How has the San Francisco Bayland's Ecosystem changed in the last century?

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INTRODUCTION

We are interested in how specifically global climate change affects the San Francisco Bay Area. We wanted to know how something as global and macro as Climate Change affects us and our community on a local level.

BACKGROUND AND SIGNIFIGANCE

- The ocean has seen a 30% increase in acidity[4], and that increase is harming all of its inhabitants. As a direct result of decreases pH levels, ⅓ of the world's coral reefs are dying[3].
- Since the 1970s, some coral reefs have shrunk by 40%[2]
- Since the past century, average global temperatures have increased by 0.85° C

Finding the biological and social repercussions of climate change on a small scale - in our case, the Palo Alto Baylands - will give us a better overall understanding of just how climate change influences a local environment in all aspects. Given the significance that global warming is today, it is important for us to understand how it changes the ecosystem on a small scale.

RESEARCH METHODOLOGIES

- Research Type
  - Our research is pure research, as the point of this question is to inform individuals about how climate change has affected communities that are right next door.
- Data Collection and Methodology
  - Like most research, our data has both quantitative and qualitative aspects to it. However, we will focus mostly on quantitative data, where we will be analyzing numbers, specifically the change in abiotic factors due to climate change and then biotic factors to see if the biotic factors were affected by climate change.
  - We plan on collecting data by researching it online and asking experts.
  - Our methodology is observational. We will observe subjects and measure the variables of interest. We will do all this without interfering with any variables.

RESEARCH

1. The Numbers

- Wetland losses in the bay area range from 70 - 93%[6]
- In 1988, there were 16264 hectares of tidal wetlands in the North, Central, Suisun, and South Bays
- In 1800, there were 76861 hectares of tidal wetlands in the North, Central, Suisun, and South Bays

Baylands Ecosystem Habitat Goals Science Update (2015)
Science Foundation Chapter 6: Carbon Sequestration and Greenhouse Gases in the Baylands

Table 6.2. Estimated volume of soil and carbon lost when former tidal wetlands were converted to a nontidal landcover. Non-tidal wetlands are managed or muted wetlands or duck ponds, non-wetlands are areas that have been converted to farming, grazing or urban development, and salt ponds are or previously were non-tidal ponds managed for salt production.

		Volume (m^3) Lost by Converted Landcover Type					Carbon Lost	
Region	Segment	nontidal wetland	non-wetland	salt pond	Total m^3	Total km^3	metric tons C	CO_2 equivalent
Suisun	A	6,983,130	930,606		7,913,736	0.00791	264,319	968,582
	B	4,522,525	471,990		4,994,515	0.00499	166,817	611,291
	C	250,760	17,475		268,235	0.00027	8,959	32,830
North Bay	D	3,639,040	532,446	211,690	4,383,176	0.00438	102,128	374,243
	E	857,763	6,326,361	12,269	7,196,392	0.0072	167,676	614,439
	F	354,514	5,306,763	230,328	5,891,606	0.00589	137,274	503,035
	G	442,995	2,024,116	186,104	2,653,215	0.00265	61,820	226,536
	H	59,551	8,334		67,884	0.00007	1,582	5,796
Central Bay	I	17,148	118,258	31,323	166,729	0.00017	3,885	14,236
	J	32,960	154,474		187,434	0.00019	4,367	16,003
	K	15,648	504,054	18,721	538,403	0.00054	12,545	45,970
	L	71	7,165		7,236	0.00001	169	618
South Bay	M	117,221	2,053,593	415,976	2,586,791	0.00259	60,272	220,864
	N	814,486	129,703	14,806	958,995	0.00096	22,345	81,881
	O	731,175	333,374	3,096,949	4,161,498	0.00416	96,963	355,315
	P	673,283	1,306,415	1,660,603	3,640,300	0.00364	84,819	310,815
	Q	69,782	340,441	483,584	893,807	0.00089	20,826	76,315
	R	260,924	5,567	8,806	275,297	0.00028	6,414	23,505
	S	302,255	52,720	466,794	821,768	0.00082	19,147	70,164
	T	97,295	15,512		112,807	0.00011	2,628	9,632
Total		20,242,526	20,639,348	6,837,952	47,719,827	0.04772	1,244,954	4,562,069

- Sacramento-San Joaquin Delta has emitted up to 1 billion tons of CO2 over the last century[11]

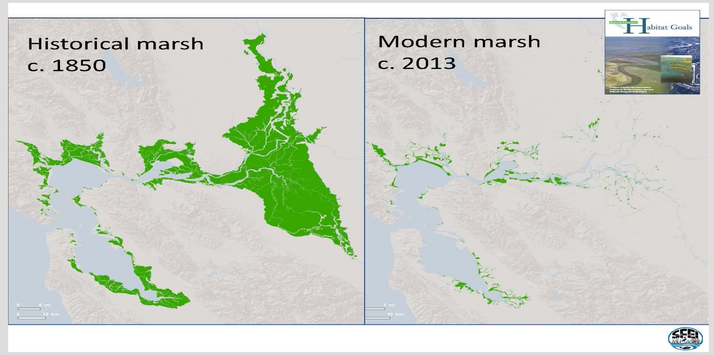
2. Case 1: Salt Marsh Harvest Mouse

- Endangered due to Climate Change[9]
- Live in salt marshes, which have been greatly damaged due to sea level rise and climate change as a whole
- Original 193,800 acres of tidal marsh in 1850 -> 30,100 acres Today[9]
- Saltmarshes are degrading due to human factors. Change in vegetation and water quality of salt marshes further impacts the marshes negatively

3. Case 2: California Clapper Rail (Ridgway's Rail)

- Endangered due to Climate Change[13]
- Greatly affected by sea level rise: Habitat Loss and stress on plants that support the Rail
- Since 1993, 3 mm sea rise per year
- Mean sea level rise on California coast will be 1.0 - 1.4 meters by year 2100.
  - Floods 150 square miles
  - 41 more square miles are lost due to erosion

DATA ANALYSIS AND RESULTS



Data Analysis

- There is undeniable proof that climate change occurs. It affects everything, from the biosphere to our local community.
- Animals and plants that live a short couple of miles away are severely affected by climate change

Projections

- An increase of 6 degrees Celsius to the average regional temperature by between 2070 and 2100[8]
- Sea level rise predicted to be 72 cm by 2100[12]
- 60% of intertidal mudflats lost by 2100

Future Steps

Given that our research project has proven that the baylands ecosystem has changed in the last century, we need to act in order to slow and eventually halt this negative change.

ACKNOWLEDGEMENTS / REFERENCES

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