Process Book

Project: Endangered Animals
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Overview:

Our visualization represents data on endangered animals worldwide. Specifically, we visualize datasets gathered from the "IUCN Red List of Threatened Species Red List," http://www.iucnredlist.org/. The data from this site contains data specific to types of animals, such as mammals, amphibians, or birds and then is further divided by country. Our visualization takes the the data organization into account and implements both a map and list of countries to allow potential users to explore available data via geography. The data about the animals is displayed in a stacked bar chart that is updated based upon user selection.

Motivation:

The authors of the visualization love animals and hope to create greater awareness of threat of extinction to the public. We also both come from a mathematical background and appreciate working on data that gives us a new point of view.

Datasource:

As noted earlier, our data is derived from the "IUCN Red List of Threatened Species Red List," http://www.iucnredlist.org/. This data was already organized via tables and csv files.

Table 6a: Red List Category summary country totals (Animals)

IUCN Red List Categories: **EX** - Extinct, **EW** - Extinct in the Wild, **CR** - Critically Endangered, **EN** - Endangered, **VU** - Vulnerable, **LR/cd** - Lower Risk/conservation dependent, **NT** - Near Threatened (includes LR/nt - Lower Risk/near threatened), **DD** - Data Deficient, **LC** - Least Concern (includes LR/lc - Lower Risk, least concern).

AFRICA

North Africa	EX	EW	Subtotal	CR	EN	VU	Subtotal	NT	LR/cd	DD	LC	Total
Algeria	2	1	**3**	15	36	64	**115**	55	0	123	889	**1,185**
Egypt	1	1	**2**	5	27	120	**152**	142	2	143	1,354	**1,795**
Libya	0	1	**1**	5	17	37	**59**	29	0	63	662	**814**
Morocco	2	0	**2**	27	56	83	**166**	81	0	170	1,340	**1,759**
Tunisia	11	0	**11**	11	26	51	**88**	45	0	91	817	**1,052**
Western Sahara	0	1	**1**	4	13	31	**48**	33	0	109	843	**1,034**

Sub-Saharan Africa	EX	EW	Subtotal	CR	EN	VU	Subtotal	NT	LR/cd	DD	LC	Total
Angola	0	0	**0**	10	32	66	**108**	59	0	228	2,395	**2,790**
Benin	0	0	**0**	8	16	46	**70**	44	0	113	1,601	**1,828**
Botswana	0	0	**0**	4	5	15	**24**	30	0	11	995	**1,060**
Burkina Faso	0	1	**1**	5	6	18	**29**	21	0	3	762	**816**
Burundi	0	0	**0**	5	15	32	**52**	40	0	35	1,040	**1,167**
Cameroon	0	0	**0**	51	108	125	**284**	82	0	219	2,543	**3,128**
Cape Verde	1	0	**1**	5	21	36	**62**	30	0	102	840	**1,035**
Central African Republic	0	0	**0**	8	5	22	**35**	24	0	48	1,348	**1,455**
Chad	0	1	**1**	11	5	20	**36**	20	0	12	810	**879**
Comoros	0	0	**0**	7	16	79	**102**	110	0	83	869	**1,164**
Congo	0	0	**0**	8	19	61	**88**	41	0	159	1,911	**2,199**
Congo, The Democratic Republic of the	0	0	**0**	29	70	137	**236**	89	0	439	3,467	**4,231**
Côte d'Ivoire	0	0	**0**	14	34	86	**134**	101	0	153	1,975	**2,363**
Djibouti	0	0	**0**	4	12	79	**95**	130	0	98	964	**1,287**
Equatorial Guinea	0	0	**0**	9	29	52	**90**	39	0	123	1,545	**1,797**
Eritrea	0	0	**0**	9	14	93	**116**	142	0	103	1,197	**1,558**
Ethiopia	0	0	**0**	18	33	57	**108**	41	0	63	1,322	**1,534**
Gabon	0	0	**0**	9	30	69	**108**	39	0	178	1,901	**2,226**
Gambia	0	0	**0**	8	13	41	**62**	43	0	120	1,449	**1,674**
Ghana	0	0	**0**	12	29	78	**119**	81	0	144	2,047	**2,391**
Guinea	0	0	**0**	15	33	91	**139**	96	0	176	1,943	**2,354**
Guinea-Bissau	0	0	**0**	7	15	50	**72**	48	0	120	1,444	**1,684**
Kenya	2	0	**2**	39	55	152	**246**	186	2	242	2,711	**3,389**
Lesotho	0	0	**0**	0	5	9	**14**	13	0	2	368	**397**

This made loading and processing our data simple and straightforward. However, as will be seen in future sections, the predefined attributes within the tables would present a challenge in our design decisions:

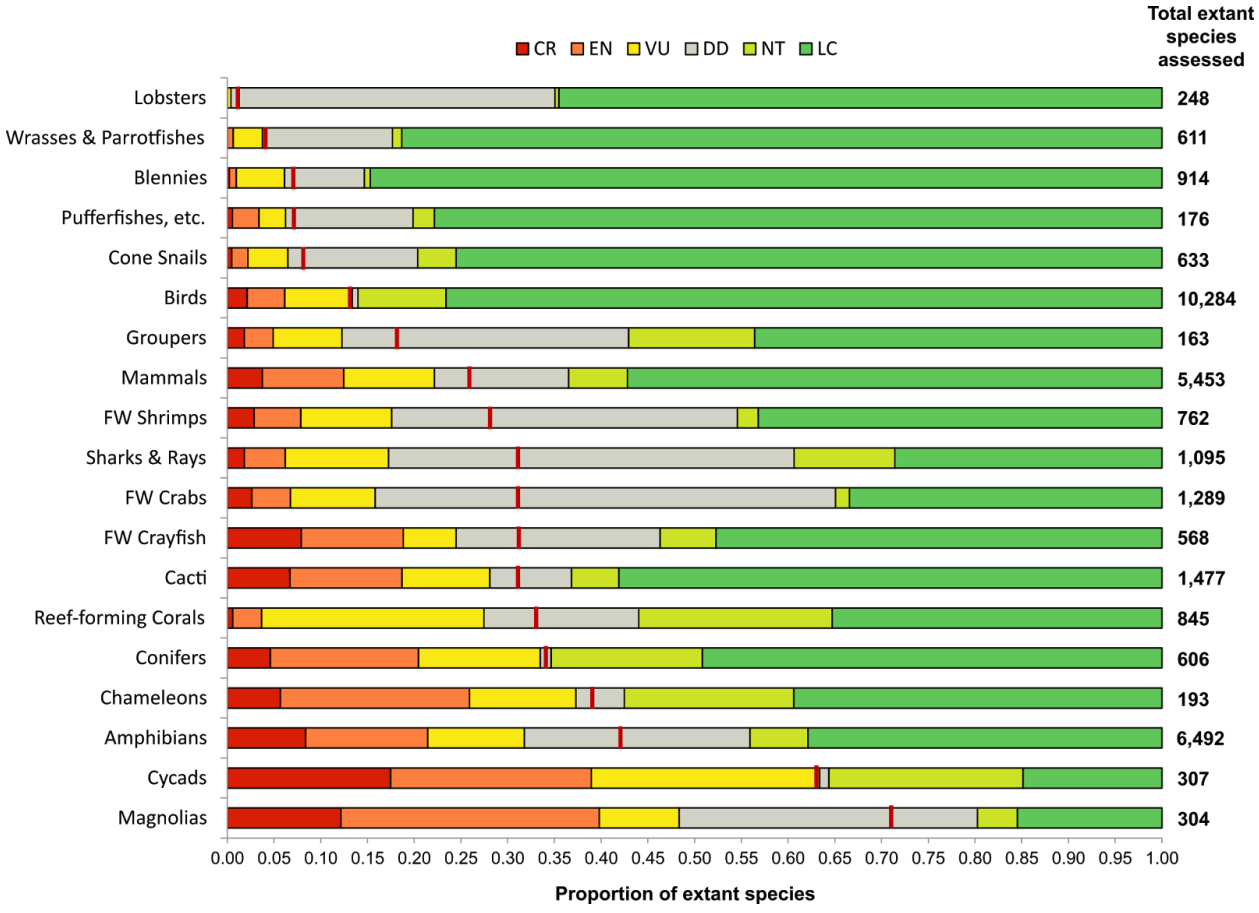
"CR - Critically Endangered, **EN** - Endangered, **VU** - Vulnerable, **NT** - Near Threatened, **DD** - Data Deficient, **LC** - Least Concern."

Questions:

The primary question we hope to answer for users of our visualization is "what is the condition of wildlife around the world?" However, from the point of view of the developers, our question quickly became how do we present our data accurately relative to country by country, as certain countries have more diverse species of animals, while others have more research collected.

Related Work/Exploratory Data Analysis:

A significant influence on our visualizations came from how the IUCN Red List displays data on threatened species.



As noted in our data section, the IUCN data contains challenging data to display:

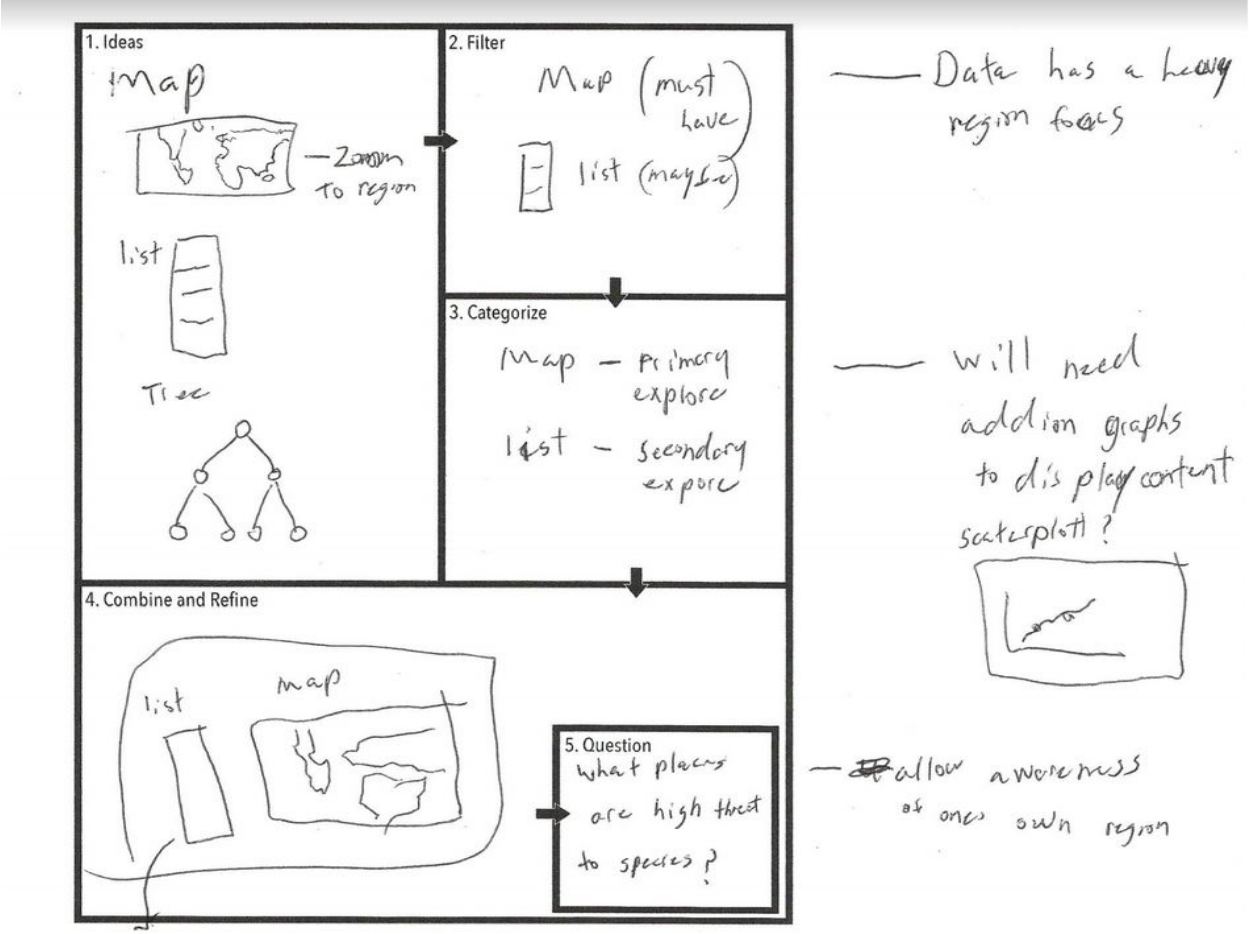
"CR - Critically Endangered, **EN** - Endangered, **VU** - Vulnerable, **NT** - Near Threatened, **DD** - Data Deficient, **LC** - Least Concern."

The reason is the key marked "DD - Data Deficient" can have an adverse effect on the user if they are not made aware of it. Moreover as you can see in IUCN own view, the "total number of species assessed" varies greatly. We believed that no matter what display we use, data deficient (meaning, data that is not collected) should be noticeable while not focal. IUCN's own use of stack bars does a fair job to accommodate this problem.

Design Evolution:

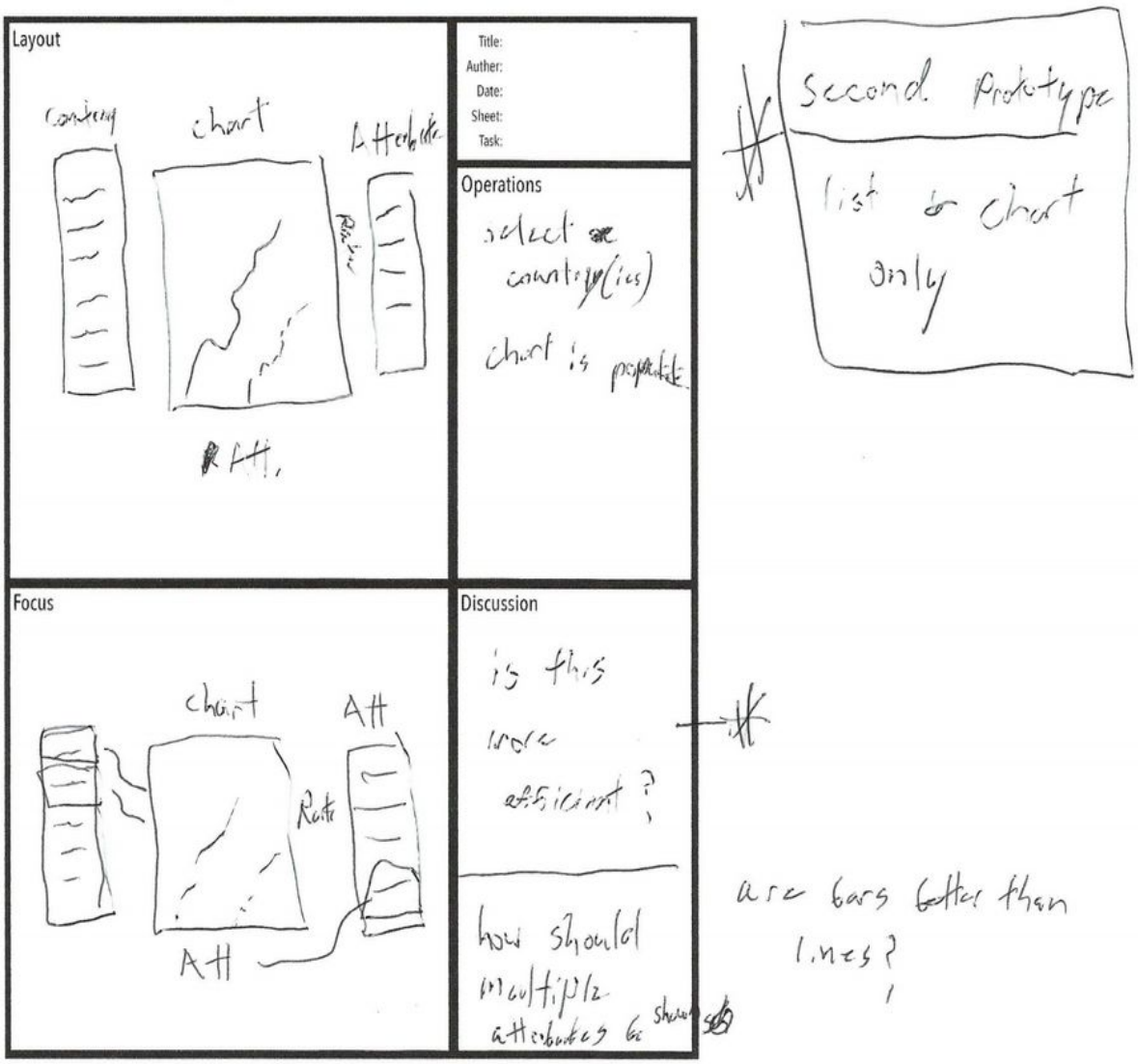
While developing our project proposal, we created 3 different designs:

1. Map/List Oriented:



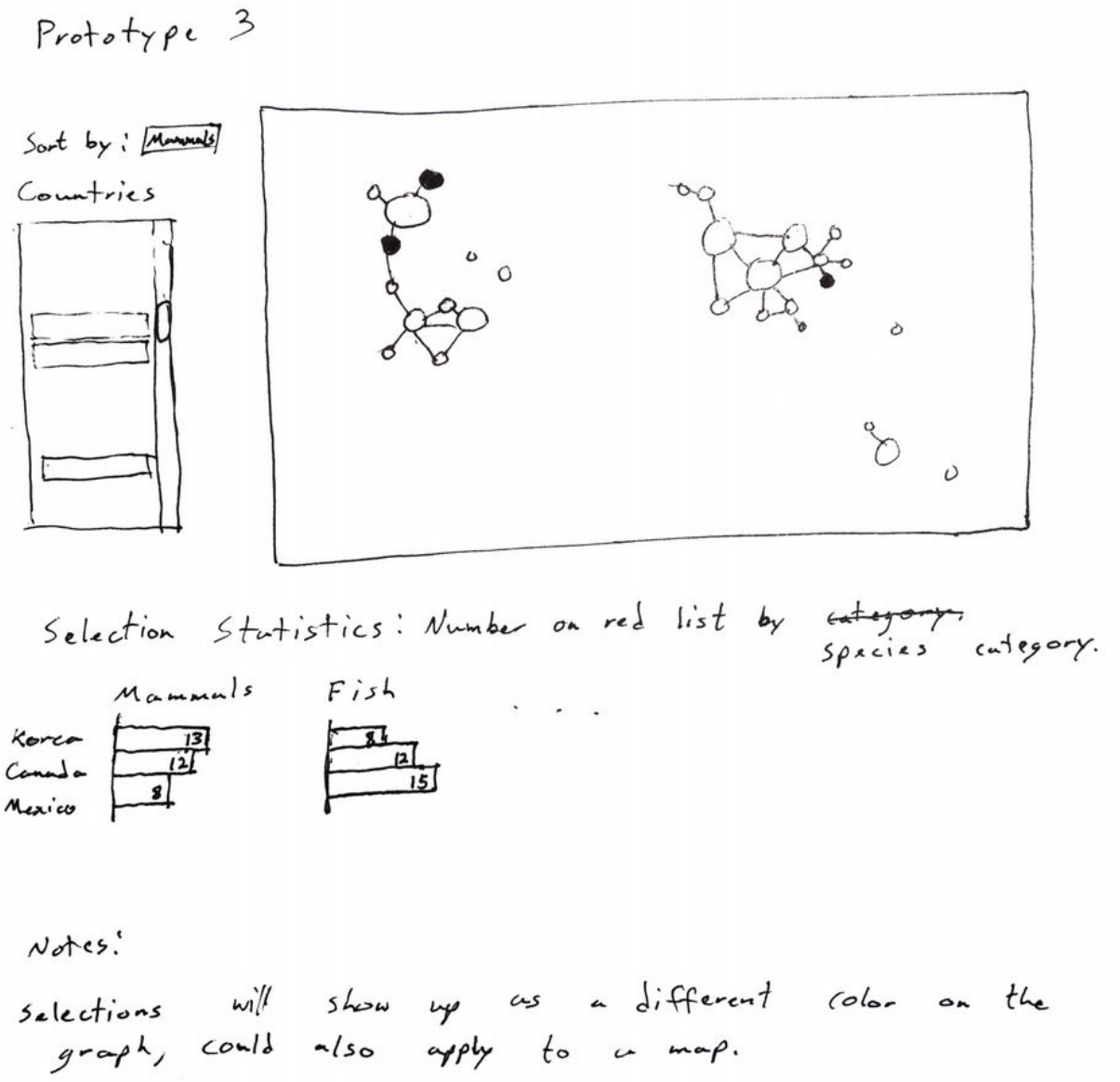
This was our first idea and the one our current vis draws most inspiration from. We developed this idea mainly because our data organized via geography. At this point we knew we have to have a 3rd component to display the data per country but we had not determined what it would be, an early idea seen above involved a scatterplot.

2. List Only



This designed recognized that the main focus of the data should be on the chart and not the map. While the map provided a nice means to explore, we didn't want the users to be distracted by it. Here we put a line chart (intended with a different color for each line) as the focal point and with two list for the user to chose their areas of interest. Countries & attributes.

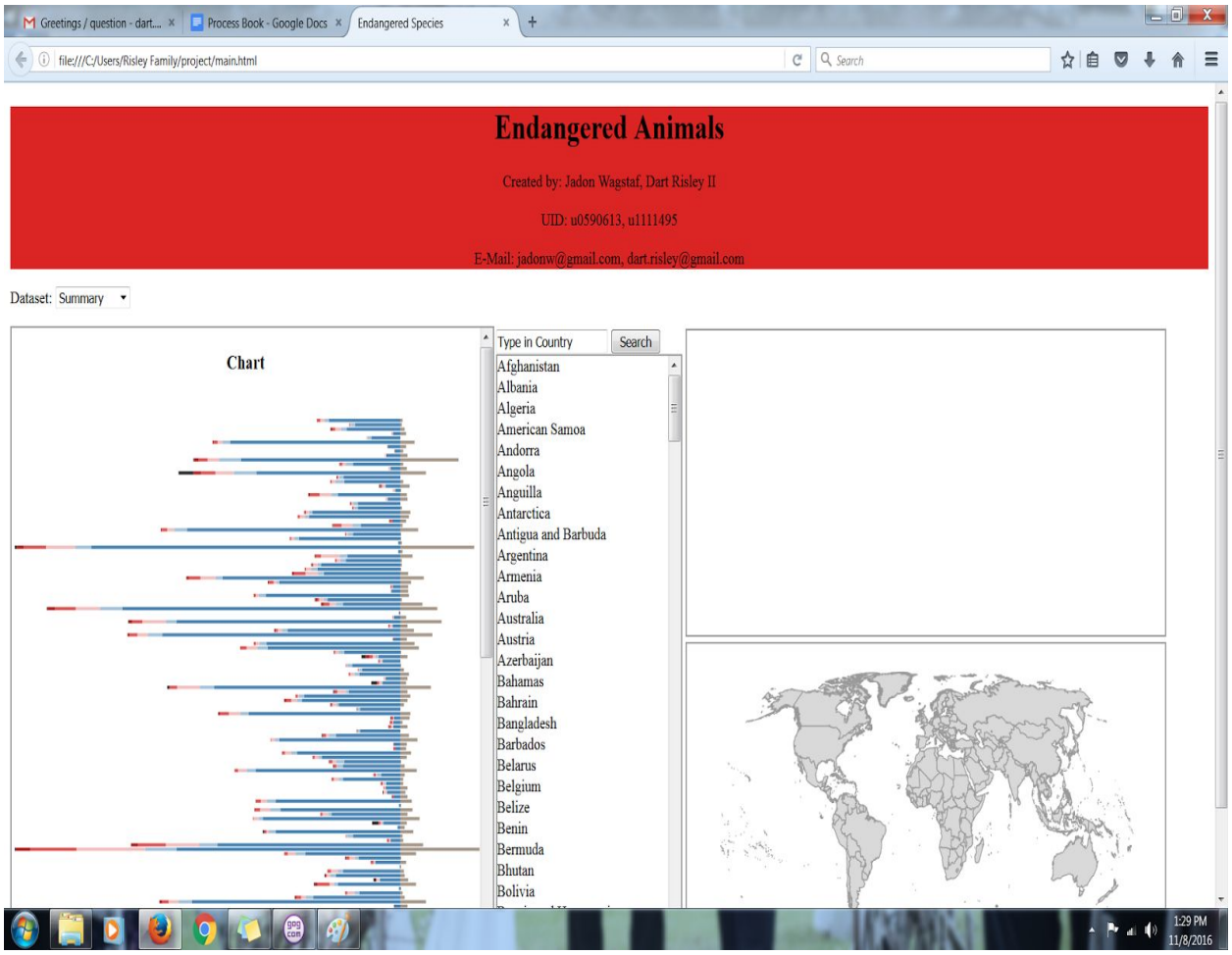
3. Tree based



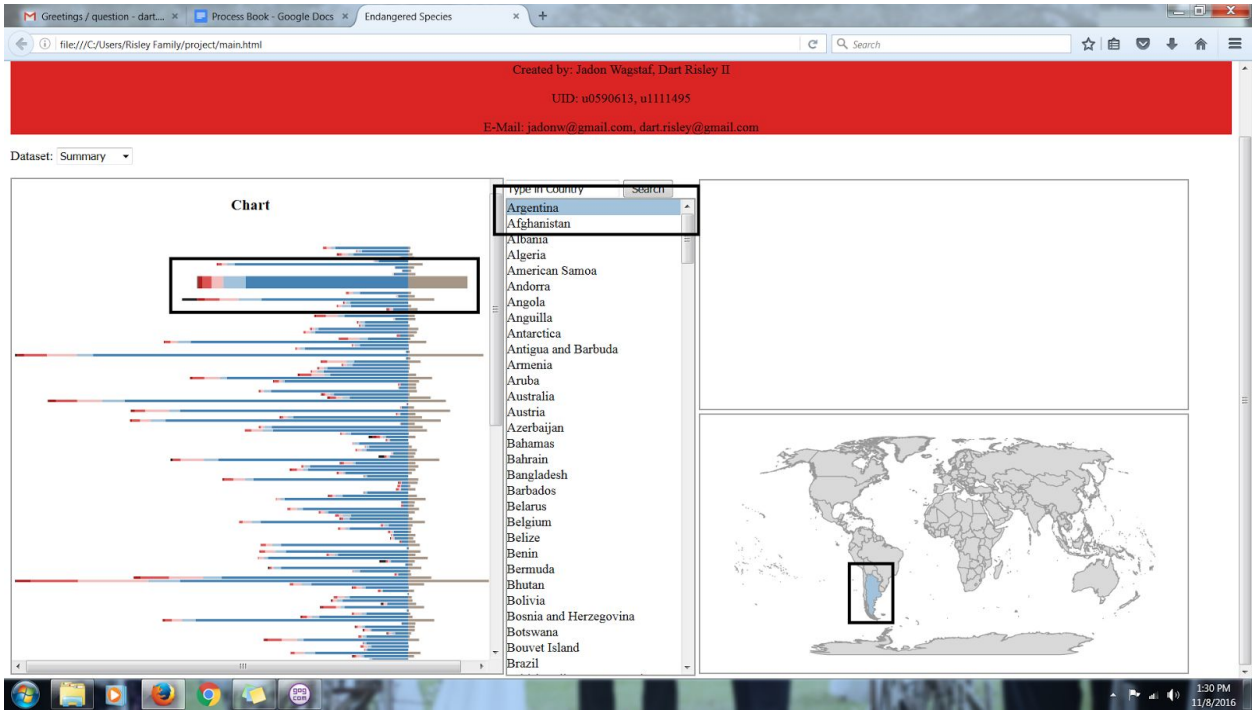
This design would represent countries as a node and each link would represent a boundary. This would allow use to show attributes about the countries view size of the node or color. The data on endangered species would be represented as through a combination of bar and line charts.

4. Design implementation

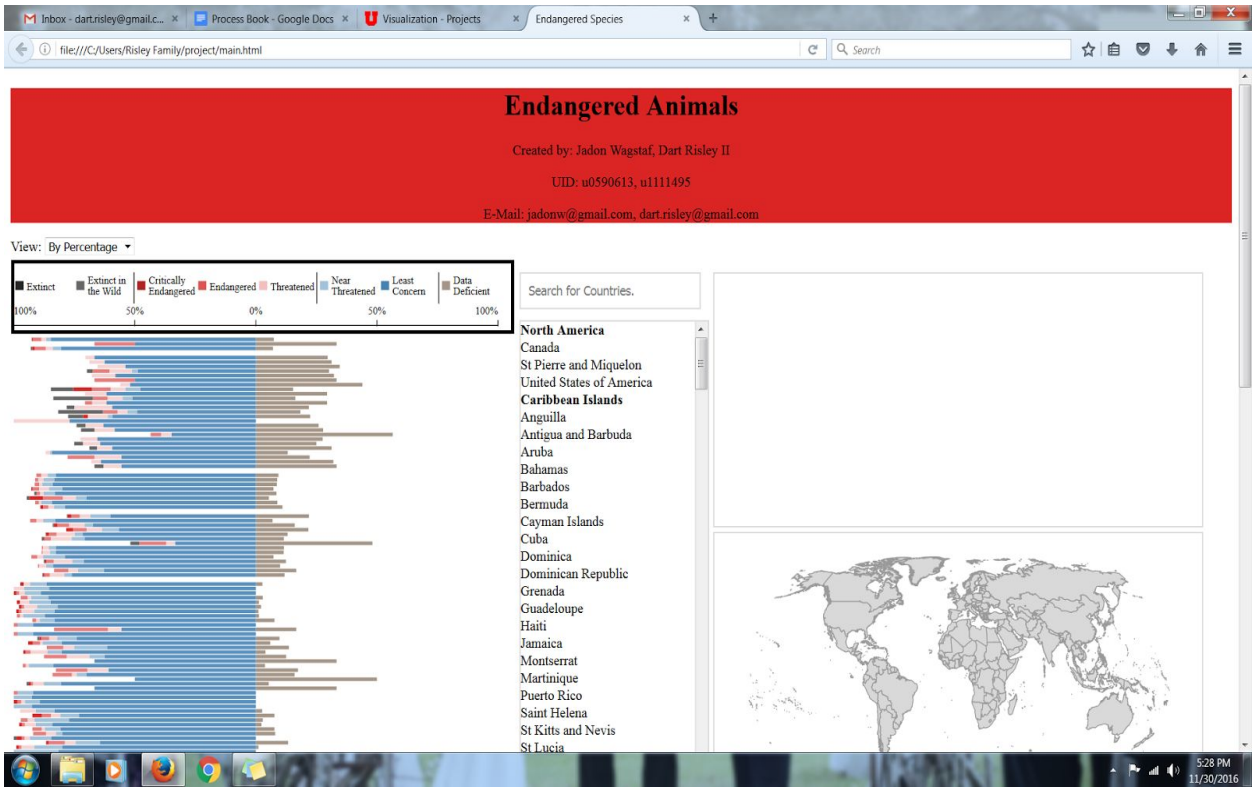
Our initial stage of visual development utilized the stacked bar chart design via HTML, Javascript and D3. We made our own variation where each data type is stacked in one direction, while the “DD” category is in the other direction, with all bars oriented horizontally, see below:



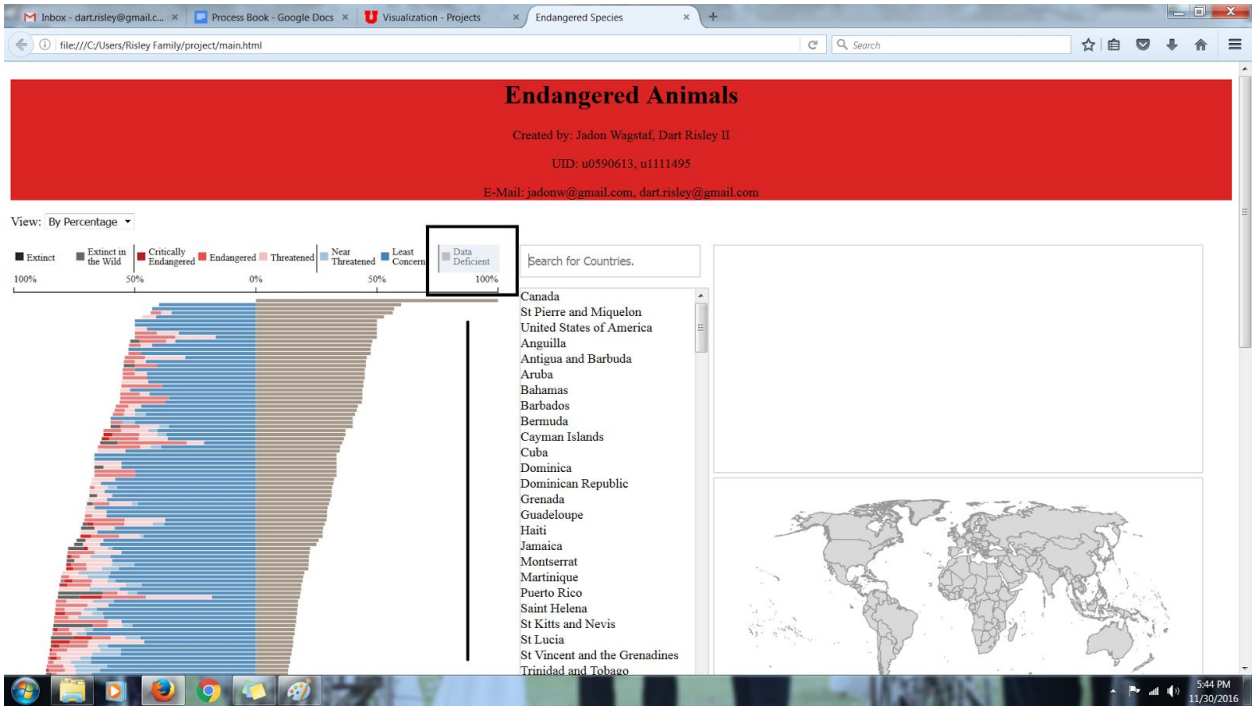
Expanding on our initial ideas from the proposal, we added new features and changed the layout. With the map and chart side by side, separated by the list, rather than one on top and the other below. We have also shrunk the map to make room for another potential feature, yet to be developed. Our most notable change, however, was the is the stack bar chart displayed data from every country initially and changes size depending upon user selection:



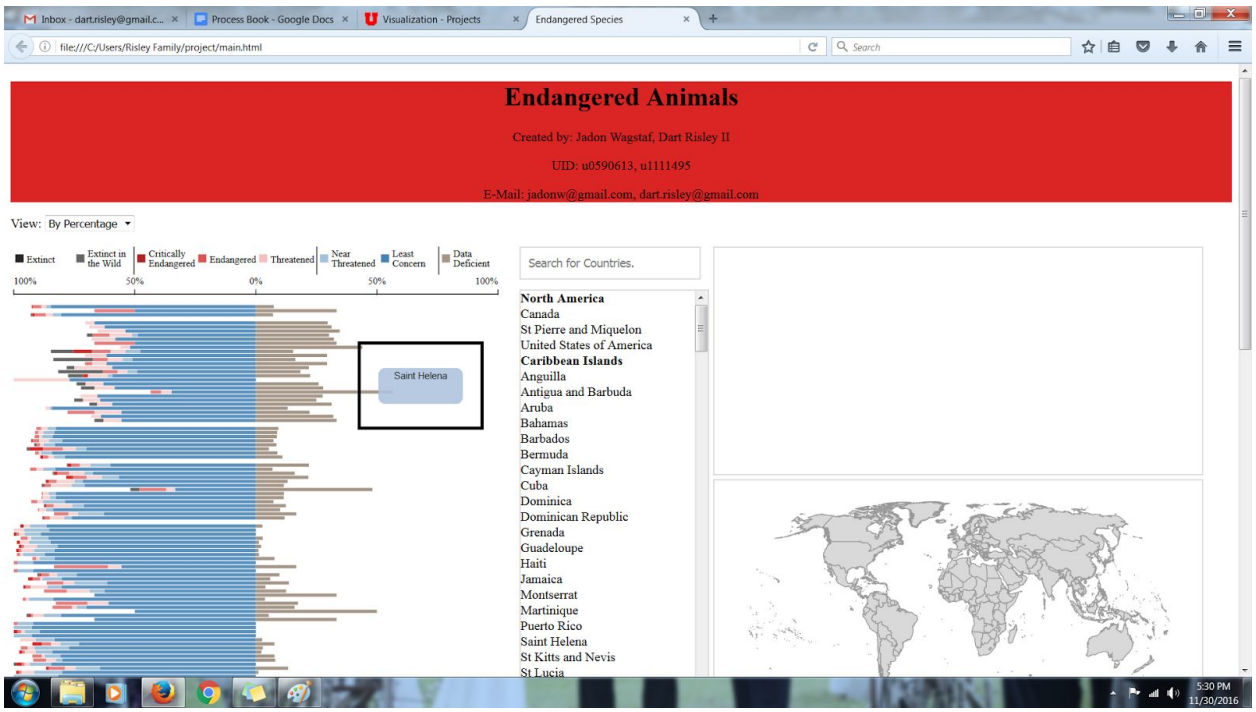
When a user selects a country from the list, that selection to the top of the list, highlight in both the list and map, then increase the size of the bars in the chart. This was accompanied by the additional implementation of a key for chart:



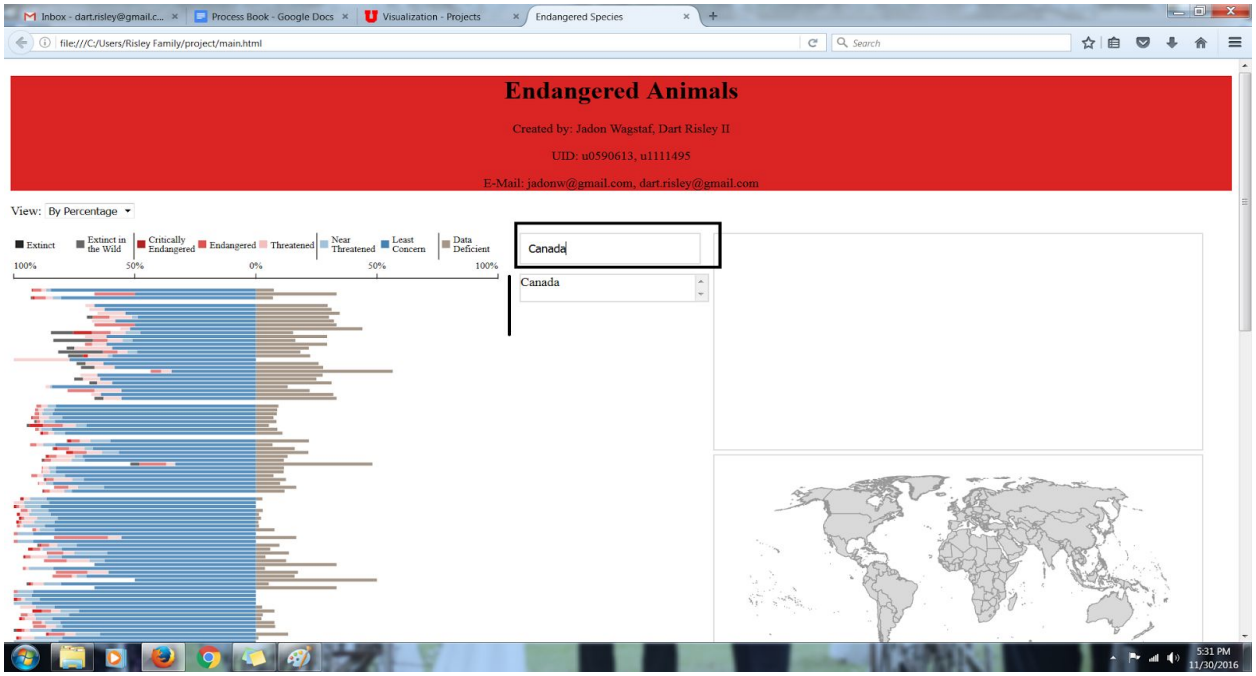
The key displayed both an axis with the values of the bars and a legend with the color code of each bar. In addition the key was also interactive, allowing users to sort by categories:



We also implemented tool tips and a country list filter:



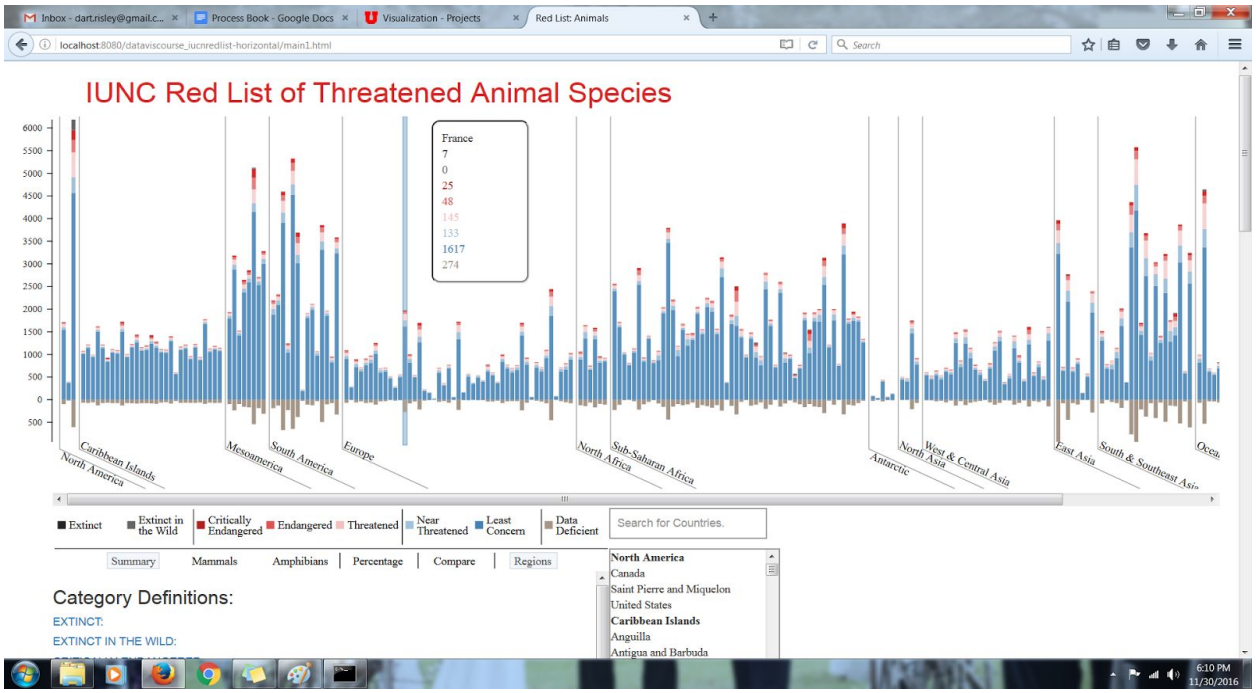
(tooltip feature)



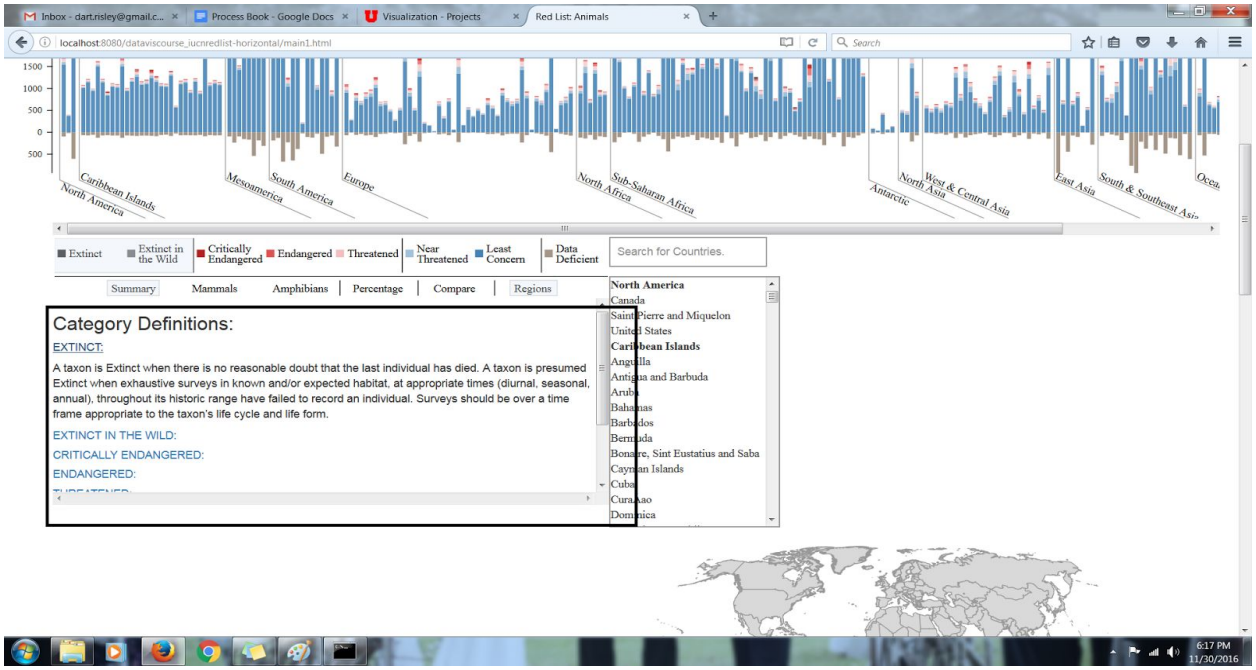
(filter feature)

Final Implementation of Project:

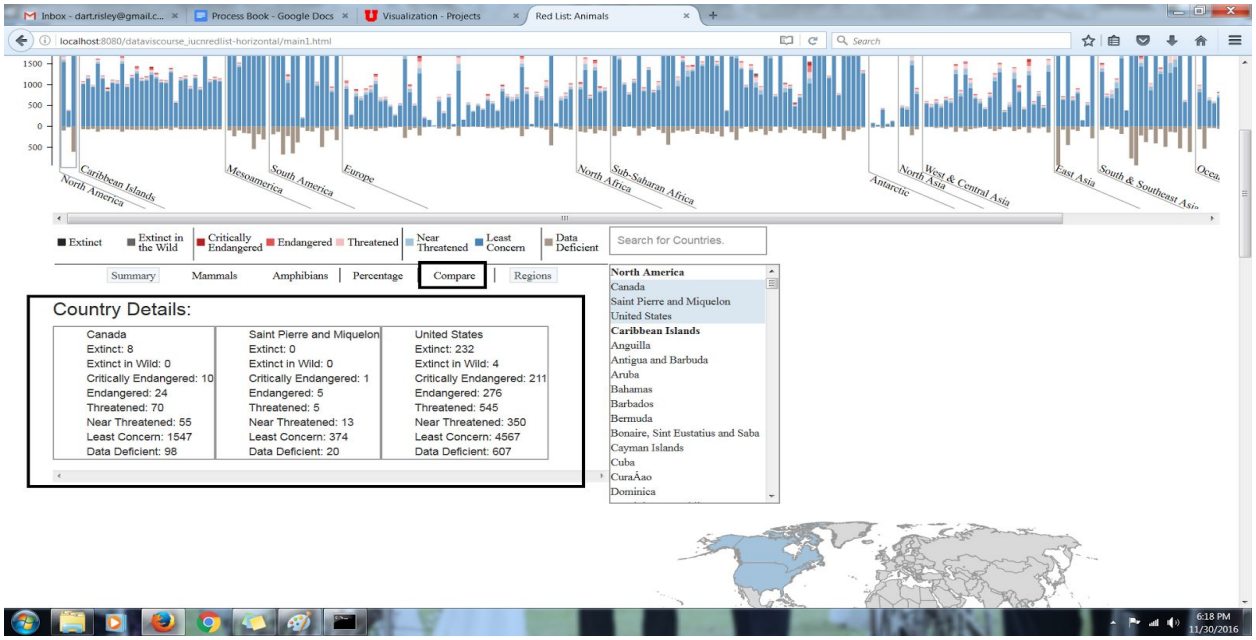
The final stage of our project development and ultimately the final product polished existing details and features, but made 3 major design changes. The first was shifting the bars from horizontal orientation to vertical across the screen:



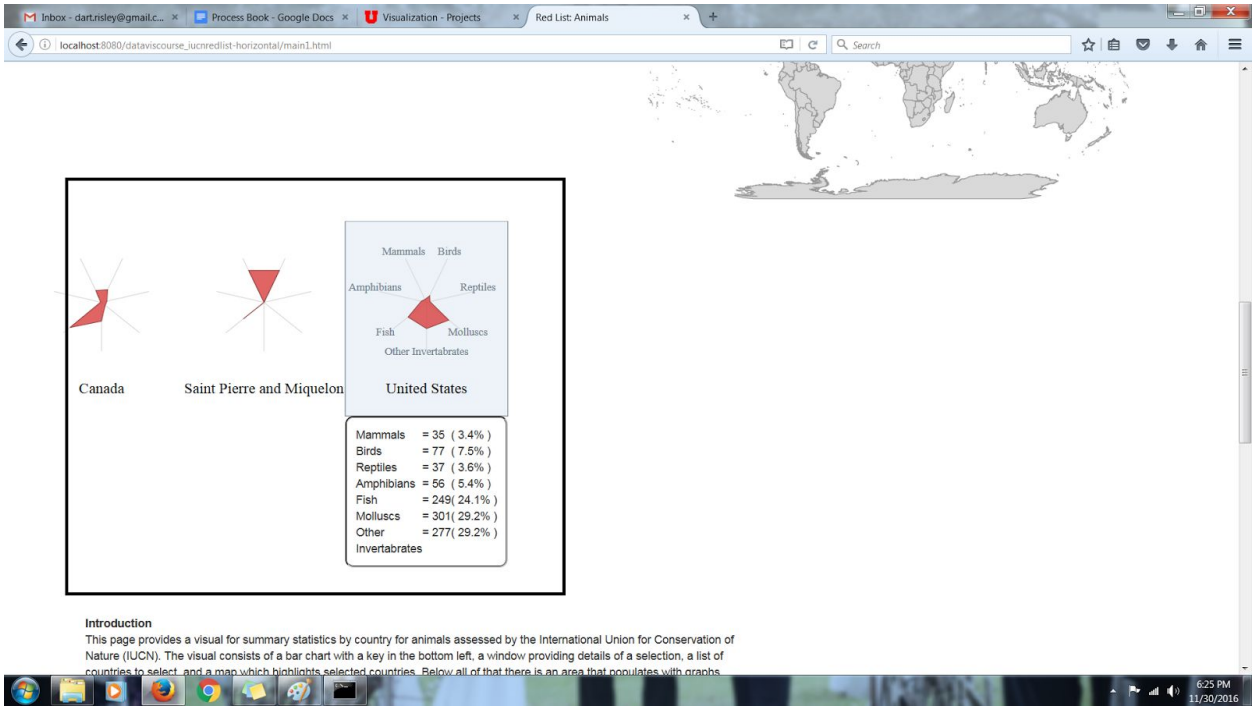
The reason for this change was allow the user to see bars at once and to shift the users attention more toward the chart which was our primary interactive visual. The next two changes came in the form of two new features, the first of which was a supplemental text field that defines the categories used in our chart:



The categories are expandable upon user click, moreover the user can change the information in this field via the compare button which will should the values for each country selected:



The final change was the addition of a graph for each country selected detailing the number each type of species present in the country (details upon user click):



Evaluation:

We believe we have found an optimal solution to our data challenges and have implemented a visual structure that is clear with room to grow. The multiple displays give users context for what they are looking at and different ways to explore the dataset.