GARBAGE PATCH KIDS – FALL 2016

Abundance of Invasive and Native Plants in the Tijuana River Estuary

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Physics and Environmental Science

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Abstract
By Will

An invasive species is a plant, animal or pathogen in an environment that's not native to that environment. Invasive plants can make their way into Californian land by being tracked in on someone's boot, or being intentionally placed to have them grow here. They look at invasive plants in a San Diego, California Research Reserve to see what the damage can look like and what they have done to native plants there. The objective was to determine what kind of presence non-native plants had where sensitive native plants were present. The group used a transect that they decided on before the research was conducted and set quadrants along that transect. They controlled the location of their research which was the Tijuana River National Estuarine Research Reserve, the exact protocol for their research and the length of the time that they had between the research dates and how long they were out there. They found that the native plants were found more frequently in both surveys and in one of their surveys they found no alien species at all.

I.) Introduction

The diversity of an ecosystem in species is directly related to its overall health, where each species is dependent on the survival of another. However, many ecosystems around the world have been negatively impacted by the presence of foreign factors such as humans (Nature Serve, 2016). These foreign impacts can be detrimental to many plants and animals alike. One main impact that threatens environments is the introduction of invasive species (Invasive Species Council, 2009).

Invasive species are defined as "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" according to the United States Department of Agriculture. Invasive species who successfully establish themselves in a given environment have a strong chance of out competing other similar species. For example, during a growing season, crystalline ice plants may have a better chance at survival than other native plant species due to having no natural predators. Eventually edging out the original species from that ecosystem. The danger stems from the absence of this natural species, as all parts of the ecosystem have relied on it being there. This ends with the ecosystem becoming at risk, potentially collapsing in on itself and slowly becoming nonviable. Invasive plants have been present over the course of human history. Some species are intentionally placed for aesthetic reasons, to later escape into greater regions. Invasive plants can also be deliberately planted in an attempt to enhance and control the wildlife (Alaska Department of Fish and Game, 2016). Yet, most of the time it ends up having the opposite effect on the environment due to the fact that most natural growth repellants don't affect invasive plants, but native ones. This makes it difficult to control the growth of invasive plants (Alaska Department of Fish and Game, 2016).

Our question is: What is the effect of invasive plants on the surrounding environment? This is significant because it will allow us to understand the native plant situation and how invasive plants could be affecting their growth. We predict that invasive plants will override native plants in terms of population and numbers.

II.) Methodology

a.) Independent Variable

The independent variable is the presence of invasive species in a habitat where sensitive native plant species are present.

b.) Dependent Variable

Our dependent variable is the species and percent coverage of plant species along the line transects at each site, and the percent coverage at quadrants along the transect.

c.) Control Variables

The regulations and methods already set in place by the Tijuana River Estuarine Research Reserve allow for no variances in plant care. The types of native and invasive species and the period of time are apart of our controls to make sure the plants are within the same season and interact with each other. Also all samples will be taken from the Tijuana River Estuary, with the same long term transects.

d.) Confounding Variables

Our confounding variables include temperature, weather, known/unknown human impact, and sedimentation. Temperature and weather are closely connected as we are unsure of the effect they will have on plant growth, both native and invasive. Human impact that has happened before or after our data collection can also greatly affect how the plants grow. If people trample over our research sites, sprouts and saplings might not be seen or are destroyed. Sedimentation because we are unable to control the effect of sedimentation deposits on or near our sites. Plant smothering, stunted growth, and conservation efforts may vary between sites.

e.) Sample Size

The sample size that we will be conducting our research on is along a 15 meter line transect for site B and a 8 meter line transect for site A. We will be measuring at each meter mark, totaling: 16 data points along the line and 7 quadrant measurements for site B; and 9 data points along the line and 3 quadrant measurements for site A. This is then compared to data taken last year by the Tijuana River National Estuarine Research Reserve.

f.) Materials

- ❑ Transect line - marked by Tijuana River Estuarine Research Reserve
- ❑ PVC Quadrant

- ❑ Camera
- ❑ Data Sheet
- ❑ Regional invasive plants expert, Jim Peugh, Friends of Famosa Slough
- ❑ Apparel for walking through thick bushes

g.) Primary Research Methods

Meter Mark Data

1. Identify which transects will be used (identified prior to research by Tijuana River Estuarine Research Reserve)
2. Create marks at each meter to collect meter mark data
3. Identify whether native plant, invasive plant, or blank space at each meter mark
4. Photograph at each meter mark
5. ID each species by confirming with local experts
6. FuFind totals of native, invasive, and blank spaces on each transect line

Quadrant Data

1. At every other meter, we place the quadrants to the left or right on the line according to the Tijuana Estuarine Research Reserve's previous method
2. Photograph each quadrant
3. Identify percent coverage of native, invasive, and blank spaces
4. Compare to previous data from the Tijuana Estuarine Research Reserve

III.) Data Collection

Transect 1:

Name of Recorder: _____

Date of Recording: _____

Site Location: _____

Meter Mark	Invasive Species, mark and write scientific name	Native Species, mark and write scientific name	Blank Space
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Total Invasive Species	Total Native Species	Total Blank Spaces

Transect 2:

Name of Recorder: _____

Date of Recording: _____

Site Location: _____

Meter Mark	Invasive Species, mark and write scientific name	Native Species, mark and write scientific name	Blank Space
0			
1			
2			
3			
4			
5			
6			
7			
8			

Total Invasive Species	Total Native Species	Total Blank Spaces

IV.) Research Results

This study references data taken from two transects, one with the length of 15 meters and the other with a length of eight meters, from the Tijuana River Estuarine Research Reserve [TRERR]. The data showcases the mean amount of invasive and native plants on each transect. Numbers have been rounded up or down to create a more uniform collection. The figure below showcases the mean amount of invasive and native plants on each transect.

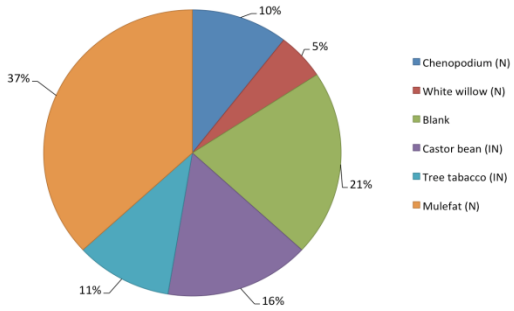

Figure 1: Coverage of Invasive and Native Plants on Transect 1

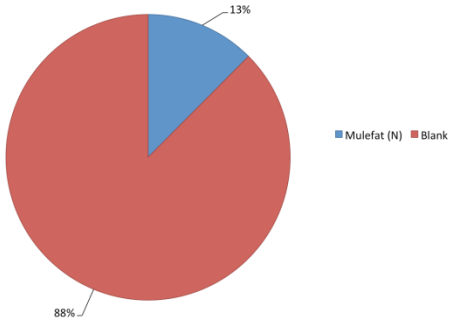

Figure 2: Coverage of Invasive and Native Plants on Transect 2

The first data collection occurred on October 11th, 2017 at Transect Site 1 as seen on Figure 1. The coverage of native plants was 52% versus invasive plant coverage at 27%.

The second data collection also occurred on October 11th, 2017 as seen on Figure 2. The average coverage of native plants was 13% and invasive coverage was 0%. Native plants include Mulefat (*Baccharis salicifolia*), Chenopodium (*Chenopodium*), and White Willow (*Salix alba*) , with their prevalence in that order. Invasive plants include Castor Bean (*Ricinus communis*) and Tree Tobacco (*Nicotiana glauca*), with Castor Bean being more prevalent than the latter. As seen in both Figure 1 and 2, Mulefat is the most prevalent species of all natives and invasives.

V.) Discussion

Research revealed that found that invasive plants have no affect on native species in the Tijuana Estuarine Research Reserve. Invasive plants were not as prevalent as predicted. Native plants were able to grow separately from invasive ones, meaning the growth of invasive species did not hinder the growth of native ones.

Native plant rehabilitation has been successful at the TRERR. This is seen due to there being a great amount of native plants on Transect 1, the transect where efforts were put in place to rehabilitate the native plants. Transect 1 has 52% native plant coverage versus the 13% coverage Transect 2 has. Mulefat, the species seen most prevalently on Transect 1 and 2, is growing and reaching different sections of the estuary. This is due to the mulefat stocks planted in the surrounding environment to Transect 1, which appears to be flourishing.

Anthropogenic activities in certain areas of the estuary has left a negative impact on all plants. With 88% of the transect 2 completely blank, versus 79% coverage on the less trafficked Transect 1, it is clear that humans are having an impact on these plants. Transect 2 had been recently cleaned during the National Beach Cleanup Day ,September 17, nearly a month prior to our data collection (Peregrin, 2016). During this cleanup, many species were trampled due to the inaccessibility of the trash from a clear uninhabited path. Plants are unable to thrive when trampled, leading there to be a degradation of overall plant coverage (Pescott and Stewart 2014). These species were potentially unable to grow again due to the severity of the trampling, and also due to the lack of efforts to rehabilitate the immediate environment surrounding Transect 2.

In conclusion, our findings did not coincide with our prediction. We predicted that there would be a greater abundance of invasive plants than native ones, when it was the opposite that was found. Invasive plants were present, however, but did not affect the native plants.

Figure 3: Transect 1

Figure 4: Transect 2

VI.) Works Cited

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Appendix
Transect 1:

Name of Recorder: Meghan Smith, Jaylah Brown, Jordan Damond, and Alonzo Houston

Date of Recording: _____10/11/16_____

Site Location: _____Tijuana Estuary_____

Meter Mark	Invasive Species, mark and write scientific name	Native Species, mark and write scientific name	Blank Space
0		Mulefat; *Baccharis salicifolia*	
1		Mulefat; *Baccharis salicifolia*	
2		Mulefat; *Baccharis salicifolia*	
3		Mulefat; *Baccharis salicifolia* Chenopodium; *Chenopodium berlandieri*	
4		Mulefat; *Baccharis salicifolia* Chenopodium; *Chenopodium berlandieri*	
5		White Willow; Salix alba	
6		Mulefat; *Baccharis salicifolia* Chenopodium; *Chenopodium berlandieri*	
7			x
8			x
9	Castor bean; *Ricinus*		
10	Castor bean; *Ricinus*		
11			x
12	Castor bean; *Ricinus* Tree Tobacco; *Nicotiana glauca*		

13			
14			x
15	Tree Tobacco; *Nicotiana glauca*		
16		Mulefat; *Baccharis salicifolia*	

Total Invasive Species	**Total Native Species**	**Total Blank Spaces**
2 species - 5 instances at 4 meter marks	**3 species - 11 instances at 8 meter marks**	**4 blank spaces**

Transect 2:

Name of Recorder: Meghan Smith, Jaylah Brown, Jordan Damond, and Alonzo Houston

Date of Recording: _____10/11/16_____

Site Location: _____Tijuana Estuary_____

Meter Mark	**Invasive Species, mark and write scientific name**	**Native Species, mark and write scientific name**	**Blank Space**
0		Mulefat; *Baccharis salicifolia*	
1			x
2			x
3			x
4			x
5			x
6			x
7			x

8			x

Total Invasive Species	**Total Native Species**	**Total Blank Spaces**
0 species - 0 instances	**1 species - 1 instance**	**7**