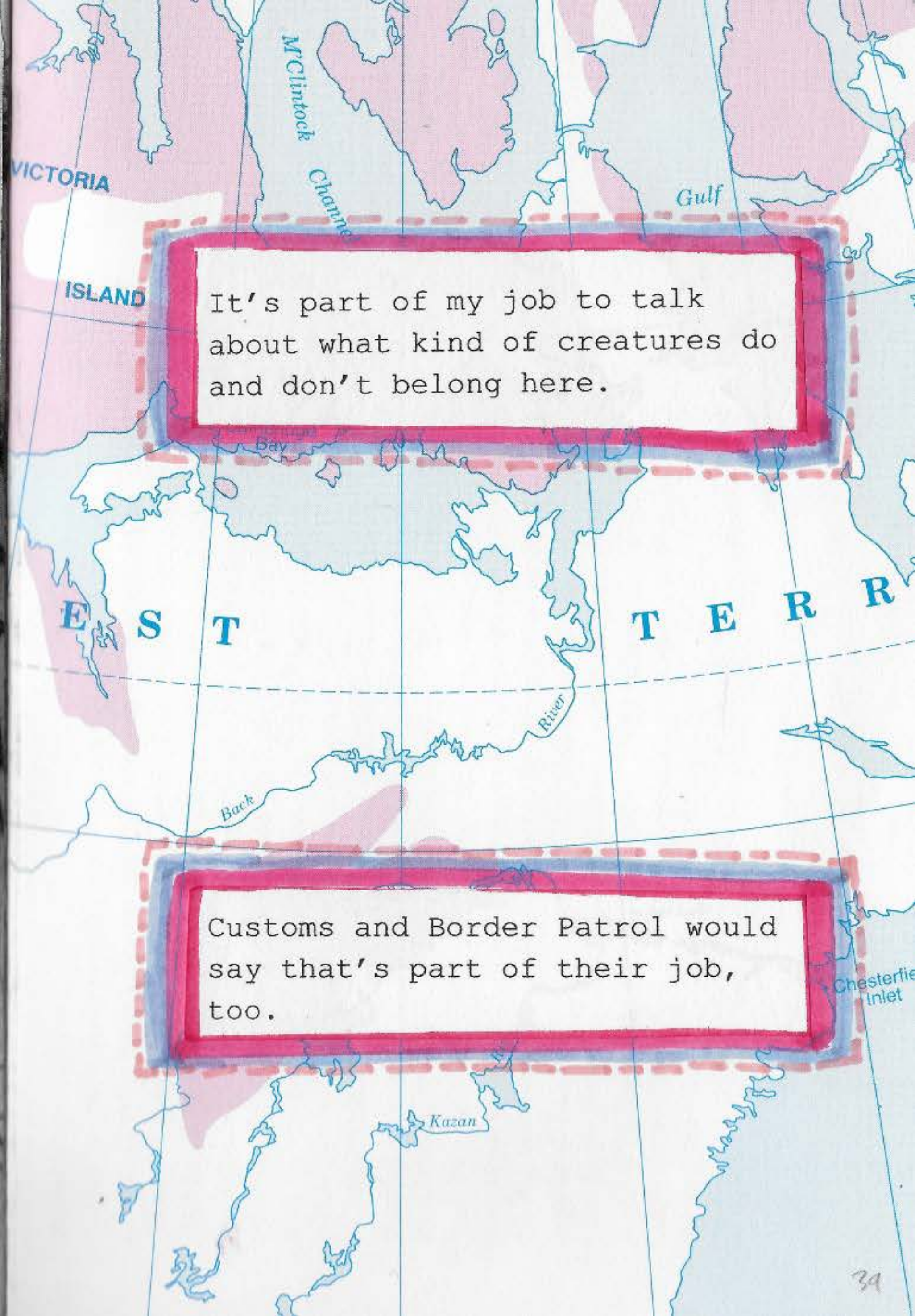




The invisible line cuts right through the Lakes. Animals, plants, and water pass through it freely, but humans do not. My wife and I are luckier than many other couples going through immigration proceedings under this administration (we're white, we can afford to do it legally, no one is trying actively to kill us while we wait) but that of course is relative. It'll still be years before we get to live together. There's always the chance something will go terribly wrong.


My wife is a foreign national. We live on the same continent, three hours away from each other, separated by an invisible line drawn by politics, not by eco-region.

The arbitrary nature of the invisible line -- of borders generally -- and the outsized quantities of resources poured into enforcing them both socially and biologically, makes me feel a little queasy today, watching kids run straight from my booth and over to the table where the cops are handing out prizes.



It's part of my job to talk about what kind of creatures do and don't belong here.

Customs and Border Patrol would say that's part of their job, too.



From *The Aliens Have Landed! Reflections on the Rhetoric of Biological Invasions* (Subramaniam, 2001):

*Journalists and scientists borrow the images of illegal immigrants arriving in the country by means of difficult, sometimes stealthy journeys, when they describe the entry of exotic plants and animals. Alien plant and animal movements are described with the same metaphors of illegal, unwelcome and unlawful entry. For example: "Exotic species—from nonnative fish to various plants, bugs and shellfish—have found their way into the country in numerous ways, such as dinging to ships, burrowing into wooden shipping crates, in food, aboard aircraft or in water discharged from foreign freighters" (Hebert 1999). So how do we respond to these unlawful and stealthy entrants? Paralleling images of armed guards patrolling borders, the nation responds in kind to plants and animals,*

*Thus the "Feds" were called on to "fight the invaders," and defend the nation against the "growing threat from non-native species" (Hebert 1999). It is implied that the situation is so dire and the number of invaders so great that even the most humane individuals cannot help but turn into killers (conservationists) in order to respond to the violations of alien species that are just not "welcome" into the country (Verrengia 1999b).*

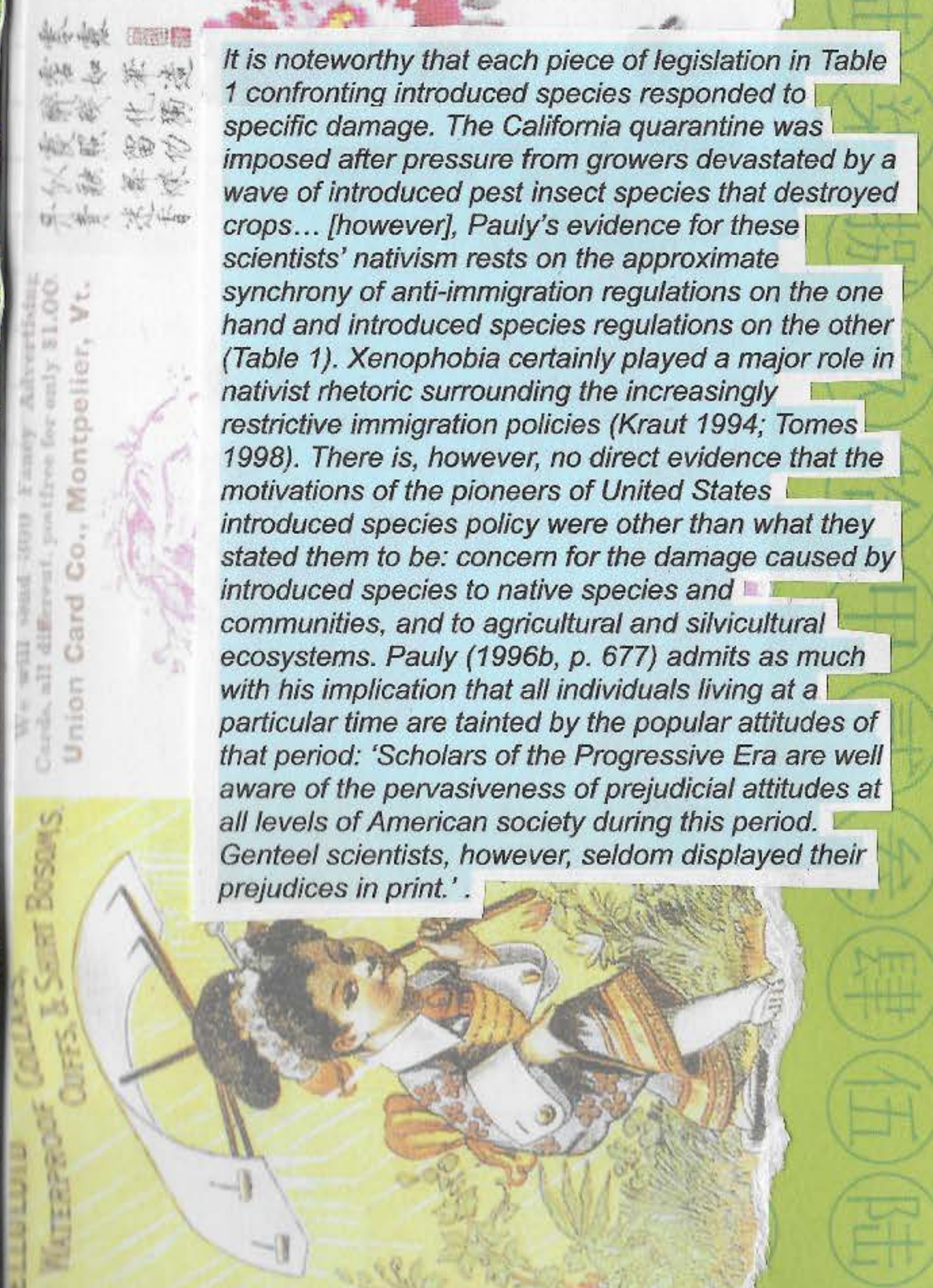
From **Confronting introduced species: a form of xenophobia?** (Simberloff 2003):

Several authors relate concern with introduced species to the evolution of immigration policy, especially in the United States. The historian Philip Pauly (1996a) sees early activity against introduced species in the United States as part of the nativism that pervaded this nation during the Progressive Era: 'attitudes towards foreign pests merged with ethnic prejudices: the gypsy moth and the oriental chestnut blight both took on and contributed to characteristics ascribed to their presumed human compatriots' (p. 54). Similarly, 'it should be clear that attitudes about foreign and native organisms were intimately linked, through both everyday experience and analogies of policy, to views on "alien" and "native" humans' (Pauly 1996a, p. 70).

*Table 1. Regulations and laws relating to human immigration and introduced species in the United States.*

Introduced species	Immigration
California state quarantine 1881	Chinese Exclusion Act 1882
California fruit pest law 1883	Beginning of Ellis Island restrictions 1901
Lacey Act 1900	National quotas 1921
Plant Quarantine Act 1912	Immigration Act 1924

It is noteworthy that each piece of legislation in Table 1 confronting introduced species responded to specific damage. The California quarantine was imposed after pressure from growers devastated by a wave of introduced pest insect species that destroyed crops... [however], Pauly's evidence for these scientists' nativism rests on the approximate synchrony of anti-immigration regulations on the one hand and introduced species regulations on the other (Table 1). Xenophobia certainly played a major role in nativist rhetoric surrounding the increasingly restrictive immigration policies (Kraut 1994; Tomes 1998). There is, however, no direct evidence that the motivations of the pioneers of United States introduced species policy were other than what they stated them to be: concern for the damage caused by introduced species to native species and communities, and to agricultural and silvicultural ecosystems. Pauly (1996b, p. 677) admits as much with his implication that all individuals living at a particular time are tainted by the popular attitudes of that period: 'Scholars of the Progressive Era are well aware of the pervasiveness of prejudicial attitudes at all levels of American society during this period. Genteel scientists, however, seldom displayed their prejudices in print.'




I love the Great Lakes, and the animals and plants that live within them, and I want to work with others to protect the astonishing diversity of life in the region, much of it found nowhere else on earth.



# PROTECT THE PLACE WE LOVE

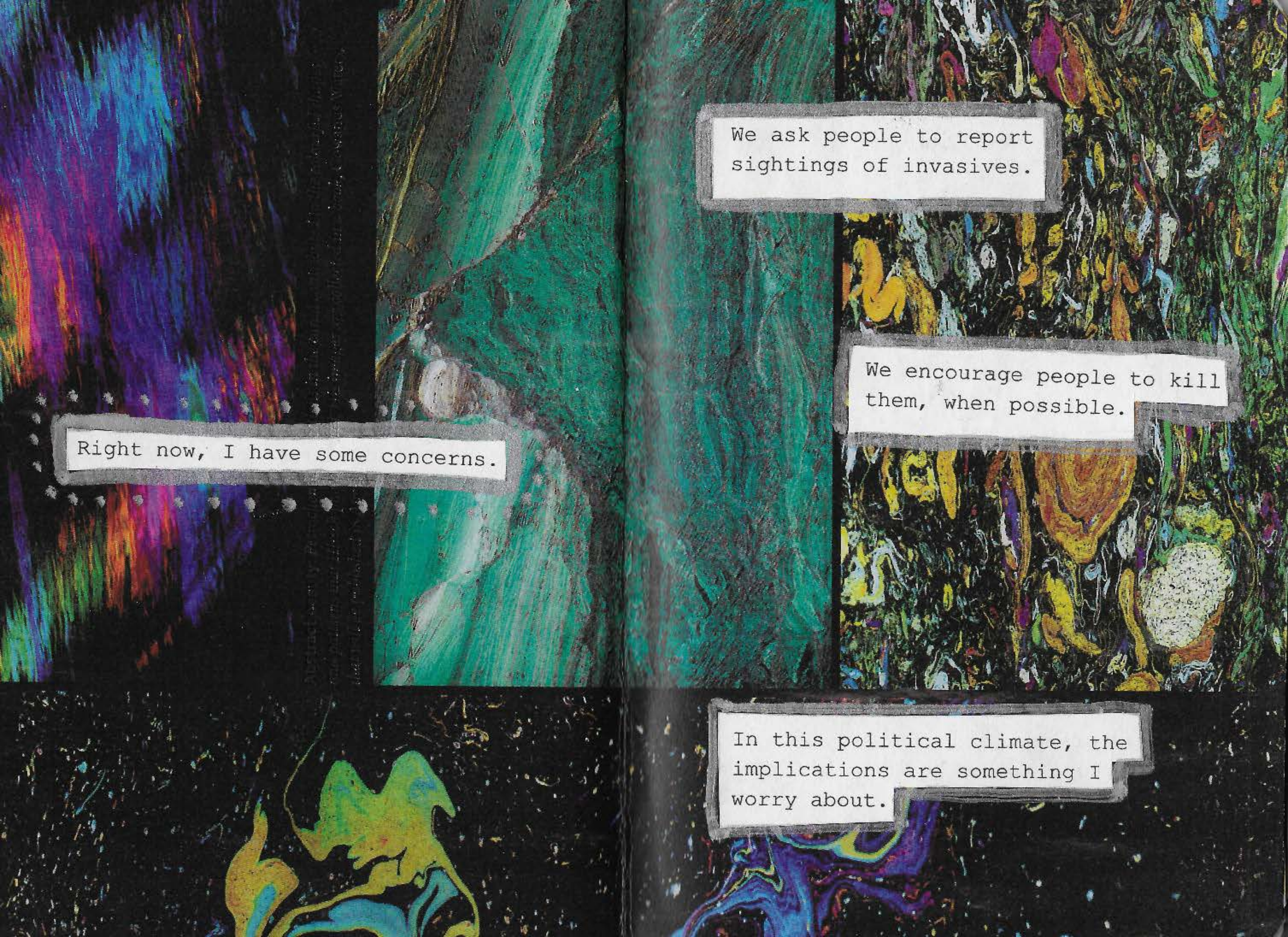
I believe very strongly in the work that I do. But I'm not immune to the rhetoric of invasion myself. How do we, as science communicators, make sure that the metaphors and rhetoric we're using to talk about invasive species don't unwittingly reinforce a fear and hatred of the unfamiliar and the foreign?

Of the foreigners themselves?



(The warped irony of being the descendent of white settlers living on Anishinaabek land, trying to have these discussions primarily with other descendents of white settlers, making decisions about what counts as an invader, is not lost on me.)

Militaristic language could also prove ineffective because of the "boomerang effect", whereby "extremely intense language or images used for purposes of persuasion can have an opposite effect on the receiver" (Mio 1997). This may be especially true given that the language of invasion biology has a xenophobic "resonance" for many people (Simberloff 2003). For example, San Francisco City Supervisor Leland Yee downplayed concerns about invasive species when he asked, "How many of us are 'invasive exotics' who have taken root in the San Francisco soil, have thrived and flourished here, and now contribute to the wonderful mix that constitutes present-day San Francisco?" (quoted in Todd 2002). There are also numerous stories about indigenous peoples who take offense at the way language about invasive species shifts attention from the invasive people who have brought about the greatest ecological impacts on their lands (Larson 2005).



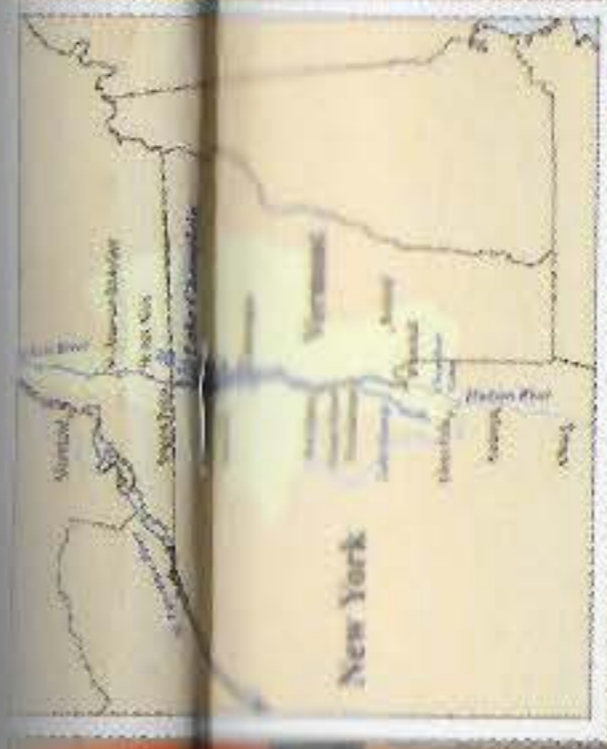
We ask people to report sightings of invasives.

We encourage people to kill them, when possible.

Right now, I have some concerns.

In this political climate, the implications are something I worry about.

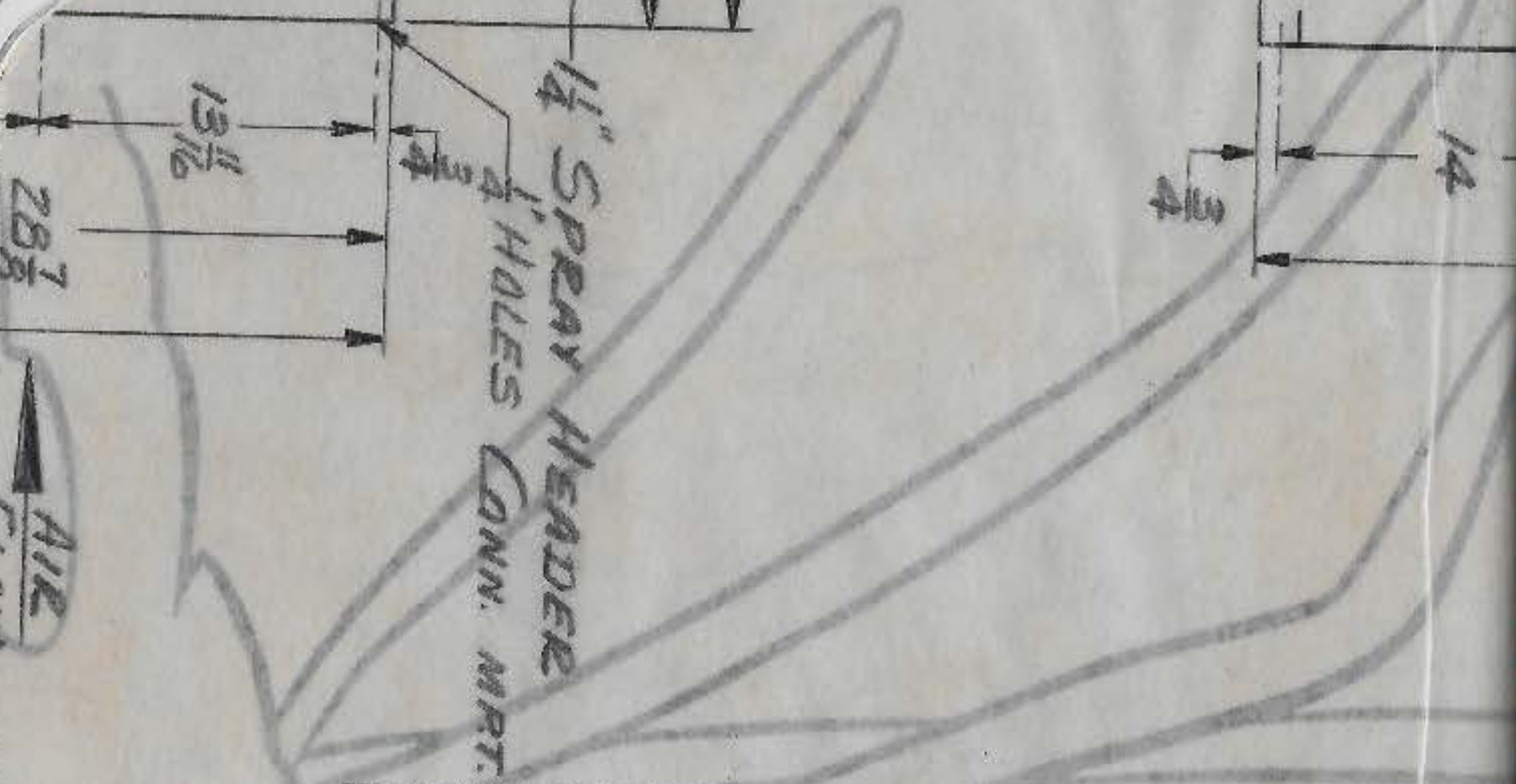
Alien Invasion: They're green, they're mean, and they may be taking over a park or preserve near you (Cheater 1992); Aliens Reeking Havoc; The Invasion of the Woodland Soil Snatchers (Stewart 2001); Native species invaded (ABC News 1998); Bio-invasions spark concerns (CQ Researcher 2000); It's a Cancer (Verrengia 1999a);<sup>10</sup> Creepy strangler climbs Oregon's least-wanted list (Brinckman 2001); Biological Invaders Threaten U.S. Ecology (McDonald 1999); U.S. can't handle today's tide of immigrants (Yeh 1995); Alien Threat (Bright 1998); Biological Invaders Sweep In (Enserink 1999); Stemming the tide of invading species (Kaiser 1999); Congress Threatens Wild Immigrants (Weiner 1996); Invasive Species: Pathogens of Globalization. (Bright 1999)



Unfortunately, it makes for catchy headlines.

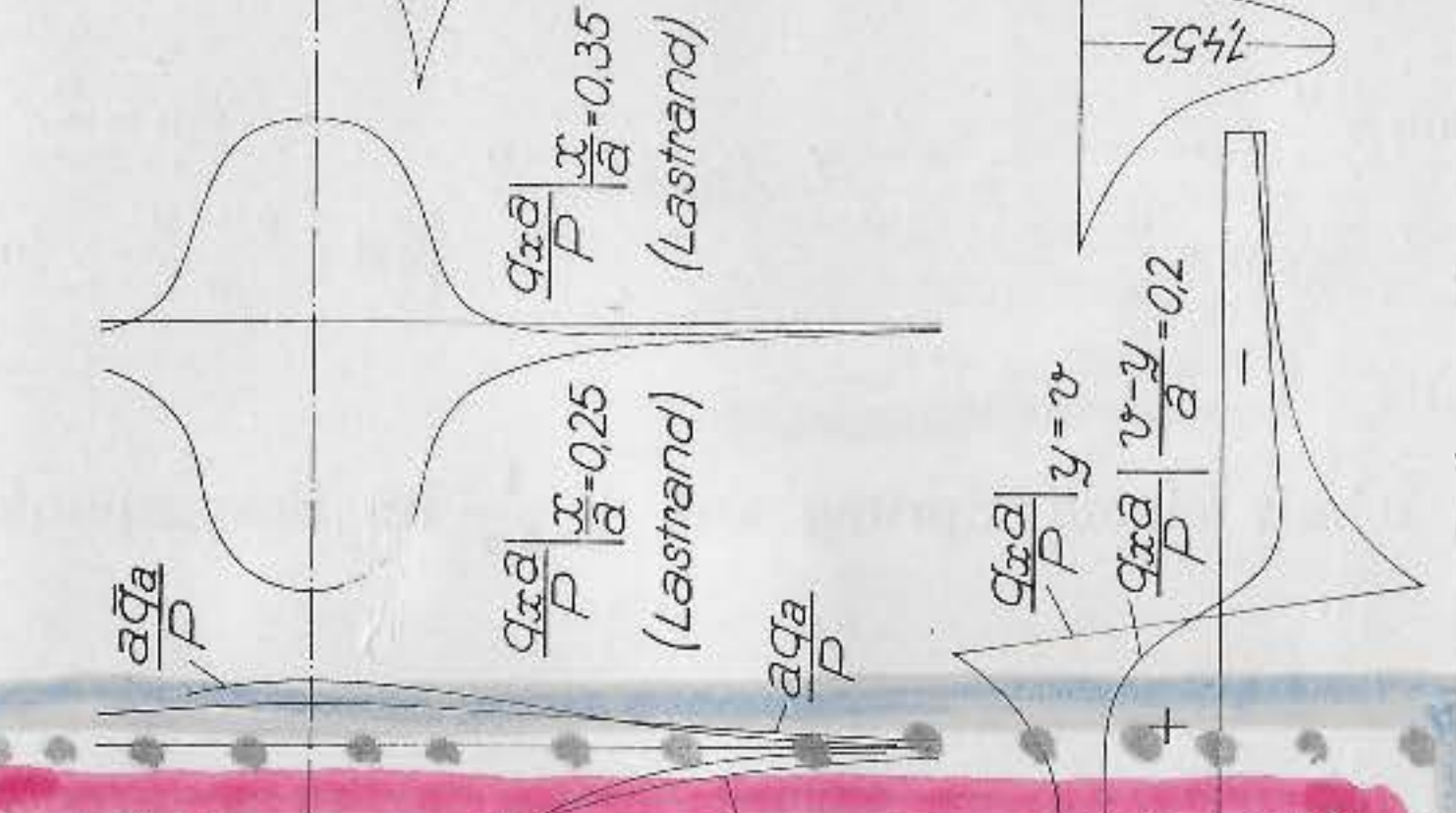
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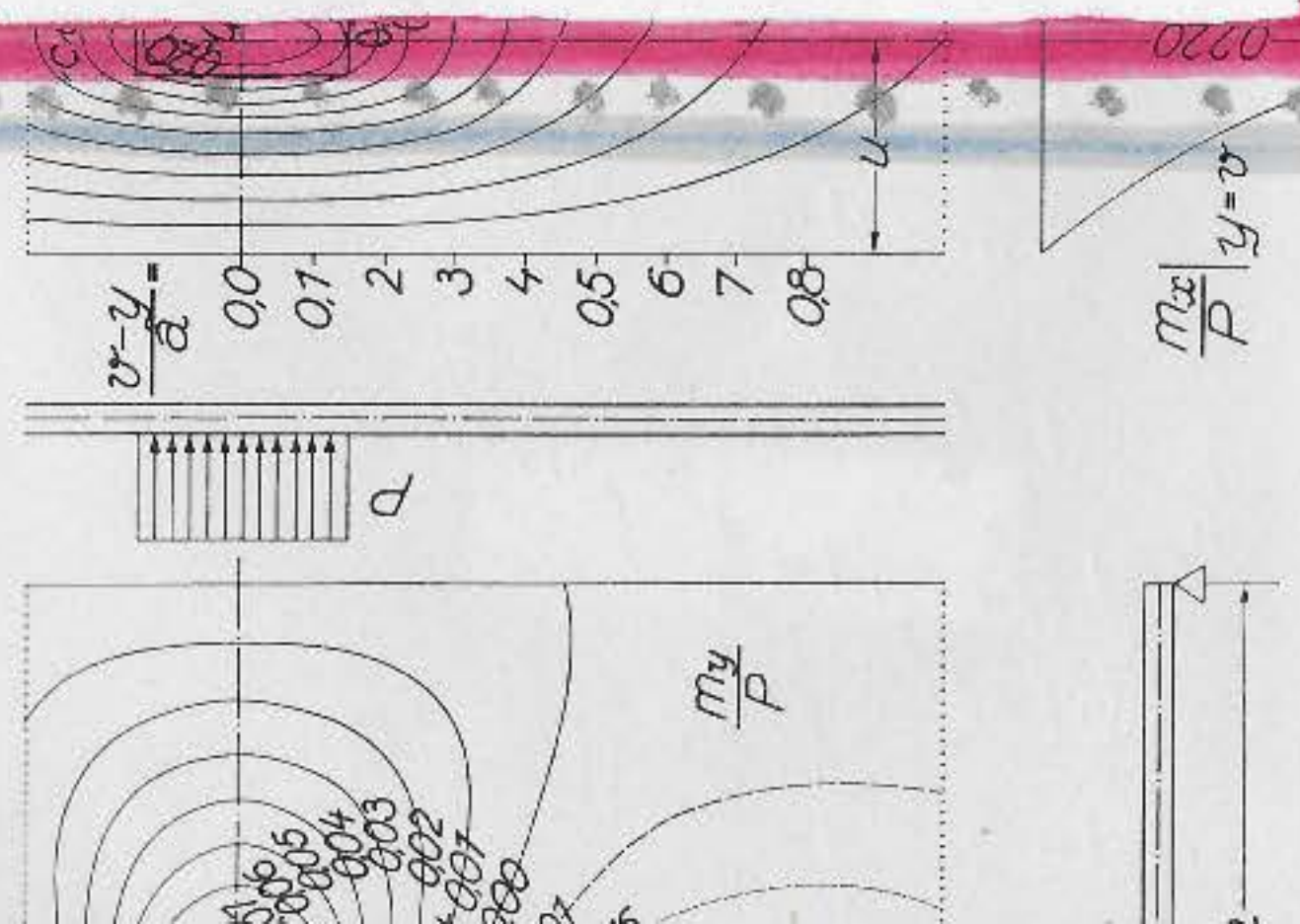


It makes for a compelling narrative, memorable content, an effective way to capture the audience's attention and get them to care.

97B122, LESS COVER PANEL CORNER ANGLES (SEE S ADAPTER BAFFLE PER	VIA 8 EDW
VAPOR-FIN	VIA 8 EDW
FACE AREA- 7.8, SOLDER FINS.	
VAPOR-FIN	VSF-LT-S1
FACE AREA- 6.25	SOLD
COPPER FINS.	
COIL MARK: REHEAT #10	
FE. 215, 5 HR., 1800 R	
BALL BEG., STD. PROT	



There's a sticky kind of trade-off to consider -- do we continue to bank on rhetoric that invokes protectionism, nationalism, and xenophobia to appeal to those across the aisle we might not otherwise reach as environmentalists? There's plenty of folks who are more amenable to ecological management when it's dressed in camo-print field gear with an American flag on its sleeve..



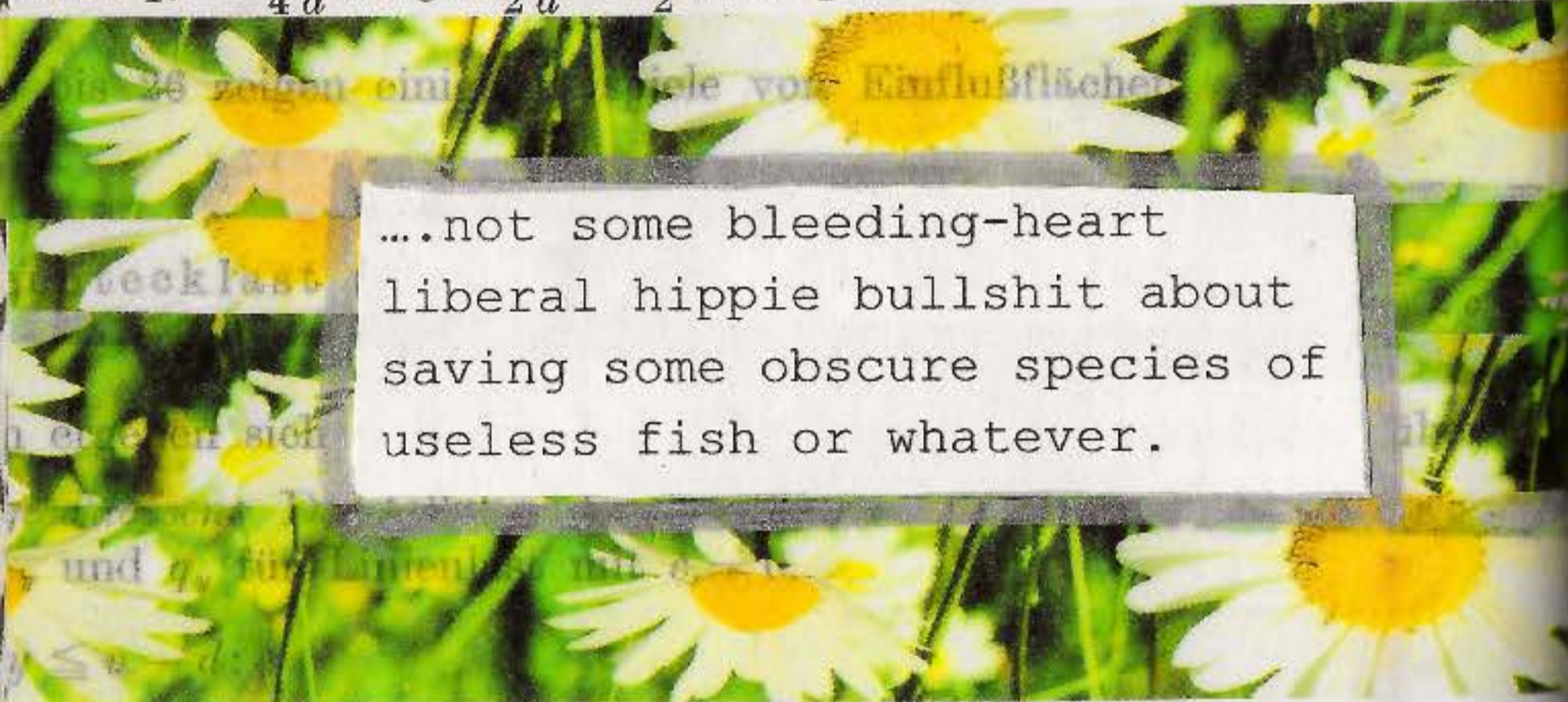
$$\left[ \frac{3 \sin \pi \frac{u}{a}}{\cos \pi \frac{v-y}{a} - \cos \pi \frac{u}{a}} - \pi \frac{v-y}{a} \frac{\sin \pi \frac{v-y}{a}}{\left( \cos \pi \frac{v-y}{a} - \cos \pi \frac{u}{a} \right)^2} \right]$$

...  $v = y$  gilt:

Einfluss  $m_{xys} = 0$  mit einem Sprung auf  $\pm \frac{1}{4\pi}$  im Bezugspunkt (s. ...)

$$\text{Einfluss } q_s = \frac{1}{2a} \cotg \pi \frac{u}{2a}, \quad (\text{s. ...})$$

$$\text{Einfluss } \bar{q}_s = \frac{3}{4a} \cotg \pi \frac{u}{2a} = \frac{3}{2} \text{ Einfluss } q_s. \quad (\text{s. ...})$$



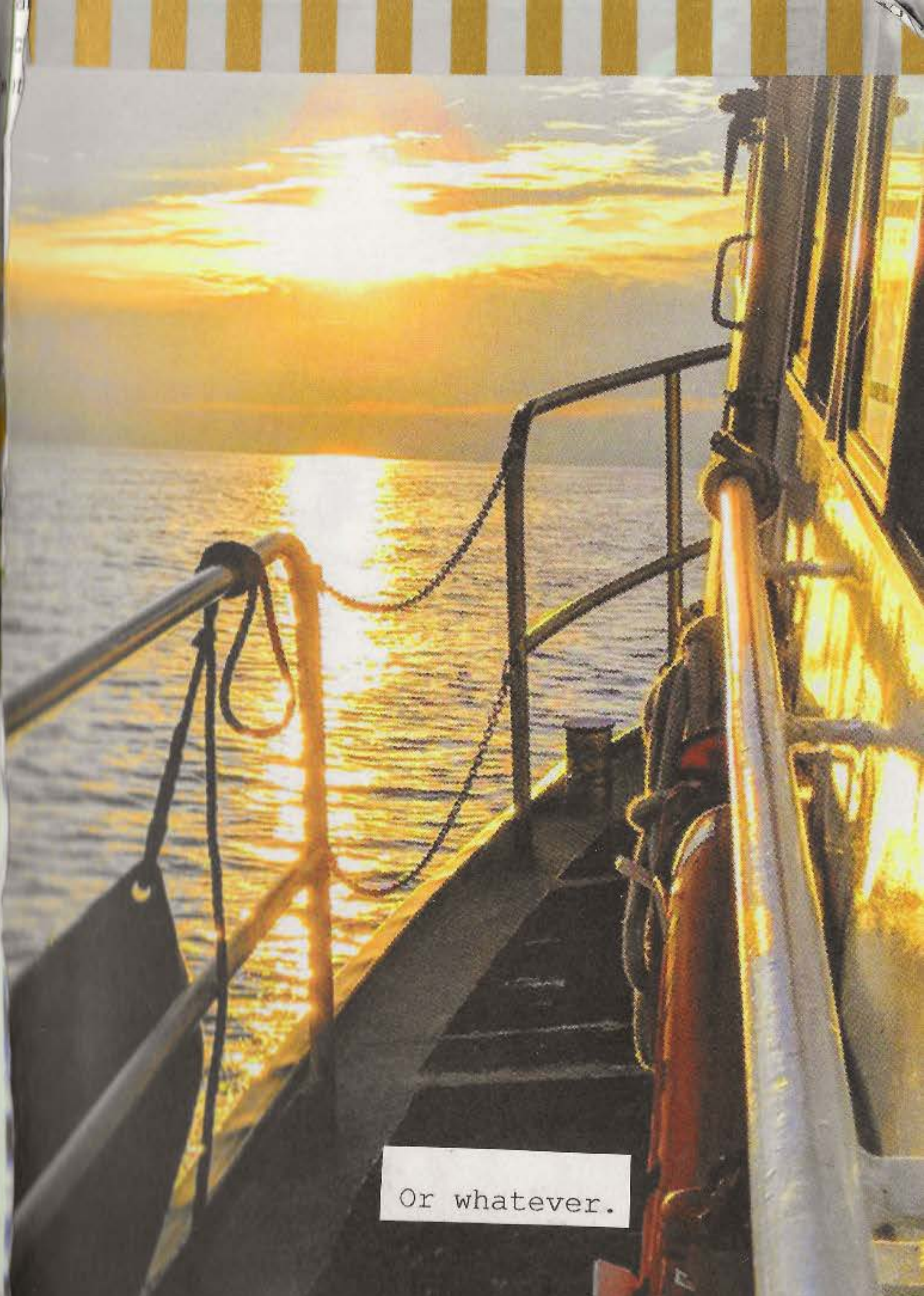
...not some bleeding-heart liberal hippie bullshit about saving some obscure species of useless fish or whatever.

$$\sin j\pi \frac{x}{a} \sin j\pi \frac{u}{a} \frac{\sin j\pi \frac{c}{a}}{j\pi \frac{c}{a}} \frac{\sin j\pi \frac{d}{a}}{j\pi \frac{d}{a}} \frac{1}{2j^3\pi^3} \left[ \left( 2 - j\pi \frac{d}{a} \cotg j\pi \frac{d}{a} \right) e^{-j\pi \frac{v-y}{a}} + j\pi \frac{v-y}{a} e^{-j\pi \frac{v-y}{a}} \right]$$

$$\sin j\pi \frac{x}{a} \sin j\pi \frac{u}{a} \frac{\sin j\pi \frac{c}{a}}{j\pi \frac{c}{a}} \frac{\sin j\pi \frac{d}{a}}{j\pi \frac{d}{a}} \frac{1}{2} \left[ \frac{d}{a} \cotg j\pi \frac{d}{a} e^{-j\pi \frac{v-y}{a}} - \frac{v-y}{a} e^{-j\pi \frac{v-y}{a}} \right]$$

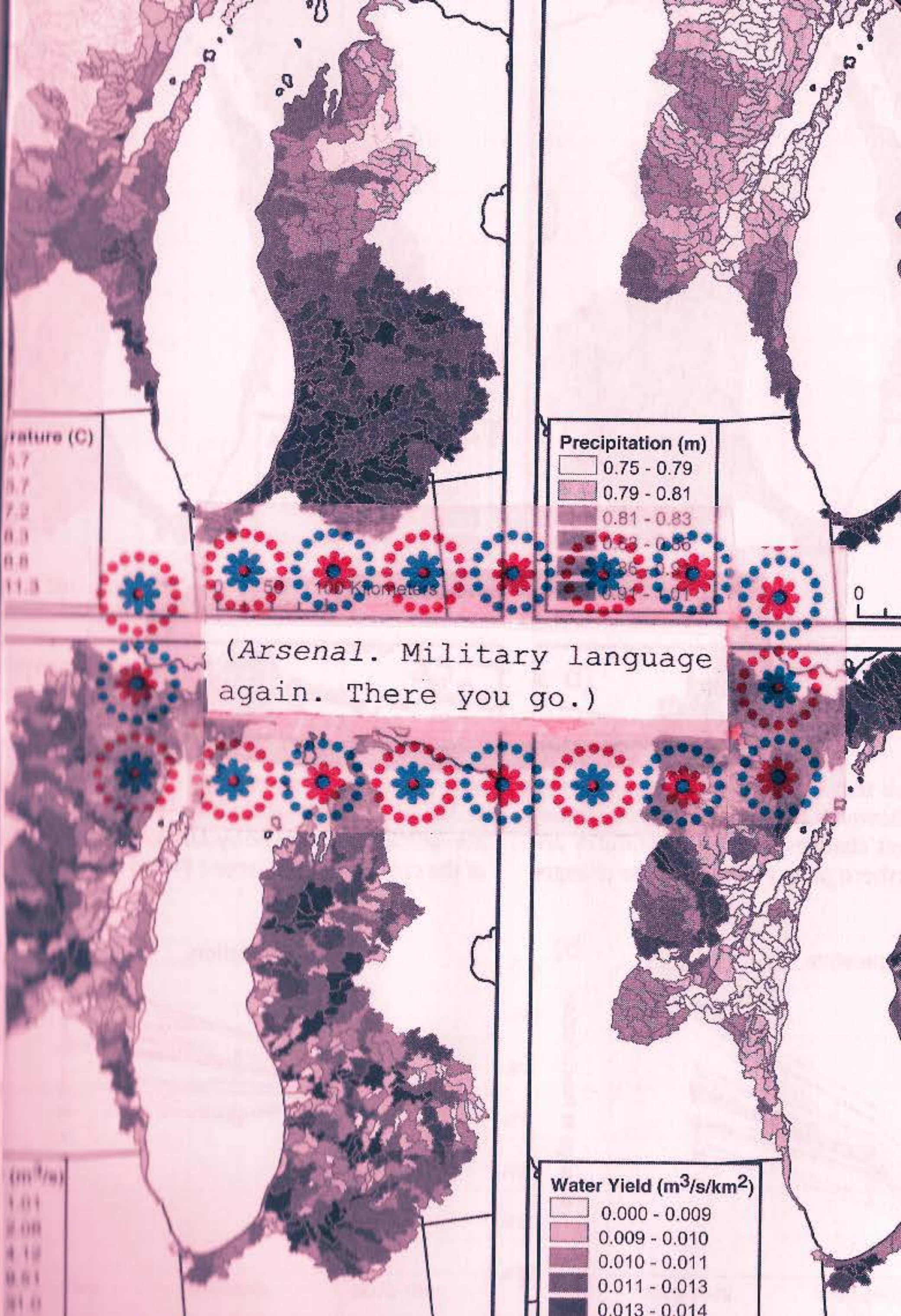
$$\cos j\pi \frac{x}{a} \sin j\pi \frac{u}{a} \frac{\sin j\pi \frac{c}{a}}{j\pi \frac{c}{a}} \frac{\sin j\pi \frac{d}{a}}{j\pi \frac{d}{a}} e^{-j\pi \frac{v-y}{a}},$$

$$\cos j\pi \frac{x}{a} \sin j\pi \frac{u}{a} \frac{\sin j\pi \frac{c}{a}}{j\pi \frac{c}{a}} \frac{\sin j\pi \frac{d}{a}}{j\pi \frac{d}{a}} \left[ \left( 1 + \frac{j\pi}{2} \frac{d}{a} \cotg j\pi \frac{d}{a} \right) e^{-j\pi \frac{v-y}{a}} + j\pi \frac{v-y}{a} e^{-j\pi \frac{v-y}{a}} \right]$$

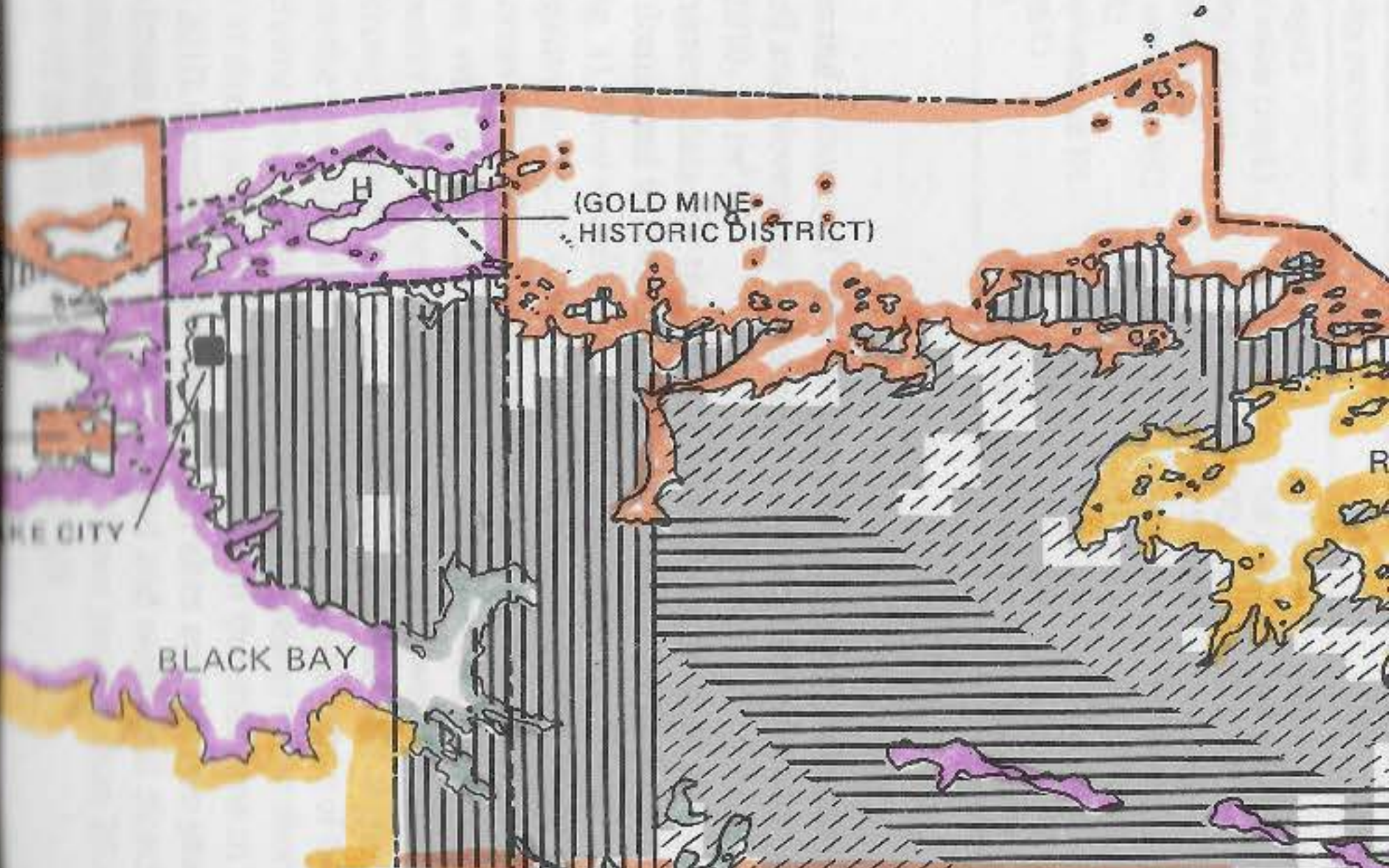


Or whatever.

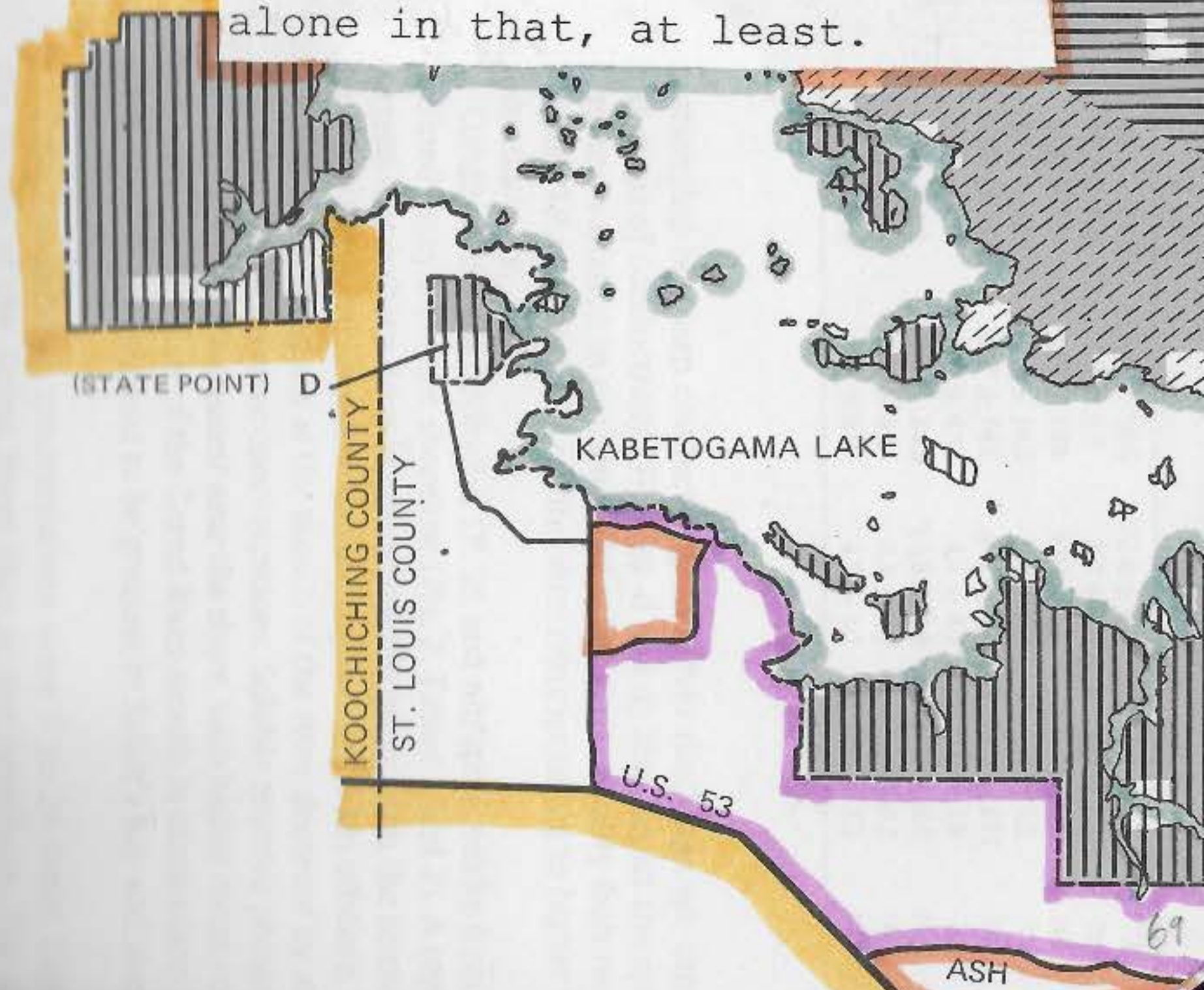
On the other hand, what *do* we replace our current metaphors with? Because they do a *lot* of work for us, for now, and at the moment I don't have too many better options in my arsenal.



(Arsenal. Military language again. There you go.)



But I'm working on it. I'm not alone in that, at least.



H A O C C O C C O  
 T H E A K F A S T  
 H O W I X S T A S  
 T S B M E U I L C  
 S R R R R M K L  
 D A V A O M H A H  
 S C H O O L H O S  
 S E K A C N A P T X  
 Y S E K A C N A P T X

E R R H A N D D  
 E N I G M A T I O W E Z  
 U D T Y L Y H T L A E T S  
 E R R I O N I R E V O C E R R S Z N Y D  
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 G M A T I O W E Z  
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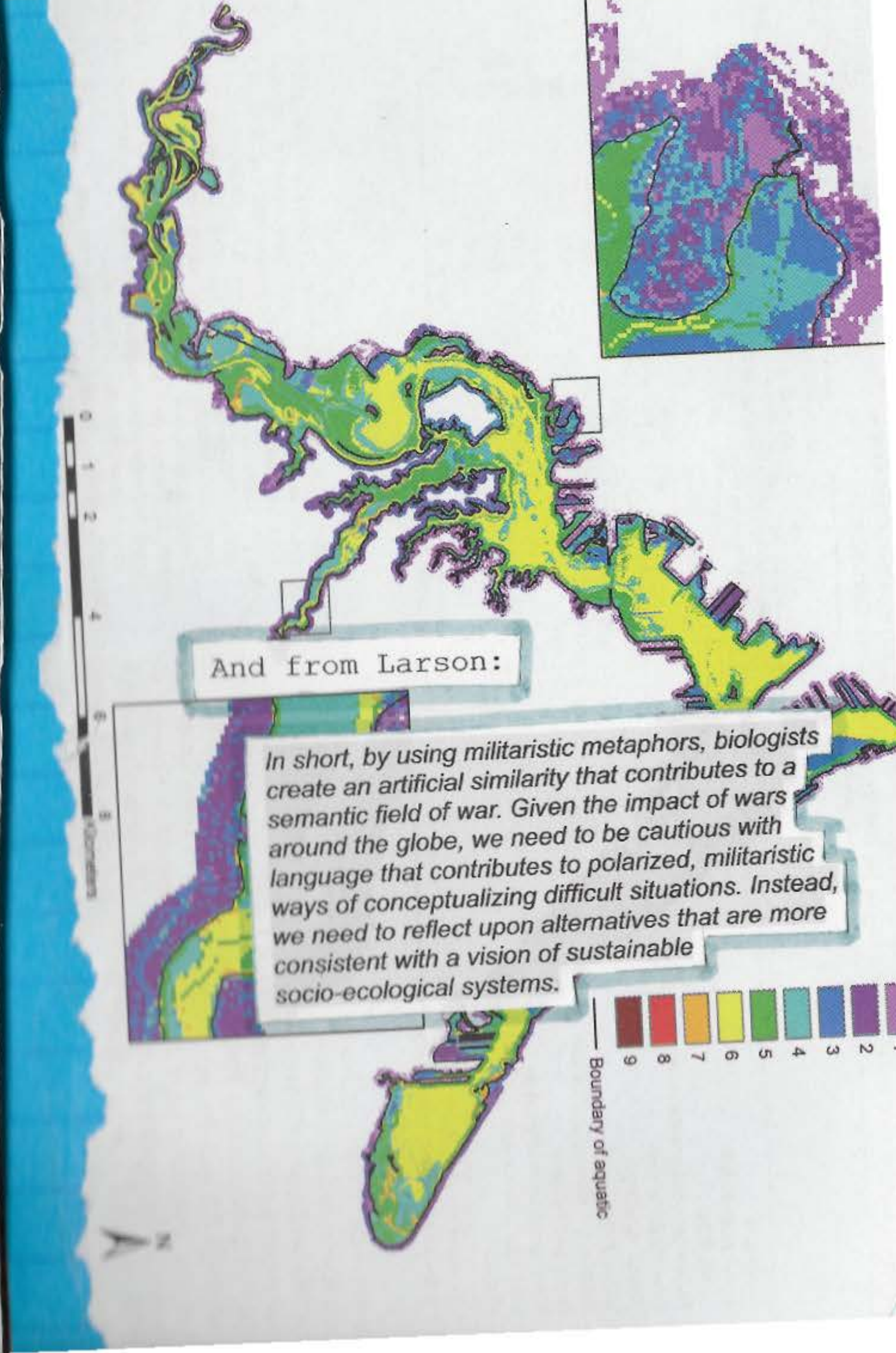
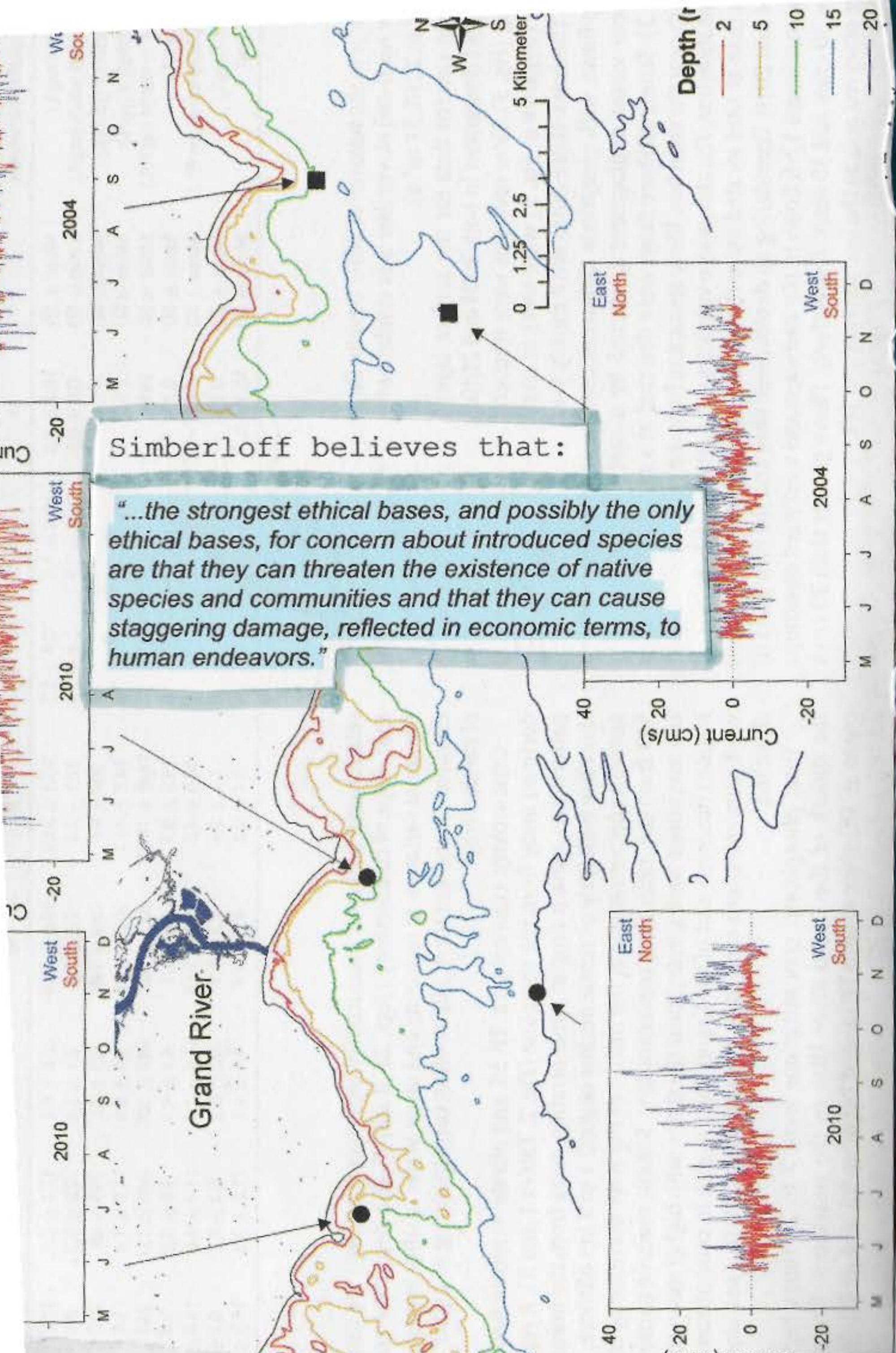
**PUZZLE 59**

W P R E S S U R E N I D I  
 G E U S P A M C U G E B L I E  
 L U R M C W R D N L S L I E  
 L U S C P U I I O D P S L A S  
 E R T R H D S B H L D P A C N A O L  
 V O Q E E U Y E R S K G K A C I N O  
 I A P D F W I E S R I O G C I N E  
 L I P P S W O S E L E R R S D L R S  
 G L P E O E E G D L B E R S D R S  
 F W E R S R R R X B A P C Y U  
 C I K W V A I O K A P C Y U  
 N S N E B L E Z P C Y U

I don't know.

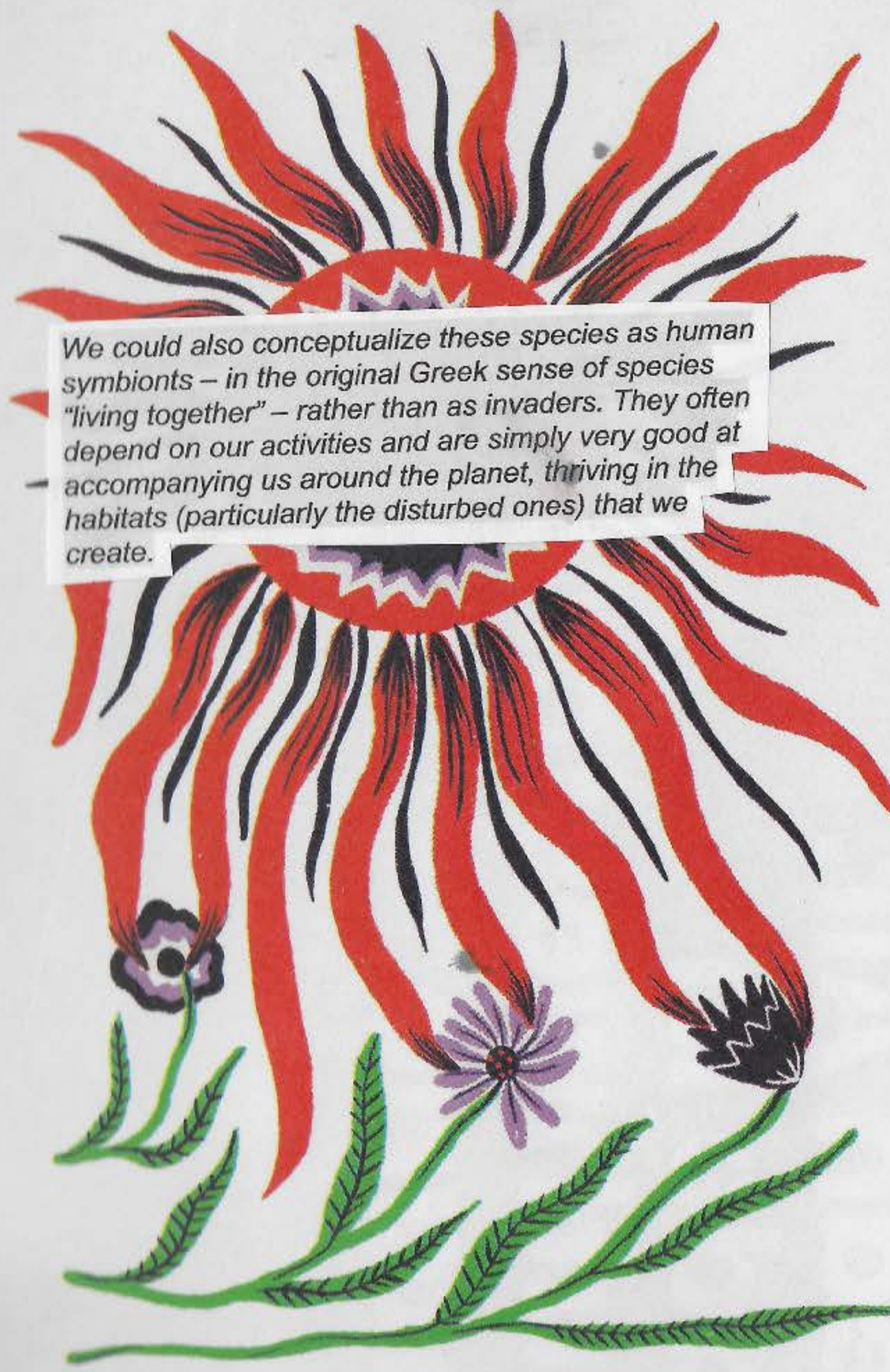
**PUZZLE 60**

E Z B B C S A P H O U S E S J  
 B E B L A M E R C H A N T E  
 S A K E Y T B N S R T D I N D I G O  
 A K A Y T B N S R T D I N D I G O  
 F L A A R S N I C H I P U A  
 N O H I L R S S I Z Z  
 V E T I U O J O F L  
 T F C S Z E L O J O F L  
 S K I N G B E E H U S O  
 U S K I N G B E E H U S O  
 R A G R U G S L L I M W A S

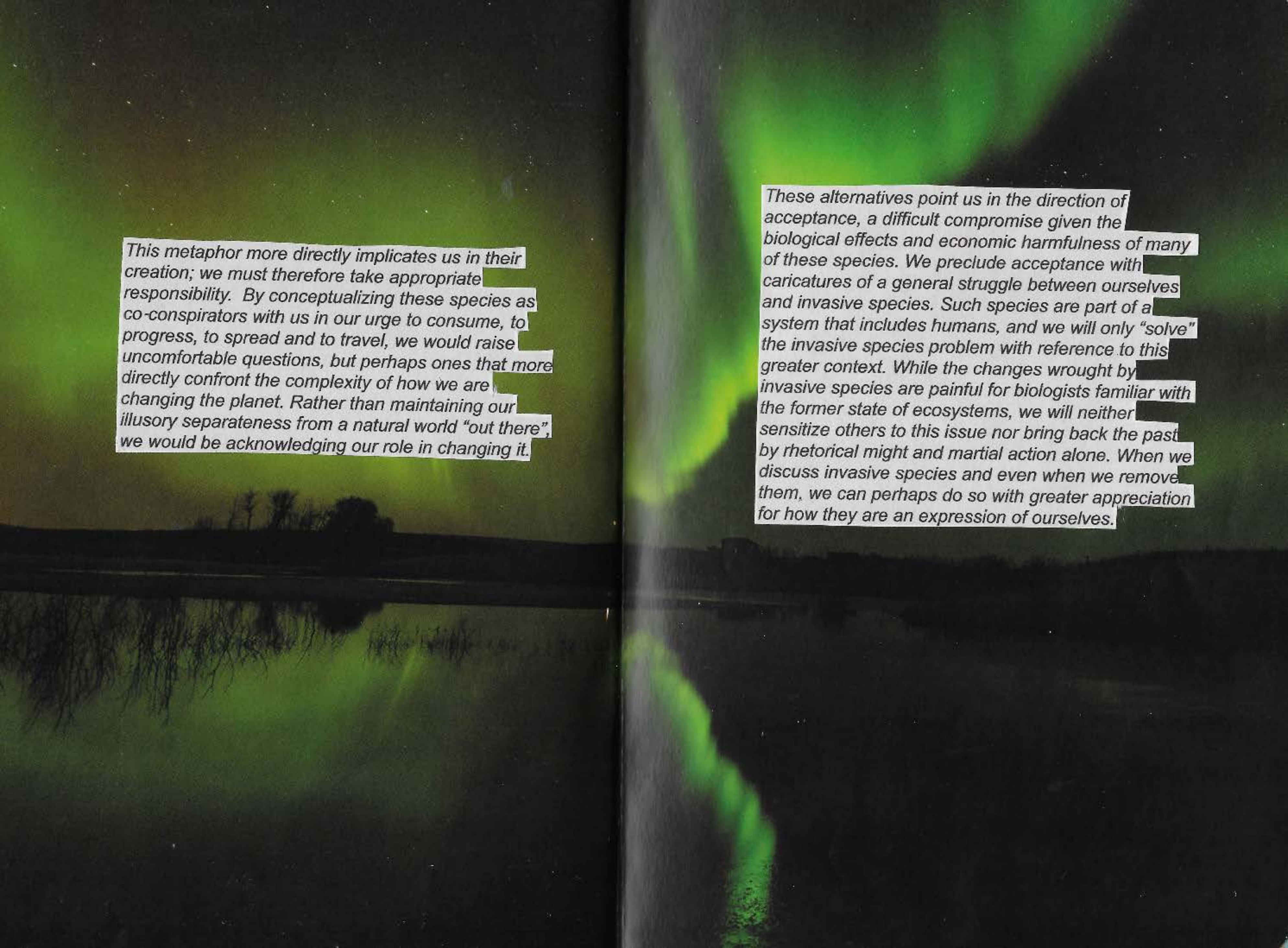




We might emphasize metaphors that are relevant to their origins rather than just to the species themselves, directing us more towards prevention and acceptance rather than opposition. Invasive species are often conceptualized as a disease (Baskin 2002), for example, and by analogy they weaken ecosystem health just as pathogens weaken bodily health. Unfortunately, our response to disease is often militaristic too, but we can draw upon alternative medical models. Traditional Chinese medicine conceptualizes disease with metaphors of balance, energy, and weather – sometimes even emphasizing “kindness to tumors”, whereas conventional Western medicine draws upon militaristic imagery and the metaphor that “curing illness is a fight” (Stibbe 1996). The latter metaphor is particularly misleading for terminal illnesses, and to the extent that invasive species are a “terminal” disease we may need to adopt language that focuses on improving “quality of life”.



We could also conceptualize these species as human symbionts – in the original Greek sense of species “living together” – rather than as invaders. They often depend on our activities and are simply very good at accompanying us around the planet, thriving in the habitats (particularly the disturbed ones) that we create.



*This metaphor more directly implicates us in their creation; we must therefore take appropriate responsibility. By conceptualizing these species as co-conspirators with us in our urge to consume, to progress, to spread and to travel, we would raise uncomfortable questions, but perhaps ones that more directly confront the complexity of how we are changing the planet. Rather than maintaining our illusory separateness from a natural world "out there", we would be acknowledging our role in changing it.*

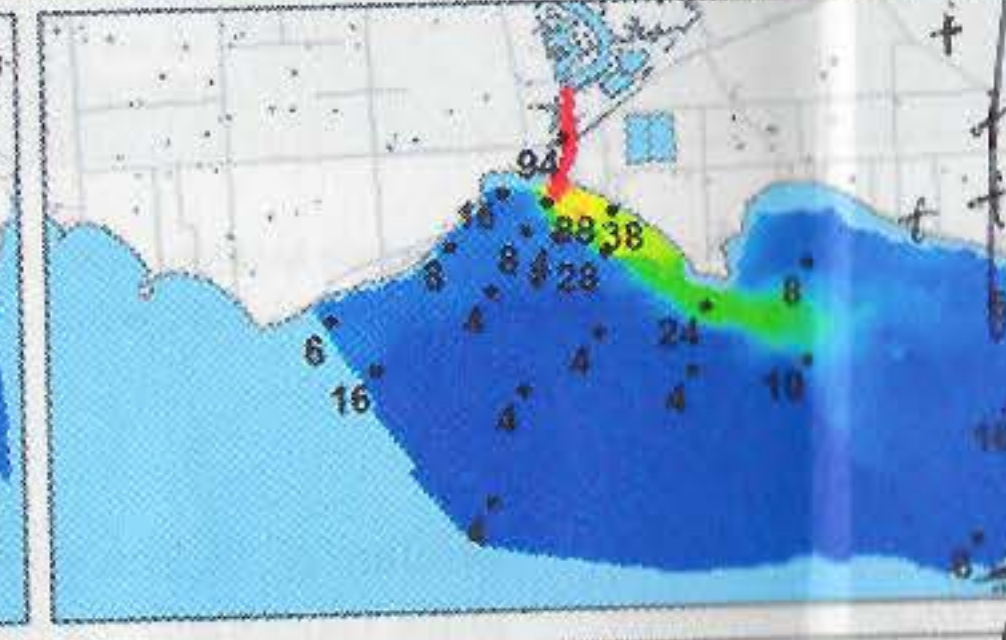
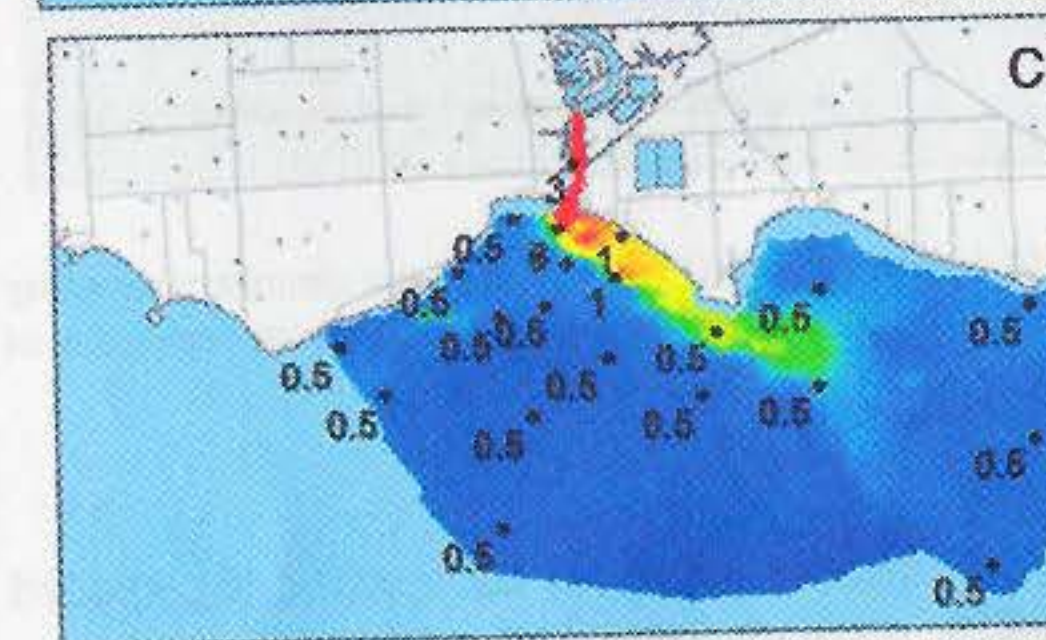
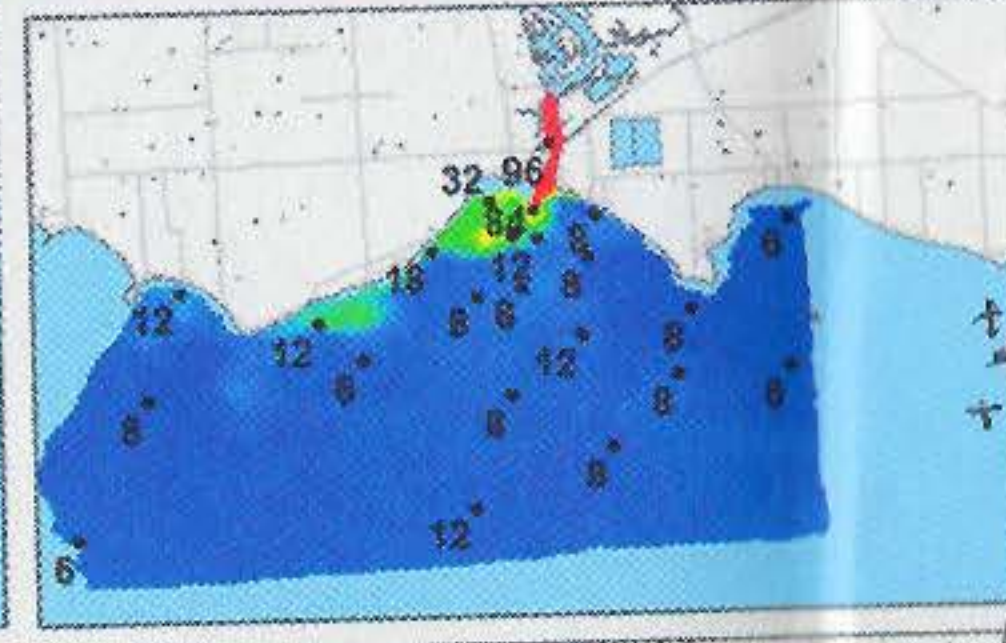
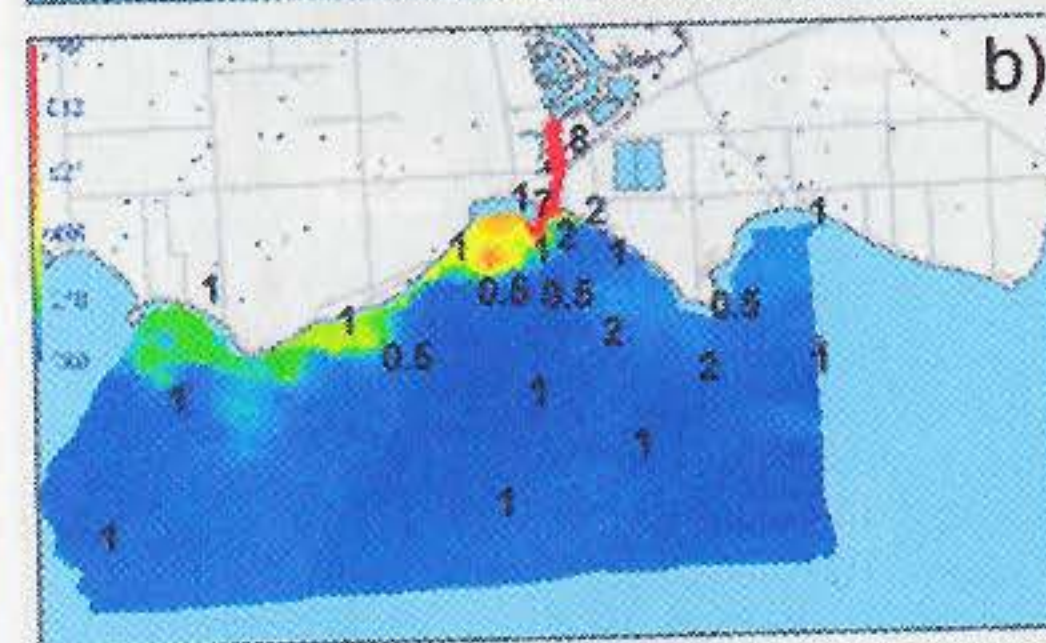
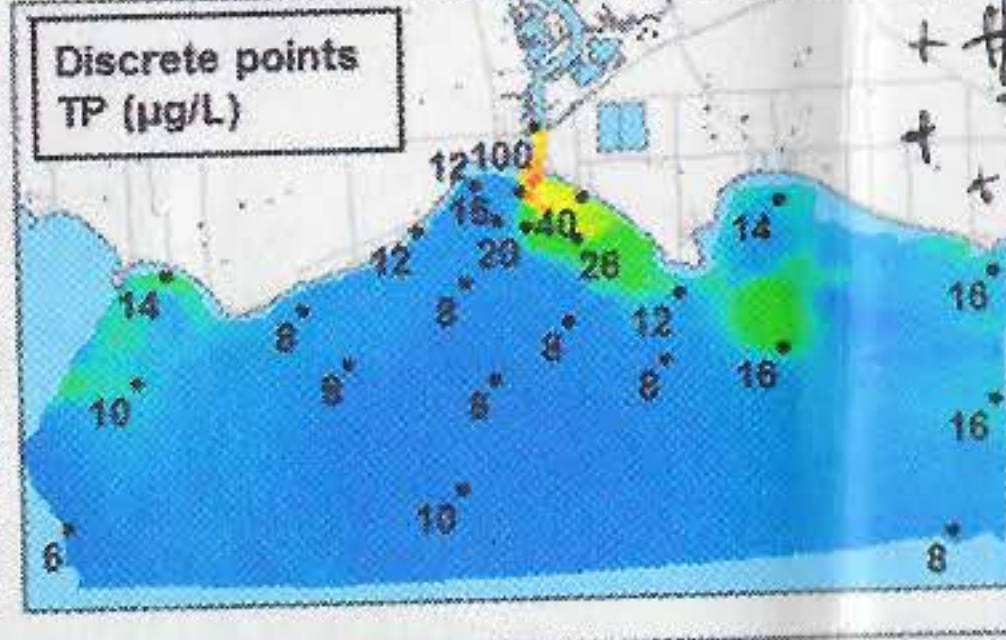
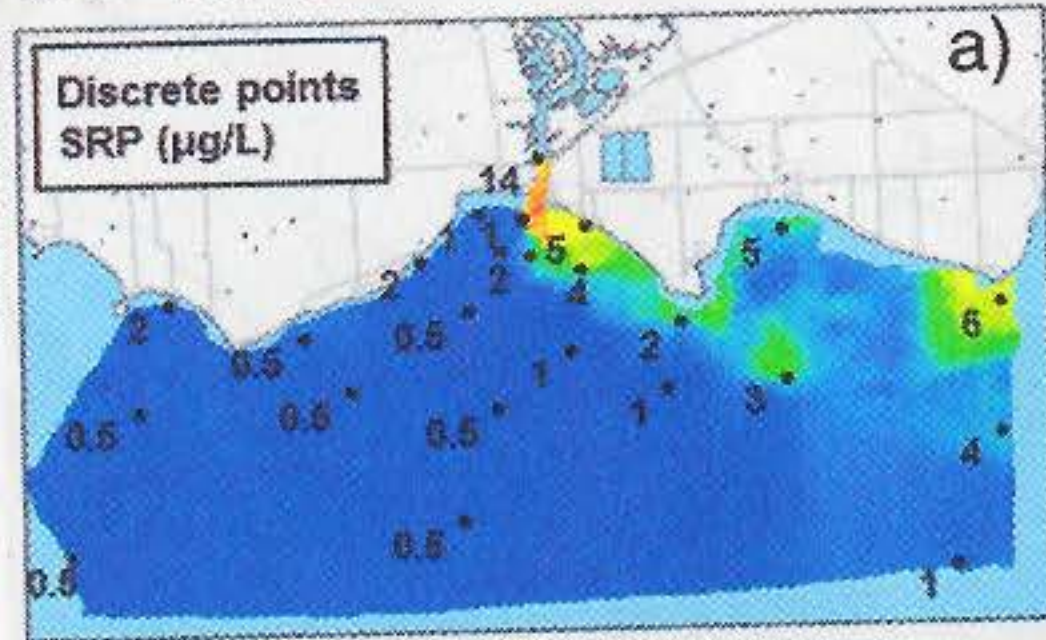
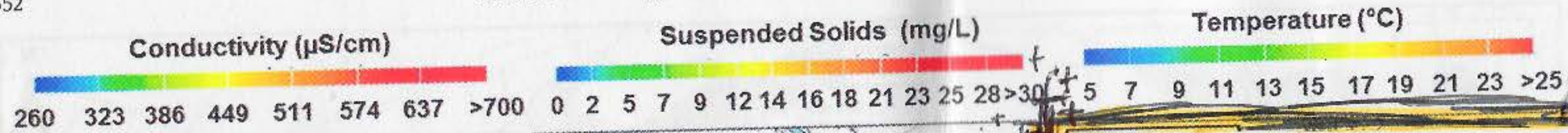
*These alternatives point us in the direction of acceptance, a difficult compromise given the biological effects and economic harmfulness of many of these species. We preclude acceptance with caricatures of a general struggle between ourselves and invasive species. Such species are part of a system that includes humans, and we will only "solve" the invasive species problem with reference to this greater context. While the changes wrought by invasive species are painful for biologists familiar with the former state of ecosystems, we will neither sensitize others to this issue nor bring back the past by rhetorical might and martial action alone. When we discuss invasive species and even when we remove them, we can perhaps do so with greater appreciation for how they are an expression of ourselves.*

The lampreys, now resting at the bottom of their tank in the temporary shade of another passing freighter, are oblivious.

I'm trying not to be, anymore.







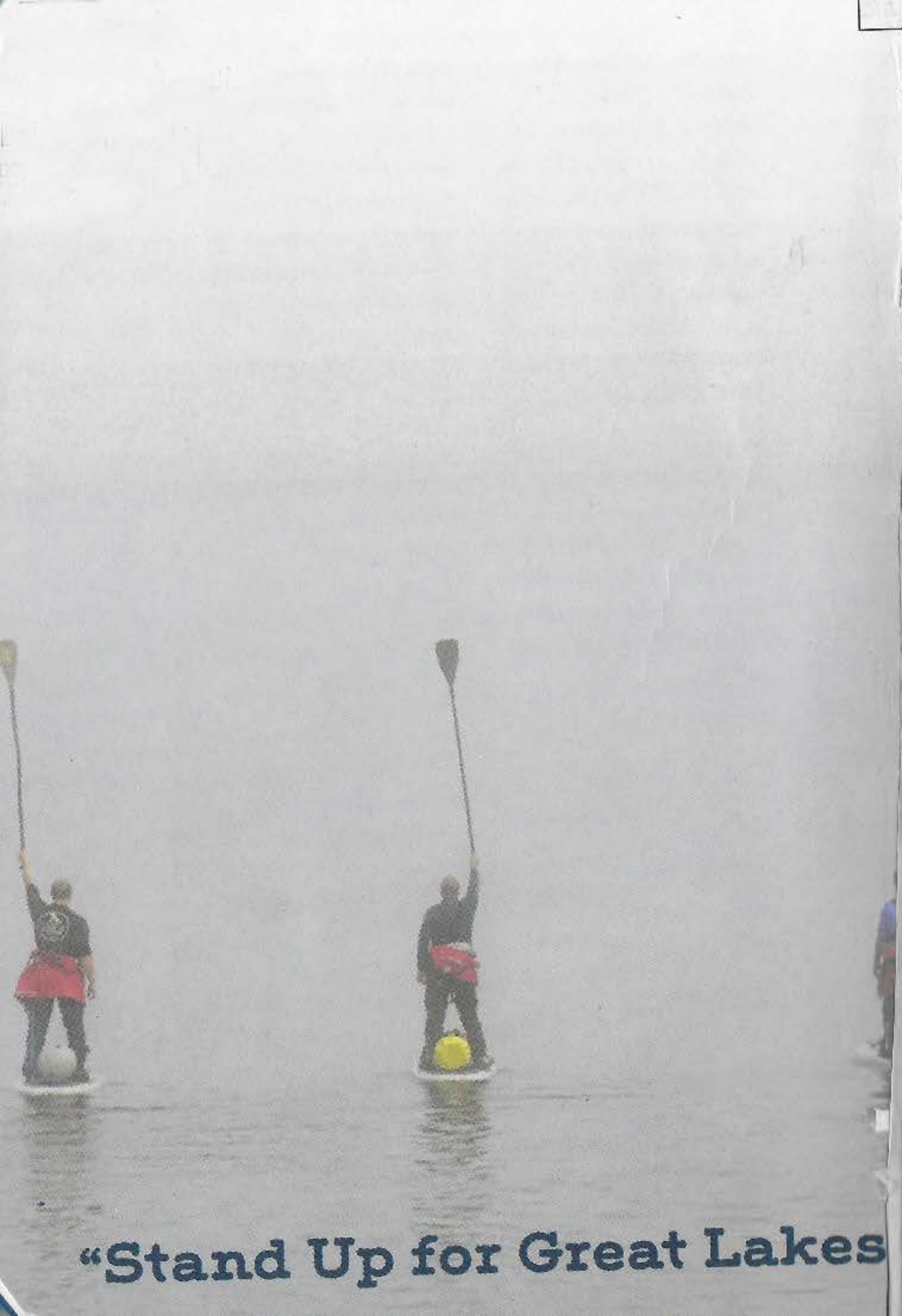
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**Stand Up for Great Lakes**

El Green is a science communicator in the Great Lakes region. When not researching aquatic invasive species, they can be found hunting mushrooms, making soup, and taking notes for future zines.

\* \* \*

Special thanks to Levigator Press, who made the mixed-paper notebook that the analog version of this work was created in, and to everyone who encouraged this narrative along the way.

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