



BIOGEOGRAPHY

BIOGEOGRAPHIC REGIONS

1 Afrotropical
Realm

2 Antarctic Realm

3 Australian Realm

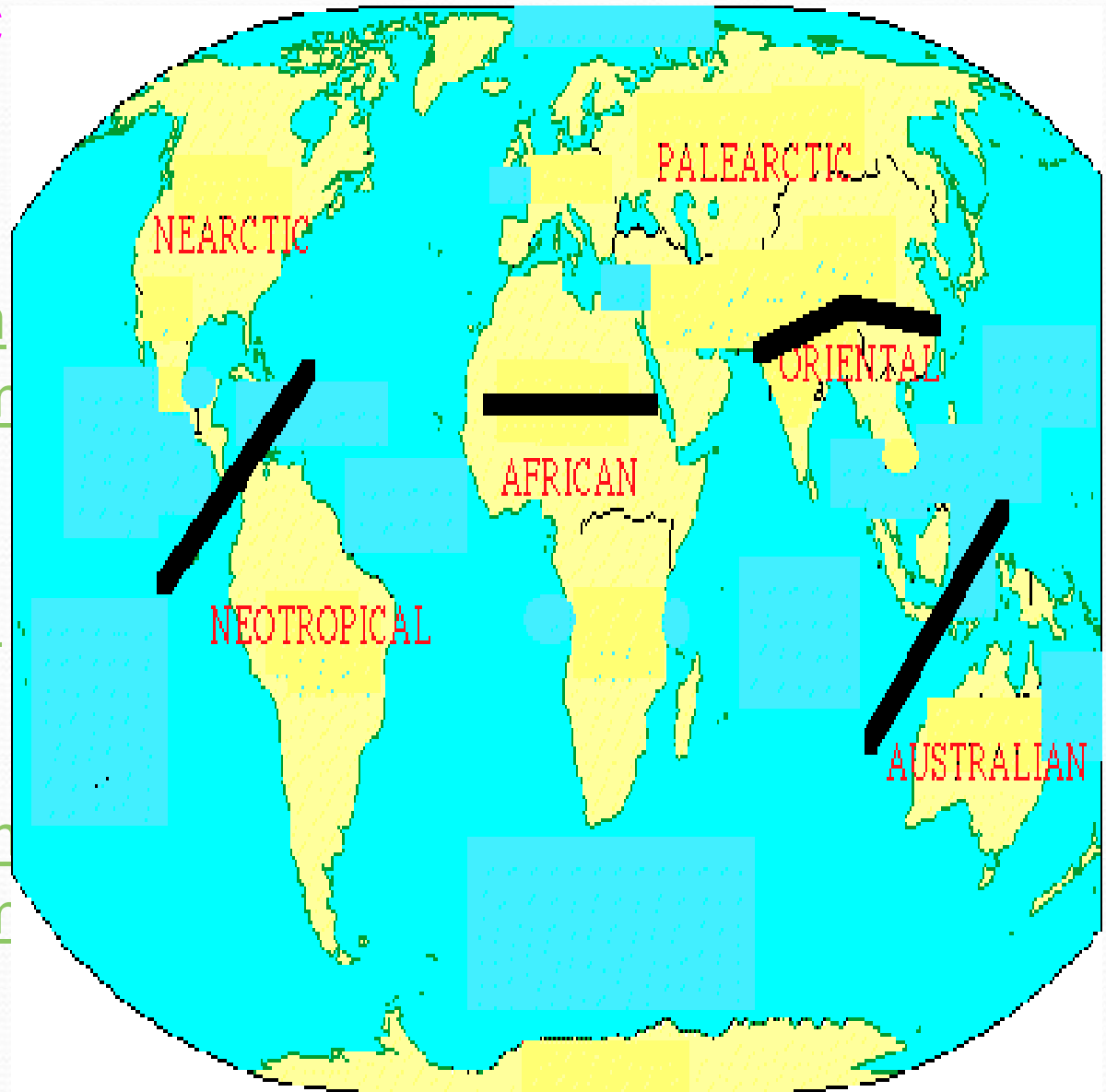
4 Indomalayan
Realm

5 Nearctic Realm

6 Neotropical
Realm

7 Oceanian Realm

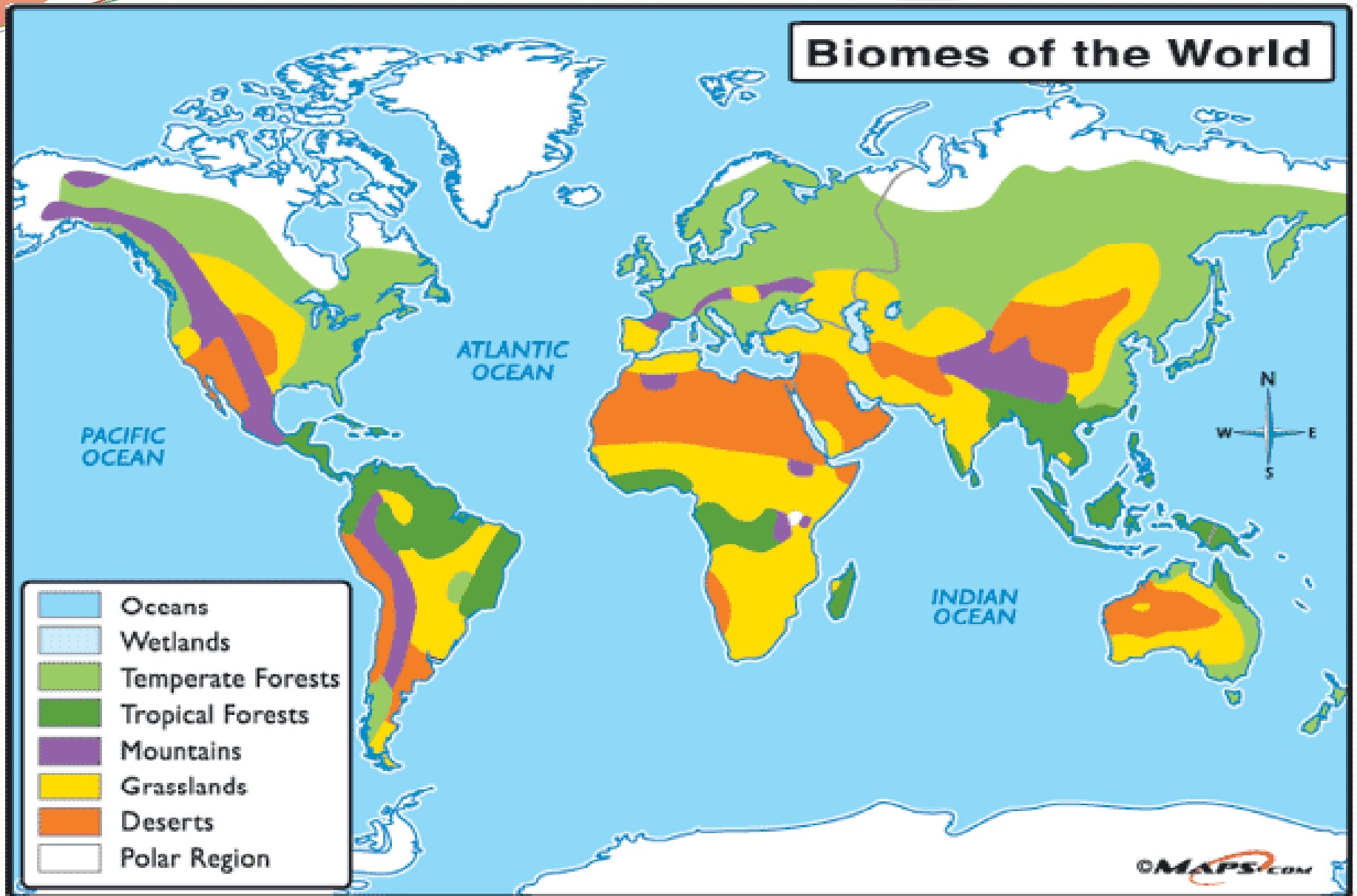
8 Palearctic Realm

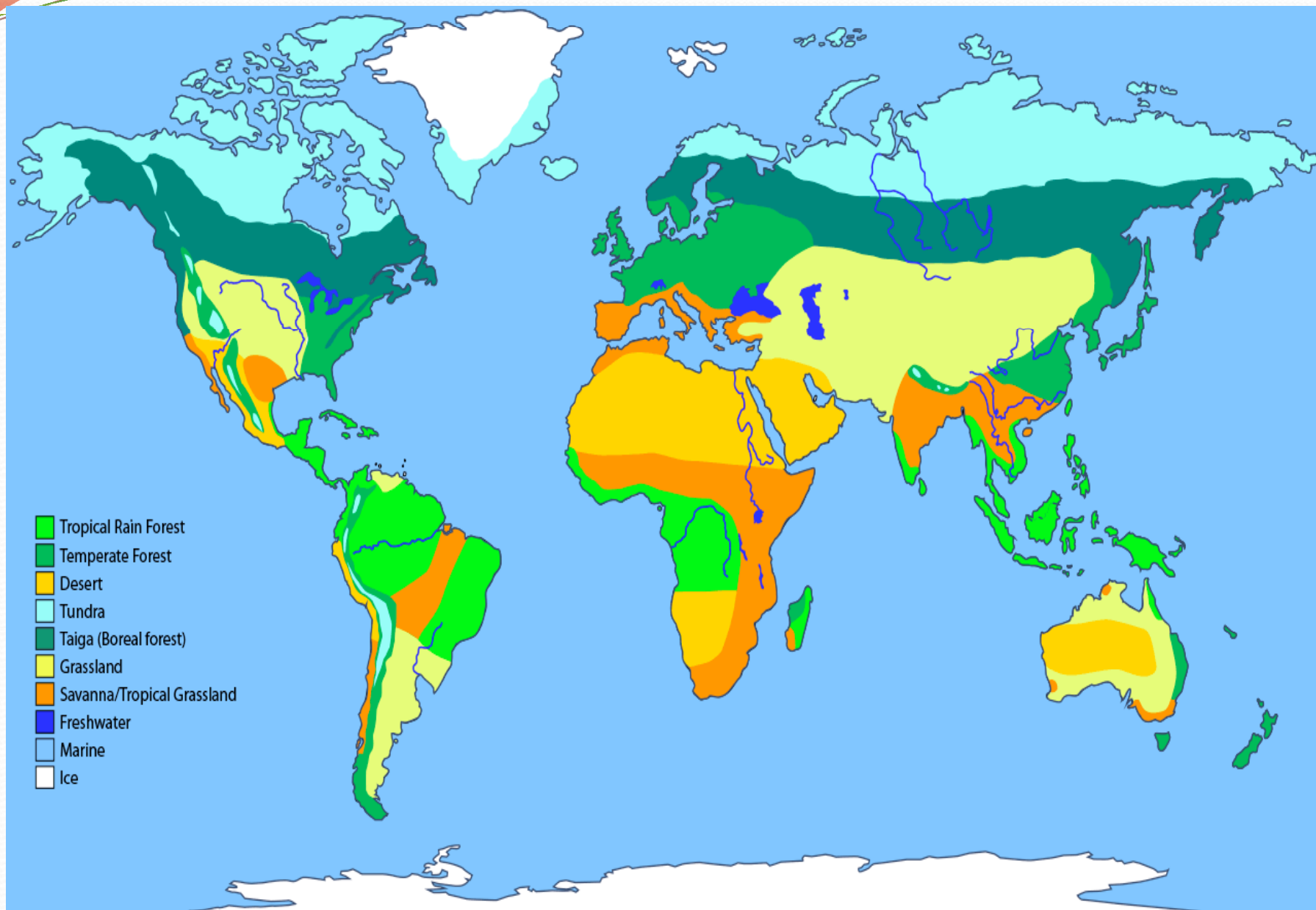


BIOGEOGRAPHIC REGIONS



Biomes of the World





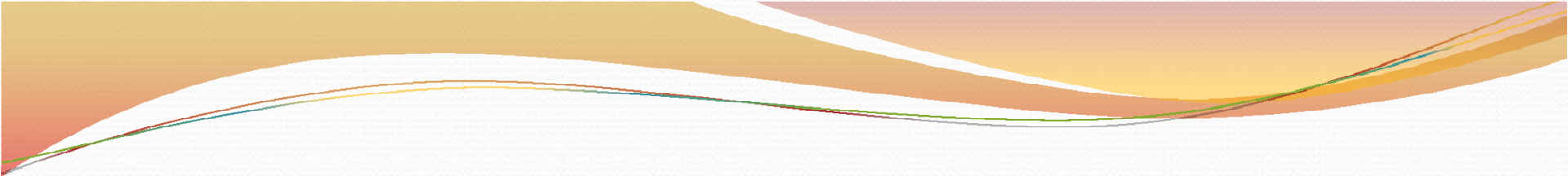
KEY STONE SPECIES



- **Robert T. Paine** (1969) {zoologist} coined the term.
- “It is often, not always, a predator, that can control the distribution of large numbers of prey species”

What is a keystone species?

- A keystone species is a species that plays an essential role in the structure, functioning or productivity of a habitat or ecosystem at a defined level (habitat, soil, seed dispersal, etc).
- Disappearance of such species may lead to significant ecosystem change or dysfunction which may have knock on effects on a broader scale. Examples include the elephant's role in maintaining habitat structure, and bats and insects in pollination.
- By focussing on keystone species, conservation actions for that species may help to preserve the structure and function of a wide range of habitats which are linked with that species during its life cycle.



If that single predator is removed, dramatic changes result in the varieties and population densities of all the other species in the community. Interestingly, no comparable changes appear when other "consumers" are removed from the biological fabric.

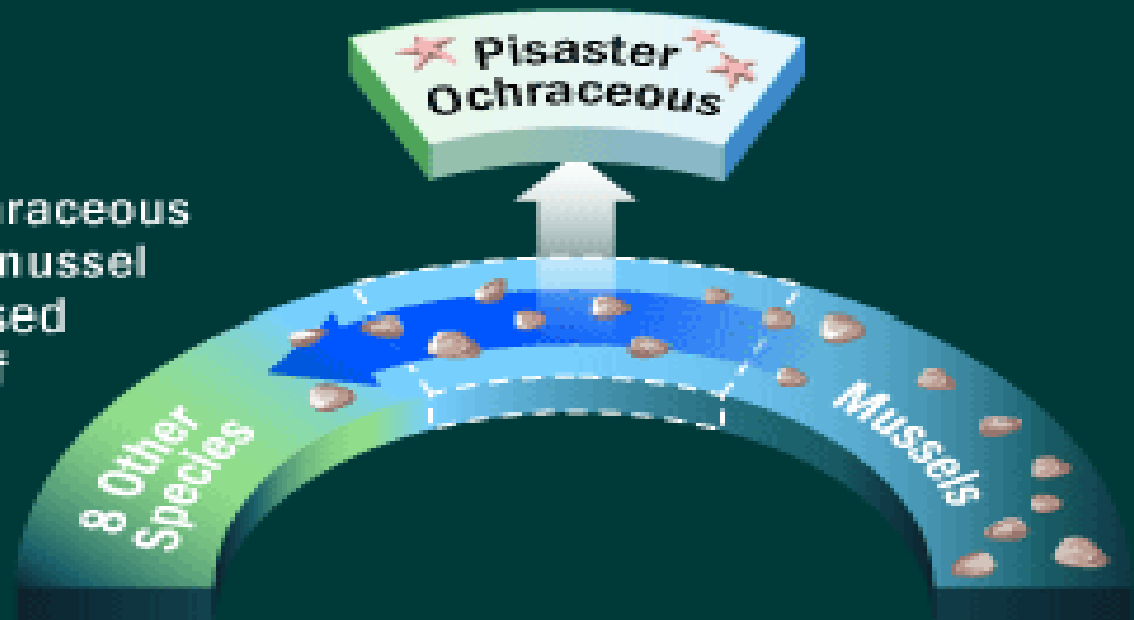
The Keystone Species Concept

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The sea star *Pisaster ochraceus* living in Mukkaw Bay, Washington, feeds on mussels.



When *Pisaster ochraceus* was removed the mussel population increased and the number of other species decreased.



DOMINO EFFECT

Key Stone species
disappearance would
influence the
disappearance of other
species.

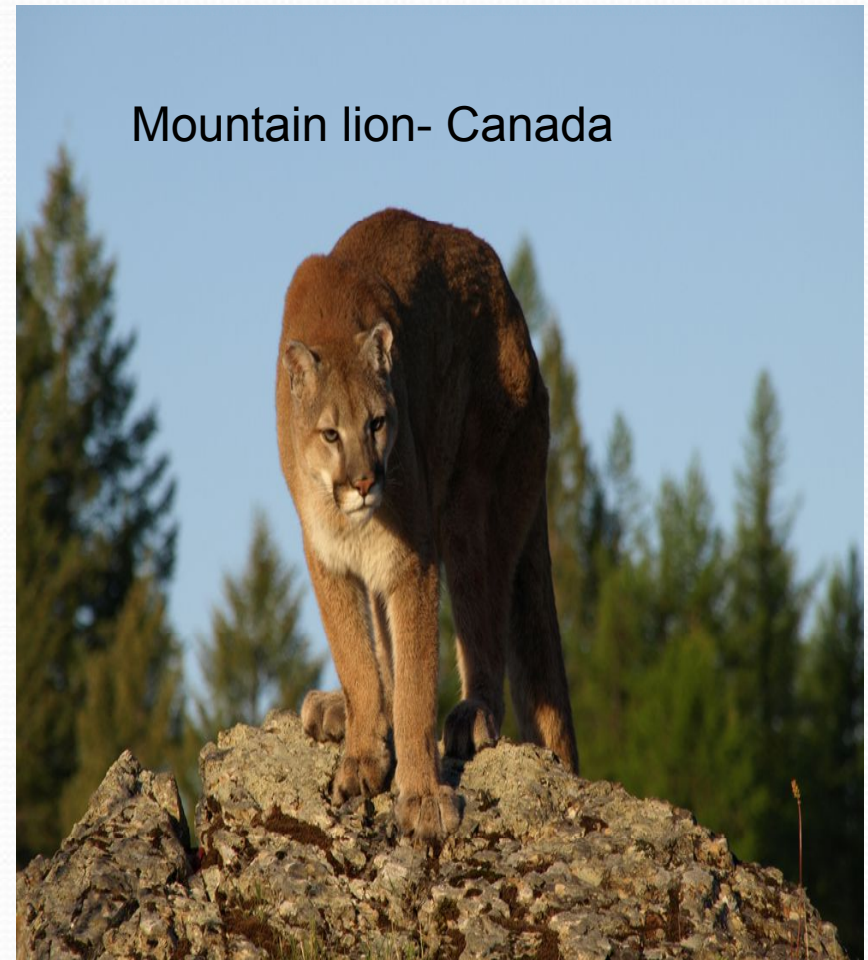
Key stone species- tree(walking tree)

Red mangrove
Rhizophora mangale

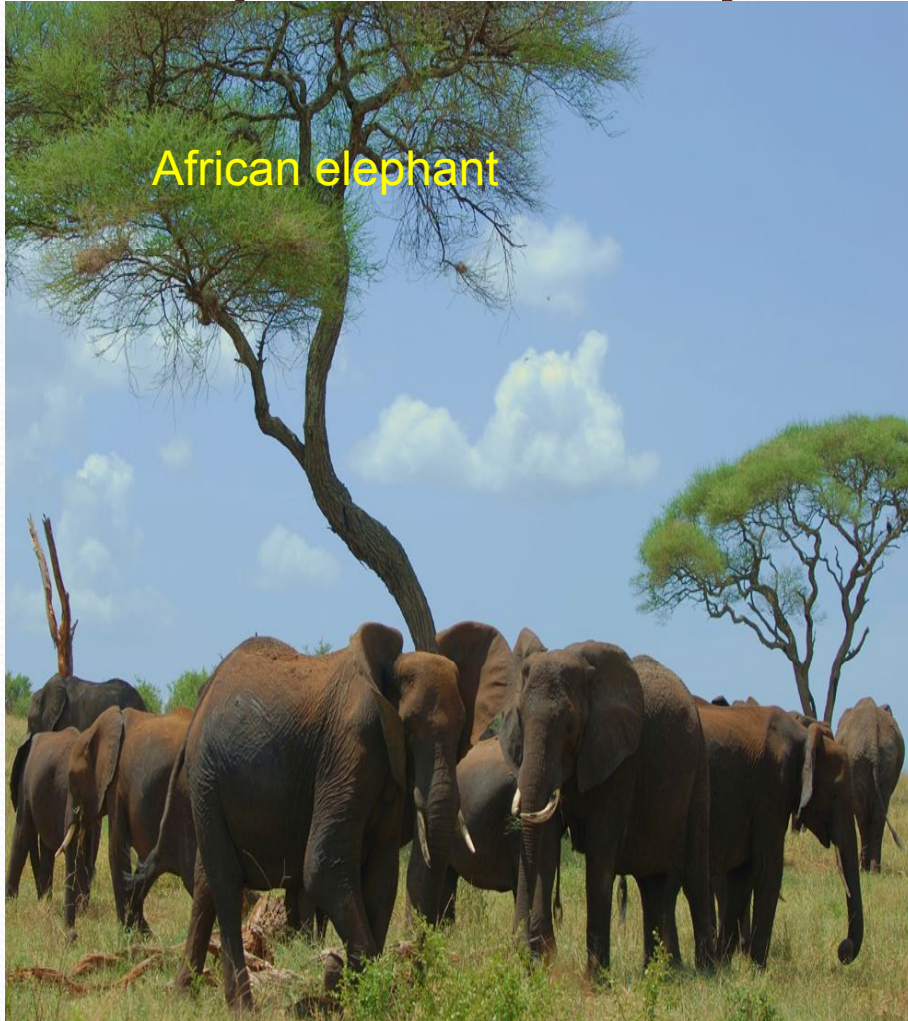


Key stone species- predator

- It can roam an area of 100's of Kms&control deer Pop. In it's absence deer pop.explode and become extinct due to intra pop. competition.



Key stone species-herbivore



- African elephants control the population of Acacia thereby maintaining the Savanna ecosystem.
- “A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether”

Key stone species-tree



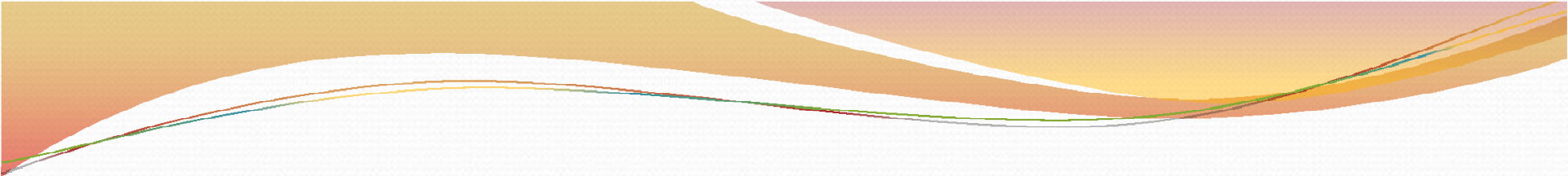
Acer
saccharum
Sugar mapple

FLAGSHIP SPECIES



What is a flagship species?

- A flagship species is a species selected to act as an ambassador, icon or symbol for a defined habitat, issue, campaign or environmental cause.
- By focusing on, and achieving conservation of that species, the status of many other species which share its habitat – or are vulnerable to the same threats - may also be improved.
- Flagship species are usually relatively large, and considered to be 'charismatic' in western cultures.
- Flagship species may or may not be keystone species and may or may not be good indicators of biological process.



Flagship species, chosen for their charisma, increase public awareness of conservation issues and rally support for the protection of that species' habitat. Protection of other species is accomplished through the umbrella effect of the flagship species.







Surrogate species

Modern conservation approach

“STRATEGIC HABITAT CONSERVATION”

It is no longer feasible or efficient to carry out conservation on a species by species or habitat by habitat basis. Surrogate species helps us maximize our resources and act proactively on behalf of many species before they are put at serious risk



Moore 1962 introduced the surrogate species concept

“ surrogate species are plants and animals that distinctly signal the health of Ecosystems” they are defined as “species that are used to represent other species Or aspects of the environment”



Why surrogate approach?

- The number of species listed under the endangered sps act grown(78 in 1967 to more than 1200 & many more are waiting).
- Designing management to meet the individual needs of so many sps need a new approach .
- Surrogate approach represent the ecological needs of of a larger set of species.

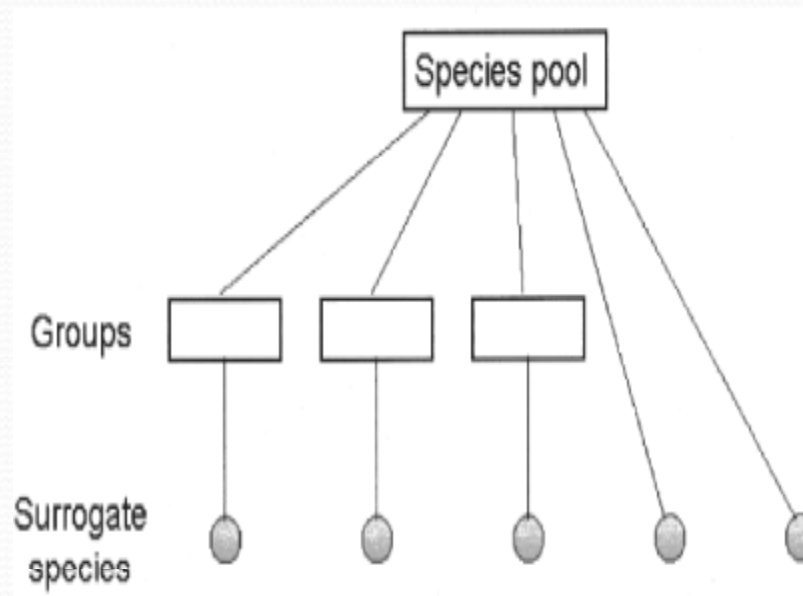
Surrogate approach

In species management and conservation surrogate species or groups of species can be used as proxies for broader sets of species when the no. of sps. of concern is great to allow each to be considered individually

- Umbrella sps.
- **Flagship sps.**
- Indicator sps.
- **Focal sps.**
- Sps. Groups chosen on the basis of tax., habitat, lifehistory features etc. to reduce the burden of addressing the requirements of individual taxa

The hierarchical relation between the species pool of interest, species groups and surrogate species.

Surrogate species may be used either to represent the species pool as a whole or to represent the subsets of that pool designated by species groups, or the groups themselves may be used as distillations of the larger species pool.



Surrogate approach are not applicable to all situations. A surrogate species of one region cannot be used for all regions.

When & Where surrogate sps. are as an effective conservation tool?

How they are selected? So that conservation goals are achieved.

The central concept is that land protected for surrogate sps. will support many other species that also live within the area.

Surrogates reduce the amount of time money and data required when compared to The collection of detailed multispecies inventory data.



importance

Surrogates as indicators of pollutants or to monitor health of the ecosystem. Surrogates are useful to find species richness. They may not be broadly effective because results at one study site might not apply to other regions.



Indicator species

Indicators should have some of the same habitat requirements as the species, communities, or ecosystems for which they indicate. By protecting indicator species, other species are also protected.

Landres et al. 1988



What is an indicator species?

An indicator species is a species or group of species chosen as an indicator of, or proxy for, the state of an ecosystem or of a certain process within that ecosystem.

Examples include crayfish as indicators of freshwater quality; corals as indicators of marine processes such as siltation, seawater rise and sea temperature fluctuation; peregrine falcons as an indicator of pesticide loads; or native plants as indicators for the presence and impact of alien species.

Lichens as indicators of air pollution

No.	Zone description	Characteristic species or forms of lichen
I	Absolute lichen desert – extremely high air pollution.	No arboreal lichens, not even crustose forms.
II	Relative lichen desert – very high air pollution.	<i>Lecanora conizaeoides</i> and <i>Lepraria</i> spp.: species most resistant to pollution.
III	Inner zone of weakened vegetation – high air pollution.	<i>Xanthoria candelaria</i>
IV	Middle zone of weakened vegetation – moderate air pollution.	<i>Hypogymnia physodes</i>
V	Outer zone of weakened vegetation – relatively low air pollution.	<i>Pseudevernia furfuracea</i> , <i>Ramalina</i> spp.
VI	Inner zone of normal vegetation – slight air pollution.	<i>Usnea hirta</i> , <i>Platismatia glauca</i>
VII	Typical zone of normal vegetation – clean air or, at the most, minimal air pollution.	Very sensitive species of the genus <i>Bryoria</i> : <i>Bryoria fuscescens</i> .

Bushy lichen

**Leafy lichen
(green)**

Bushy lichen

**Leafy lichen
(brown)**

Crustose lichen

5cm



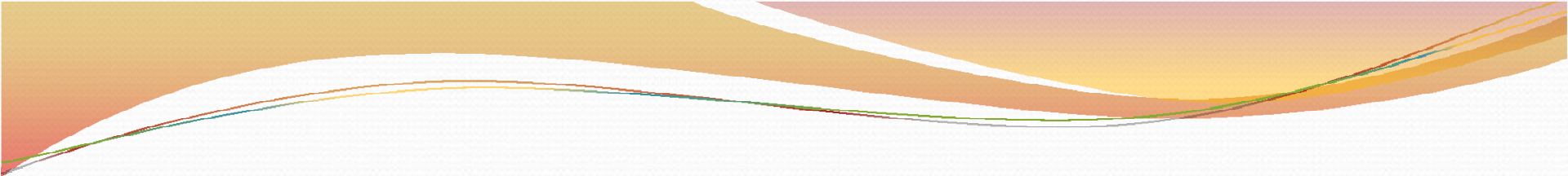
Naturalists'
Handbooks 19

Pollution monitoring with lichens

D. H. S. RICHARDSON

With colour plates by Claire Dalby





An umbrella species is typically chosen because it requires large areas of habitat. The assumption is that protection of an umbrella species' habitat simultaneously protects other, less spatially demanding species.

Wilcox 1984.



Focal species approaches build on the single-species umbrella approach by

(1) identifying threatening processes responsible for species decline, and

(2) selecting a suite of species, each of which is considered most sensitive to each of the threatening processes.

The underlying premise is that well-chosen focal species provide a protective umbrella for other species.

Lambeck 1997