Using big data and GIS Enhancement Module Handout

Learning Objectives:

1. Interpret, analyse and evaluate data from a variety of different, unfamiliar sources
2. Explain how big data sources can help to support and illuminate your own fieldwork data
3. Consider the importance of big data in population monitoring

Link to Storymap:

You will need to access secondary data sources through a Storymap. Use this (case sensitive) link:

https://arcg.is/L110e

When using the Storymap:

- Each habitat section consists of a variety of different maps. Make sure you press the arrow on the right of whichever map you are viewing to see all of the different map views for that habitat.
- Map layers may take a moment to load
- A legend/ key can be found in the bottom left hand corner of the map.

Use this space to make notes on your answer to the exam question:

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Succession Data: Sand Dunes

Table 1: Fieldwork data collected on Winterton Dunes				
Site	**1**	**2**	**3**	**4**
Stage in succession	**Embryo**	**Fore**	**Semi-fixed**	**Fixed**
Number of pins dropped	400	400	400	400
	Number of hits on each species			
Grasses:				
Sand Couch Grass	75	12		
Marram Grass	126	315	89	43
Fescue grass (Festuca rubra)			84	364
Meadow Grass (Poa spp)			2	12
Non grasses:				
Bramble (Rubus fruticosus agg)				64
Cat's-ear (Hypochaeris radicata)		24	10	
Clover (Trifolium spp)			24	34
Daisy (Bellis perennis)			43	23
Dovesfoot Cranesbill (Geranium molle)				3
Hawkbit		10	5	
Honeysuckle (Lonicera spp)				25
Mouse-Ear Hawkweed (Pilosella officinarium)		15	15	
Moss (all species)			60	120
Sand Sedge (Carex arenaria)		10	140	80
Sea Bindweed (Calystegia soldanella)	12			
Sea Sandwort (Honckenya peploides)	26	4		
Silver Birch (Betula pendula)				14
Bare Ground	161	25	6	0
MEAN values for Abiotic:				
Wind speed (m/s)	3.4	1.8	0.8	0.5
Ground Temp (ºC)	18.1	18.8	19.2	19.9
Soil Resistance (kg/cm^2)	0.00	0.25	1.75	2.50
Humidity (%)	68.18	58.50	40.00	74.50
Simpsons diversity index (0+)	0.289	1.52	5.49	3.79

Use the Storymap and the data from table 1 to answer the following questions:

1) Compare the pattern of red fescue grass and marram grass across the dunes at Broomhill Burrows, to the pattern found at Winterton Dunes.

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2) Suggest an explanation for this pattern

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The students who collected the Winterton data formed a conclusion:

There is evidence that succession is occurring at Winterton Dunes. Bare ground reduces from 161 at site 1 to 0 at site 4, and soil resistance increases from 0.0 to 2.50 kg/cm. This can be explained by succession as the process starts with bare, unstable ground and as conditions improve over time, the abiotic conditions become more favourable for plant growth. This is due to the build up of moisture and organic matter in the soil (increasing the resistance). The data also shows a shift in the community of plants as expected in a successional environment. At site 1 there is a dominance of pioneer species such as sand couch grass and marram. By site 4 the community is mainly generalist plants such as red fescue grass and meadow flowers. Species richness follows a general trend of increase, however, species diversity calculations show that site 3 was more diverse than site 4. This can be explained by the dominance of red fescue grass at site 4 (364 out of 400 pins) which will have impacted in the calculation of species diversity.

3) Use the data and map to evaluate the student's conclusion

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4) Assess to what extent the big data set can help us to draw reliable conclusions about succession.

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5) Suggest how else a student might use this data?

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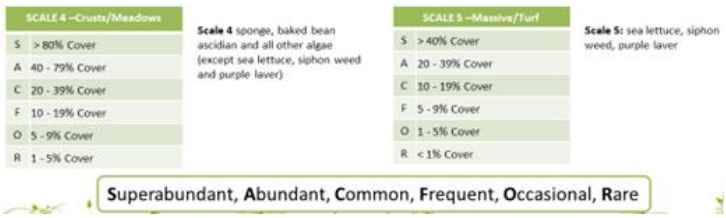
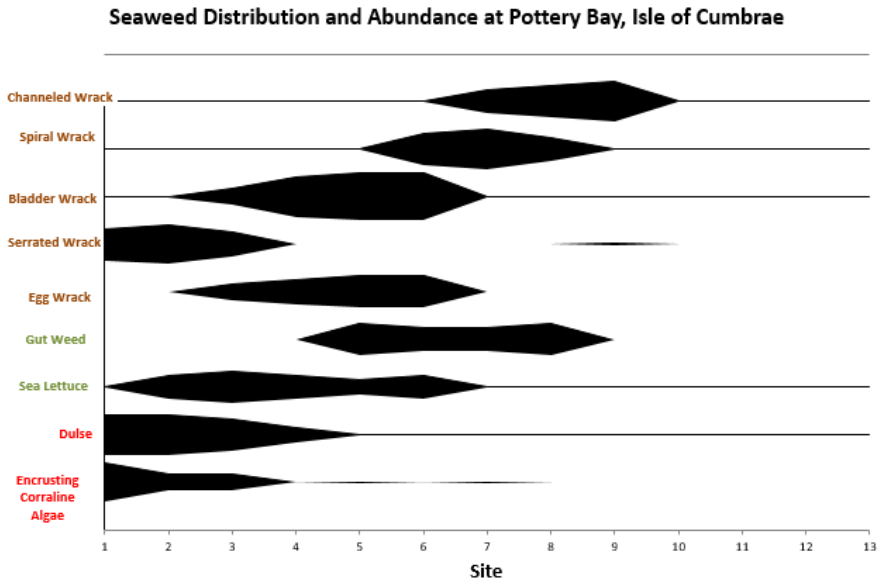
Species distribution and abundance: Rocky Shores

Table 2: Fieldwork data collected at Pottery Bay, Isle of Cumbrae			Lower Shore		Middle Shore				Upper Shore			Splash Zone
		Quadrat	1	2	3	4	5	6	7	8	9	10
Colour	**Species**	**Height above chart datum (m)**	**0.5**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**
		Common Name										
Brown	*Pelvetia canaliculata*	Channelled Wrack							F	C	A	
Brown	*Fucus spiralis*	Spiral Wrack						C	A	F		
Brown	*Fucus vesiculosus*	Bladder Wrack			O	A	S	S				
Brown	*Fucus serratus*	Serrated Wrack	C	A	F							
Brown	*Ascophyllum nodosum*	Egg Wrack			O	F	C	C				
Green	*Ulva intestinalis*	Gut Weed					C	F	F	C		
Green	*Ulva lactuca*	Sea Lettuce		F	C	F	O	F				
Red	*Lithophyllum incrustans*	Encrusting Coralline Algae	A	O	O							
Red	*Palmaria palmata*	Dulse	A	A	C	O						

Table 2 shows fieldwork data collected at Pottery Bay, Isle of Cumbrae using a SACFOR abundance scale.





6) Use the Storymap to describe the distribution and abundance of red, brown and green seaweed at Gorah rocks.

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7) Compare the pattern you have described above to the findings in the Pottery bay fieldwork data (table 2 and the kite diagram).

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8) You will have noticed that green seaweeds don't follow the same patterns across both rocky shores. Suggest a reason for this difference.

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9) Both rocky shores show a zonation pattern in seaweeds, particularly in the brown and reds. Discuss how and why seaweeds show this pattern in distribution.

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10) How could we further investigate this in a lab using chromatography?

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Species distribution and abundance: Woodlands

A group of students collected some woodland data in spring as part of their biology field trip. This is displayed in table 3. Table 4 shows data from the same woodland, collected by a different group of students as part of their biology trip in the autumn. Both groups followed the same sampling method and collected the same amount of data.

Site: Grove Wood, East Bergholt March (Spring)	Table 3 Woodland Edge	Table 3 Woodland Centre
Ash	2	2
Bluebell	29	0
Bramble	6	46
Clustered dock	40	6
Common ivy	0	0
Common chickweed	14	0
Common mouse-ear	0	0
Dog's mercury	6	2
Elder	2	5
Elm	2	0
Ground ivy	4	0
Honeysuckle	0	0
Red campion	43	0
Spring beauty	0	0
Stinging nettle	0	7
Species Diversity	4.9	0.65
Light intensity / lux	2894.87	921.20
Soil temp / °c	8.19	6.99
Air temp / °c	14.11	9.97
Humidity	55.60	49.33
canopy cover (%)	43.47	81.87

Site: Grove Wood, East Bergholt September (Autumn)	Table 4 Woodland Edge	Table 4 Woodland Centre
Ash	21	1
Bluebell	8	0
Bramble	36	68
Clustered dock	15	5
Common ivy	0	0
Common chickweed	12	0
Common mouse-ear	0	0
Dog's mercury	22	0
Elder	3	0
Elm	0	0
Ground ivy	16	0
Honeysuckle	0	0
Red campion	13	0
Spring beauty	0	0
Stinging nettle	4	1
Species Diversity	7.57	1.21
Light intensity / lux	3736.47	536.40
Soil temp / °c	18.87	17.96
Air temp / °c	16.14	15.73
Humidity	57.13	48.13
canopy cover (%)	80.27	90.00

11) Using the spring data in table 3, describe the difference in the plant communities on the edge of the woodland to the centre of the woodland, with reference to an abiotic factor.

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Species distribution and abundance: Woodlands

12) Compare the data collected 6 months later in September (table 4) to the spring data.

13) State a conclusion for the investigation carried out in spring.

14) Using the Storymap and tables 3 and 4, explain how having access to data collected at the same site but at a different time of year helps us to evaluate our conclusion.

Other sources of big data

Why is it important to keep records of species abundance and distribution?

Explain how scientists could use species, location and time of year data for moths to investigate the impacts of climate change.

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Extra space: