Designing Sustainable Landscapes: Substrate mobility settings variable

A project of the University of Massachusetts Landscape Ecology Lab

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- North Atlantic Landscape Conservation Cooperative (US Fish and Wildlife Service, Northeast Region)
- Northeast Climate Science Center (USGS)
- University of Massachusetts, Amherst

Reference:

McGarigal K, Compton BW, Plunkett EB, DeLuca WV, and Grand J. 2017. Designing sustainable landscapes: substrate mobility settings variable. Report to the North Atlantic Conservation Cooperative, US Fish and Wildlife Service, Northeast Region.

General description

Substrate mobility is one of several ecological settings variables that collectively characterize the biophysical setting of each 30 m cell at a given point in time (McGarigal et al 2017). Substrate mobility measures the realized mobility of the physical substrate, due to both substrate composition (e.g., sand) and exposure to forces (wind and water) that transport material. This is an important attribute of certain dynamic systems (e.g., coastal dune systems); given as a simple index of mobility (1 = stable, 10 = highly mobile). Substrate mobility is assigned by landcover class, derived from expert opinion (**Fig. 1**). This settings variable is dynamic, changing with urban growth.

Use and interpretation of this layer

This ecological settings variable is used for the similarity and connectedness ecological integrity metrics.

This layer carries the following assumptions:

- Land cover classes are well-distinguished, and completely and accurately mapped.
- The weights assigned to ecological systems are meaningful. As the weights were assigned by opinion rather than an empirical model, this assumption is difficult to assess, other than by noting that the resulting layers seem to pass a gut check.

Derivation of this layer

Data source

- DSLland. Our integrated landcover layer (see DSLland document, McGarigal et al 2017, for details).

Algorithm

This layer was assigned weights by landcover class according to **Table 1**.

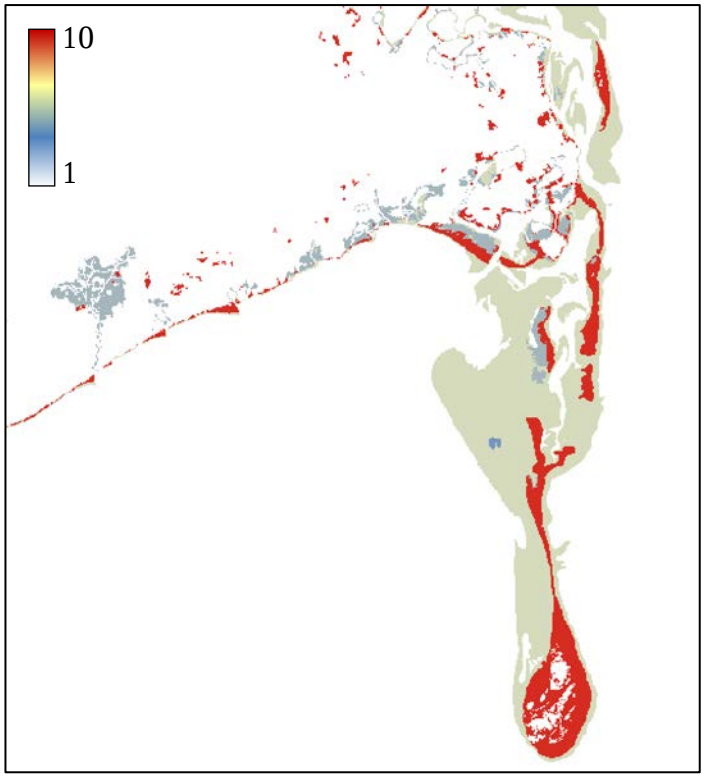

Figure 1. Substrate mobility at Monomoy NWR, Cape Cod.

Table 1. Weights assigned to landcover classes for substrate mobility.

Landcover	Substrate mobility weight
Coastal Scrub-Herb	9
Cliff & Rock	5
Estuarine Intertidal Unconsolidated Shore	4
Marine Intertidal Unconsolidated Shore	4
Estuarine Intertidal Emergent	3
Estuarine Intertidal Aquatic Bed	2
Marine Intertidal Aquatic Bed	2
Alpine	1
Northeastern Upland Forest	1
Northeastern Wetland	1
Boreal Upland Forest	1
Grassland & Shrubland	1
Peatland	1
Estuarine Intertidal Reef	1
Estuarine Intertidal Rocky Shore	1
Estuarine Intertidal Scrub Shrub	1
Estuarine Intertidal Forested	1
Marine Intertidal Rocky Shore	1
Freshwater Tidal Riverine	1
Estuarine Subtidal Sheltered	1
Lotic	1
Lentic	1
Great Lakes	1
Ocean	1

Landcover	Substrate mobility weight
Roads	1
Trains	1
Culvert/bridge	1
Dam	1
Developed- open space	1
Developed- low intensity	1
Developed- medium intensity	1
Developed- high intensity	1
Barren land	1
Pasture/hay	1
Cultivated crops	1

GIS metadata

This data product is distributed as a geoTIFF raster (30 m cells). The cell values range from 1 (stable) to 10 (highly mobile). This data product can be found at McGarigal et al (2017).

Literature Cited

McGarigal K, Compton BW, Plunkett EB, DeLuca WV, and Grand J. 2017. Designing sustainable landscapes products, including technical documentation and data products. https://scholarworks.umass.edu/designing_sustainable_landscapes/