BIODIVERSITY IN

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

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What is Biodiversity?

Encompasses all species on Earth...
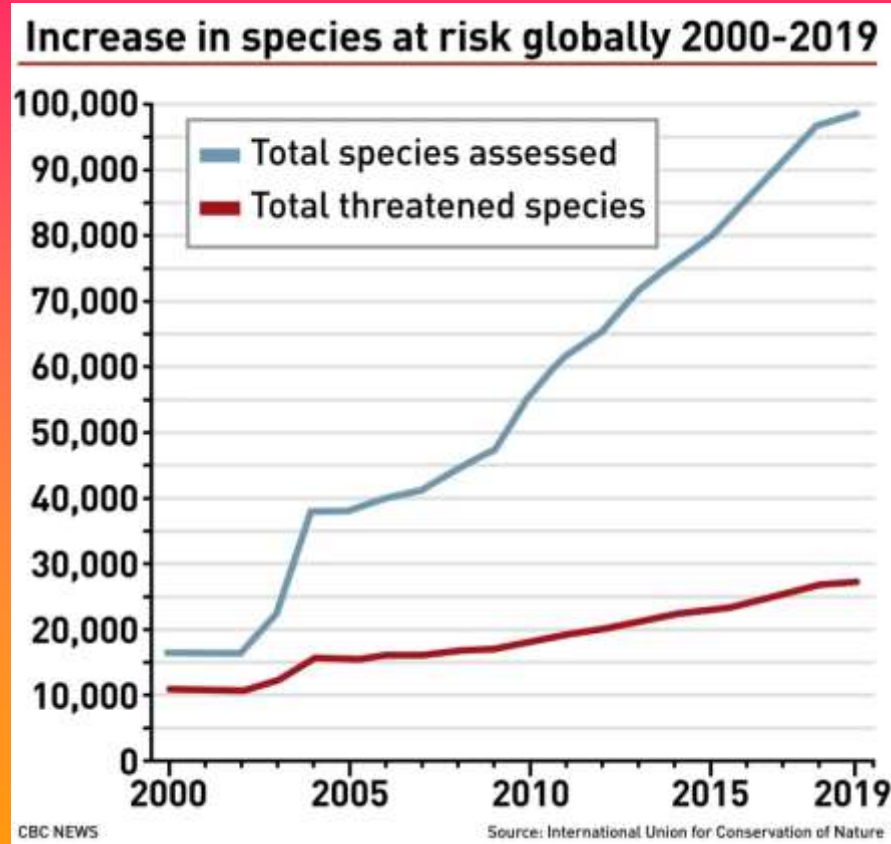

... and the environments in which they live.
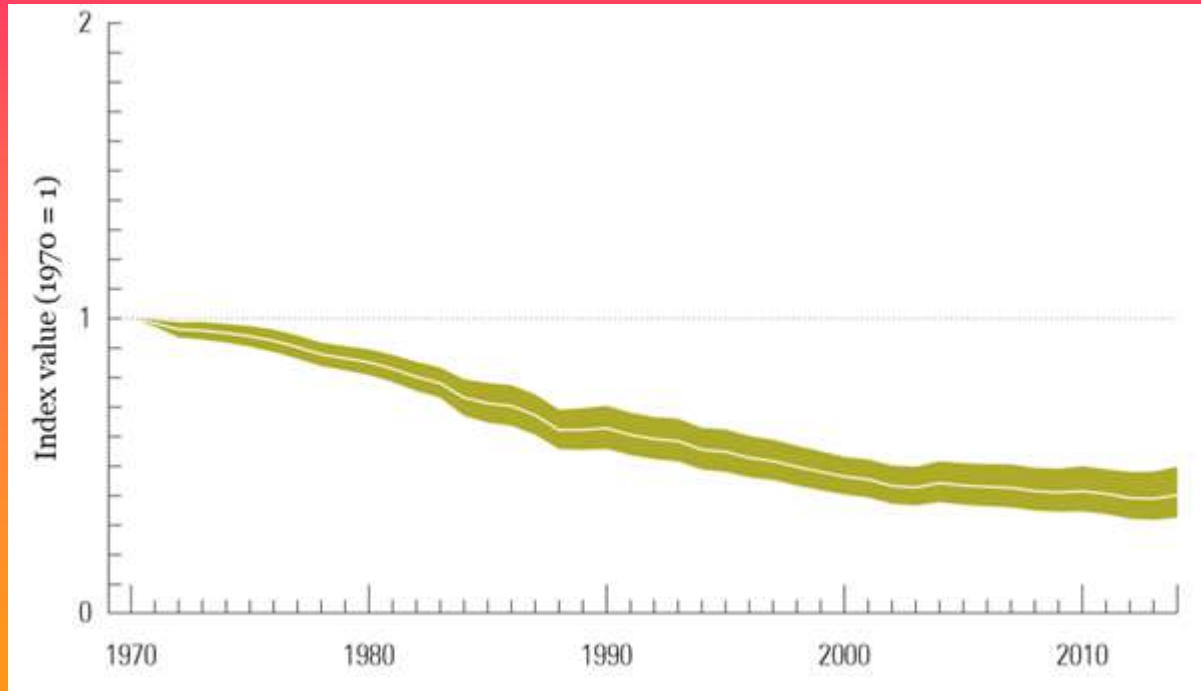
What is Biodiversity?

Our Life Support System....

...and it's greatly under threat!

ENDANGERED SPECIES ON THE RISE

Increase in species at risk globally 2000-2019

Total species assessed
Total threatened species

CBC NEWS
Source: International Union for Conservation of Nature

4

LPI (Living Planet Index) DECLINE IN VERTEBRATES

60% global decline since 1970

Threats to Biodiversity

Unsustainable Agriculture

Overexploitation of Species

Habitat Loss through Development Decisions

The Problem

biodiversity

Dispersed data sources

Data quality concerns

Wrong scale

The Solution

biodiversity

Aggregate all quality data sources into one place!

AIMS

1. Discover and assess the types of biodiversity data that is available

2. Evaluate data quality

3. Explore what kinds of questions could be answered using that data

4. Establish a baseline inventory of species in Metro Vancouver and identify data gaps

OUR WORKFLOW IS SIMPLE

COLLECT DATA ❯ **PROCESS & AGGREGATE** ❯ **PREDICT & VISUALIZE** ❯

PRIMARY DATA DESCRIPTION

GBIF (Global Biodiversity Information Facility)

- Citizen Science
- Spatial & Temporal
- Taxonomy (Evolutionary Tree)
- Spans from 1700s to present

2,957,817 records

That's a lot of records

10,563 species

And a lot of species

235 sources

And a variety of sources

Subset of Data

	Year	Lat	Lon	Data Source
Bombus impatiens	2018	49.220991	-123.214155	iNaturalist
Calidris bairdii	2016	49.221082	-123.212838	UBC Herbarium
Junco hyemalis	1990	49.221091	-123.216278	eBird

*More columns in the actual data

ENDANGERED LISTS

IUCN Red List

Database of endangered species at **international** level

SARA

Database of endangered species at **national** level

BC Red/ Blue Lists

Database of endangered species at **provincial** level

How many species on those lists?

	Species*
IUCN	**79**
SARA	**66**
BC Red-Blue	**300**

*Numbers in Metro Vancouver

SEI   (Sensitive Ecosystems Inventory)

- Ecosystem classification for Vancouver
- Identifies different ecosystems (Mature forest, Wetlands etc.) across the region and indicates habitat quality
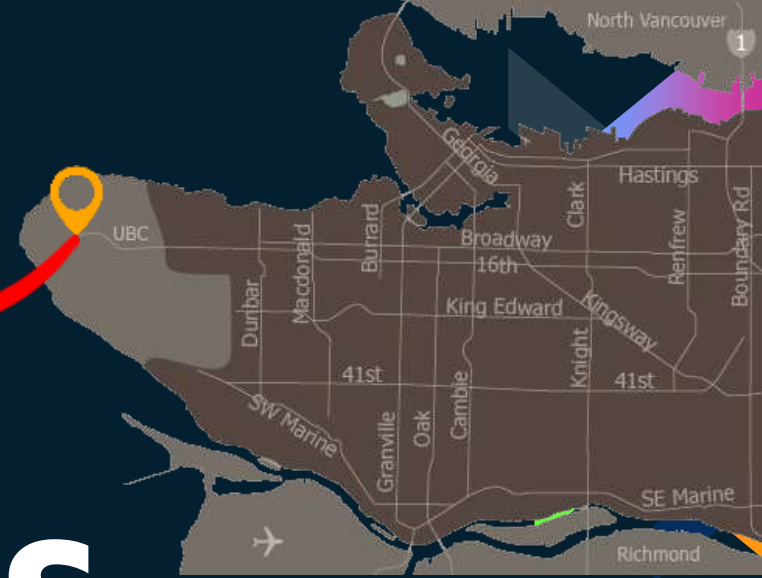
FEATURES

EXPLORATION & VISUALIZATION

1.SELECT CUSTOM REGION

Either draw out your own polygon or select from one of the layers provided

2.PLOT OCCURRENCES

Select or search any taxonomy level from the taxonomy tree to plot the observation data on the map

3.TAXONOMIC COUNT

Hierarchical histograms for unique species and total observations
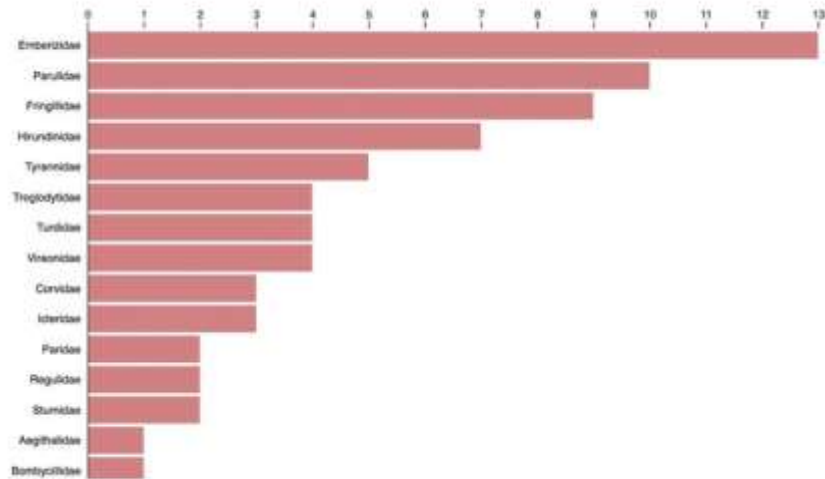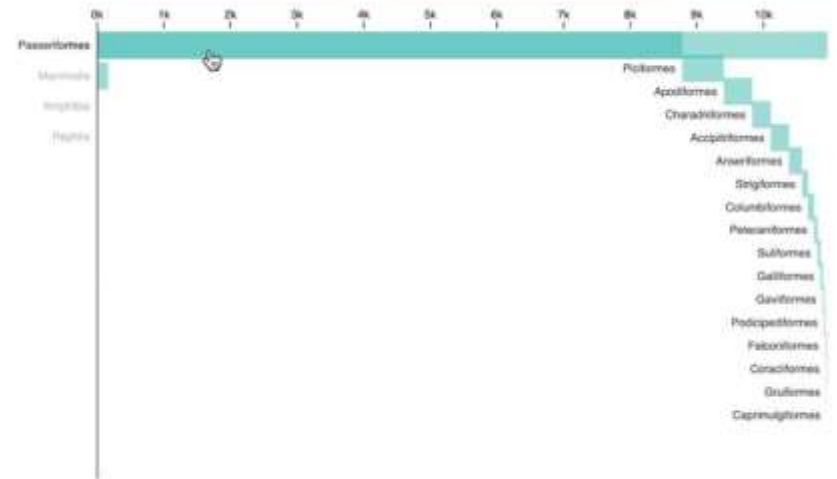
4.CHANGE OVER TIME
Interactive Time Series Plot
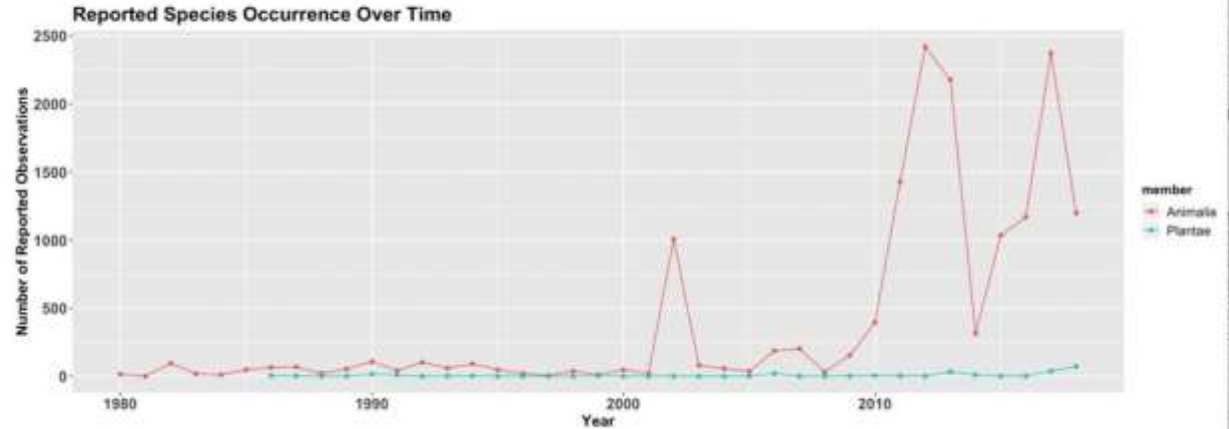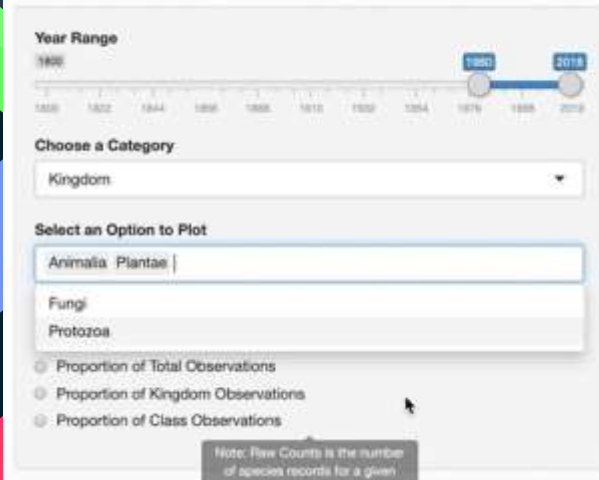
PREDICTION

1.SEI PREDICTION

Predict Species that could occur in
an SEI Polygon

Show: [10 ⟳]   Search: [   ]

rank	species	observed ▲	prob
1	Ptilidium californicum	no	0.9998946808300432
2	Myriophyllum pinnatum	no	0.999890718753814
3	Calypogeia muelleriana	no	0.9998165666113583
4	Larus heermanni	no	0.9997646661938462
5	Xylaria hypoxylon	no	0.9996954425983913
6	Marsupella sphacelata	no	0.9994679507924029
7	Lophocolea heterophylla	no	0.9991923000698618
8	Sphagnum magellanicum	no	0.9991691579738173
9	Porella cordaeana	no	0.9987911190520429
10	Setophaga ruticilla	no	0.9986399945831678

Showing 1 to 10 of 455 records

Pages: Previous 1 2 3 ... 46 Next

SEI PREDICTION:
Logistic Regression

Features included in the SEI

- Class/ Type
- Condition
- Context
- Size

Additional features

- Elevation
- Humidity
- Temperature
- Distance from fresh and salt water

Single equation for each species that predicts the probability of it being found in a given polygon

2.SDM (Species Distribution Modelling)

Predict the distribution of species spatially & identify biodiversity hotspots
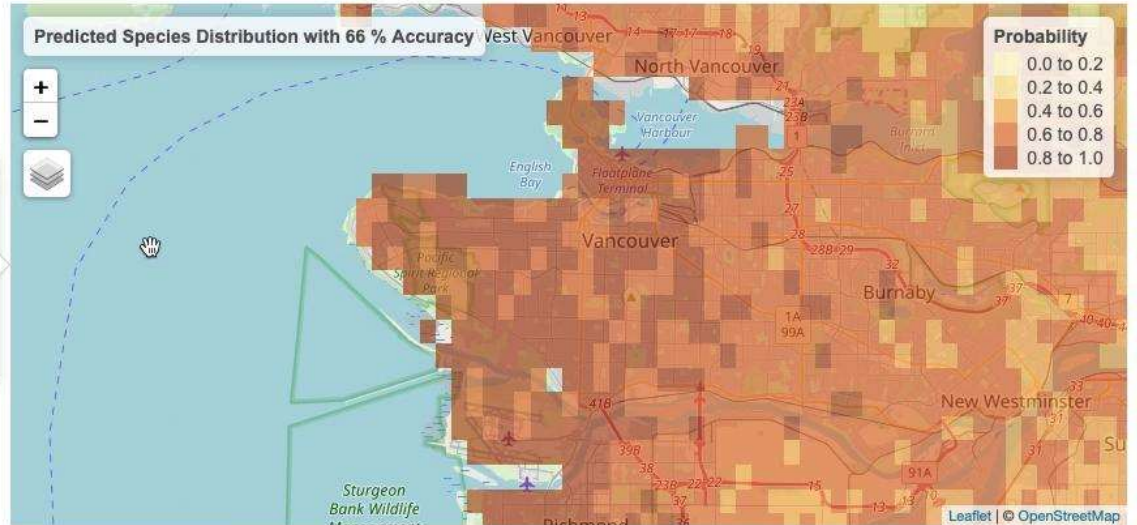
SDM PREDICTION:
User Determined Algorithms

Features

- Elevation
- Humidity
- Temperature
- Precipitation

Heatmap of predicted probability density for a species or a collection of species

LIMITATIONS

Citizen Science

- Spatial bias

- Organism bias

- Temporal bias

Modelling Limitations

- Restriction on species that can be predicted

- Prediction bias

FULFILMENT OF AIMS

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FUTURE STEPS

Improve Modelling

- Additional environment variables (e.g. soil and air quality)

- Testing to remove redundant variables

Auto-update

- Refresh data and prediction metrics automatically after a set interval

RECOMMENDATIONS

Data Logging

- Use iNaturalist and eBird to log observations

- Include precise spatial and temporal info

- Migrate legacy records to GBIF

Target undersampled species and regions

- Use the app to identify

THANK YOU!

CURRENTLY HOSTED ON HEROKU

https://tinyurl.com/y3c3j5pm