Succession and Stability
Chapter 20

Primary Succession Primary succession occurs on newly exposed surfaces, such as this newly deposited volcanic rock and ash. A volcanic eruption destroys the previous ecosystem (1). The first organisms to appear are lichens (2). Mosses soon appear, and grasses take root in the thin layer of soil (3). Eventually, tree seedlings and shrubs sprout among the plant community (4). **Predicting** ***What types of animals would you expect to appear at each stage, and why?***

Introduction

- Succession: Gradual change in plant and animal communities in an area following disturbance.
  - Primary succession on newly exposed geological substrates.
  - Secondary succession following disturbance that does not destroy soil.
- Climax Community: Late successional community that remains stable until disrupted by disturbance.

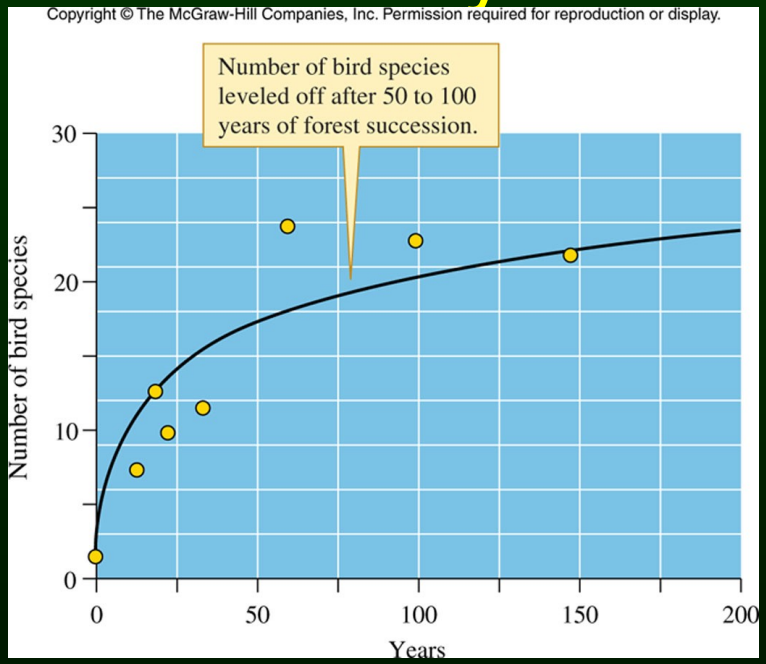
http://www.youtube.com/watch?v=AWwe0udewD8

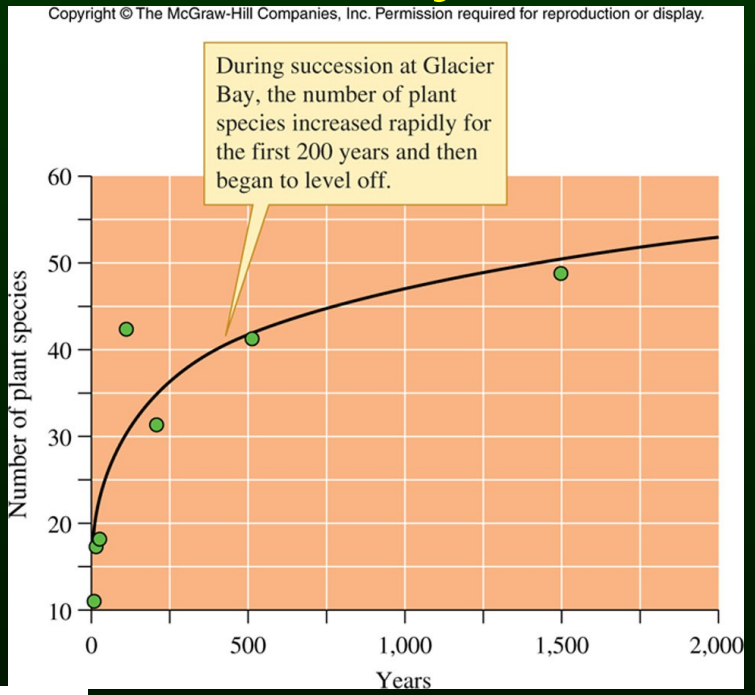
Community Changes During Succession

- Succession leads to climax community
  - 1500 years at Glacier Bay
  - 3 years in the intertidal

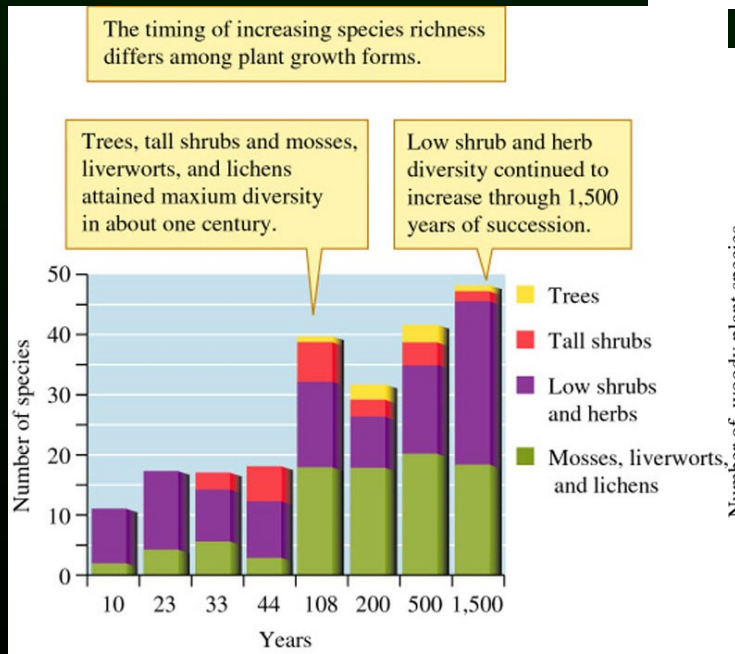
However, all succession shows an increase in species diversity over time!

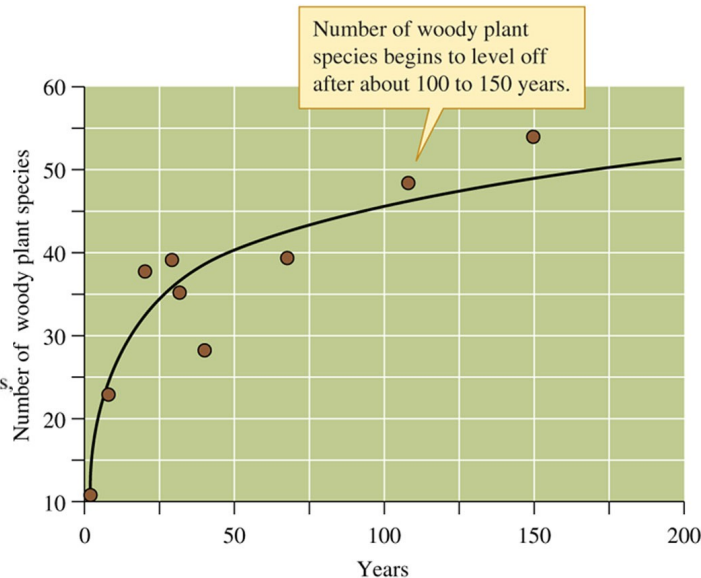
Primary Succession at Glacier Bay





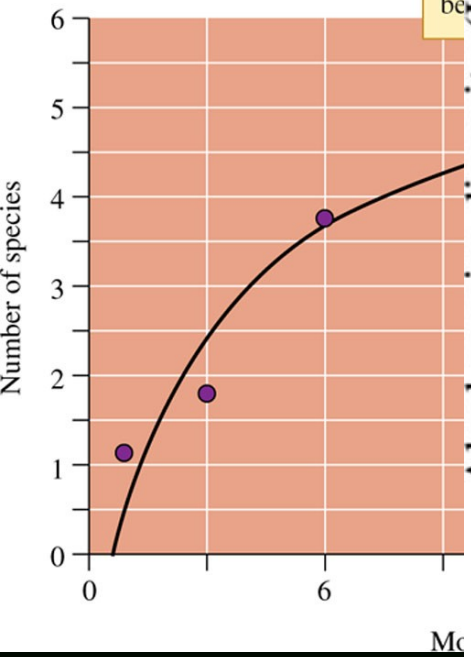
Increases in species diversity over time!

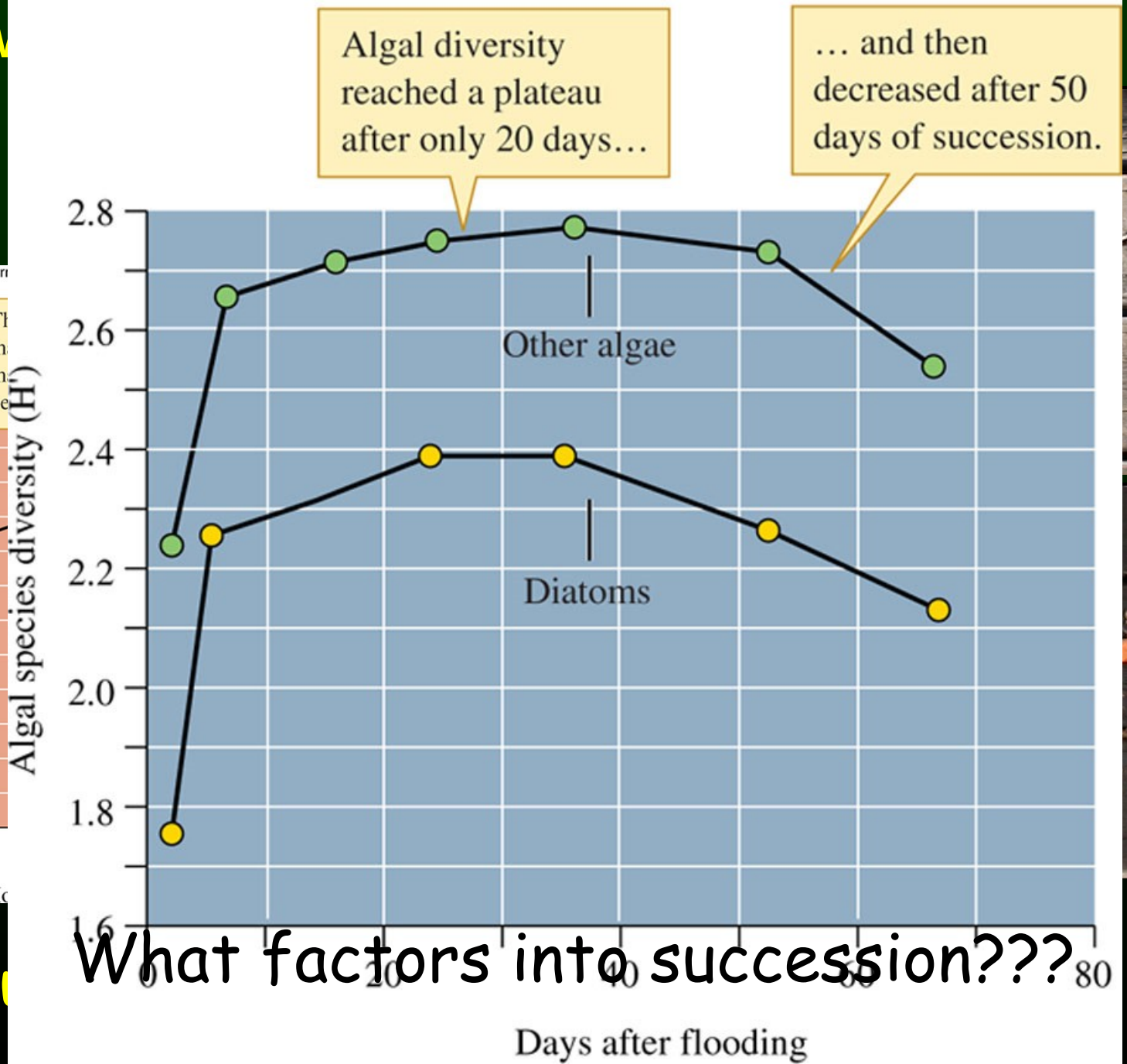




<2 months in desert stream!!!

Sousa's bo

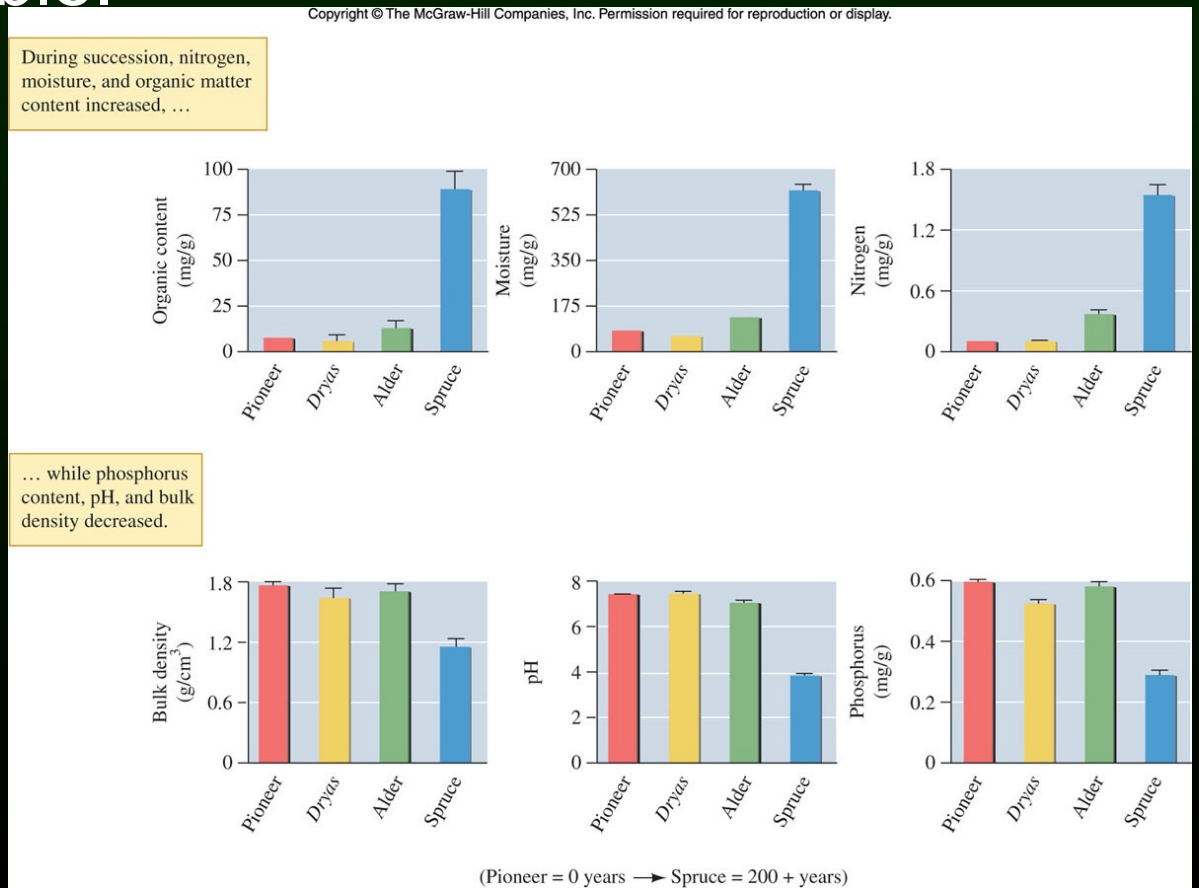




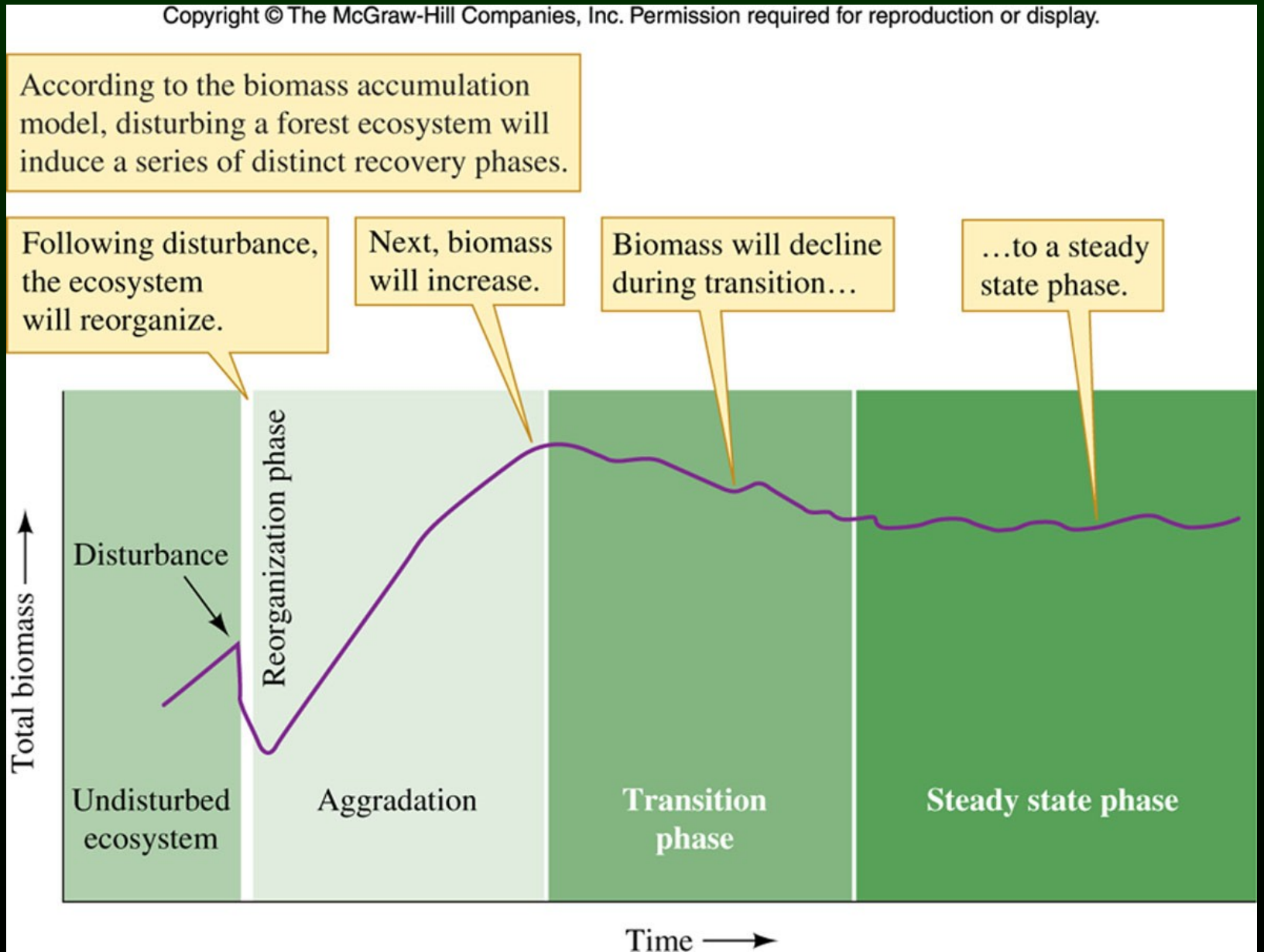
What factors into succession???

Ecosystem Changes During Succession

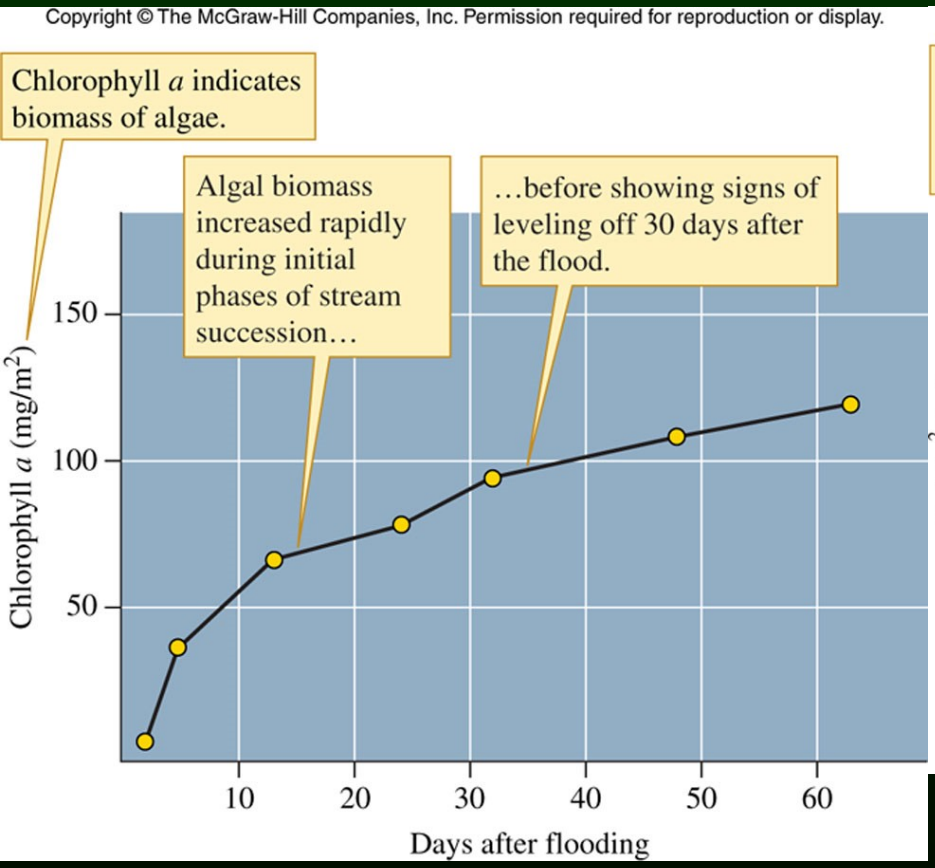
- Ecosystem changes during succession include increases in biomass, primary production, respiration, and nutrient retention
  - Physical and biological systems are inseparable.

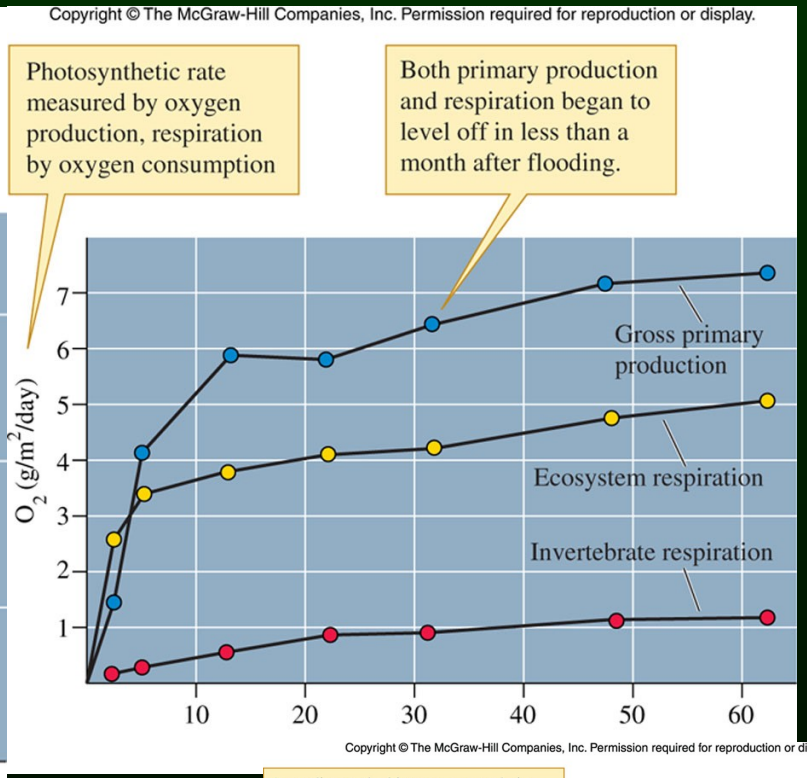


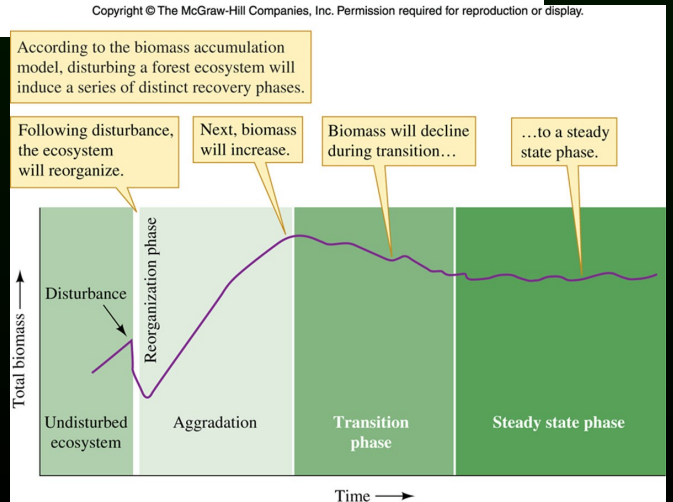
Model of Ecosystem Recovery from Disturbance (Forest – 200 years)



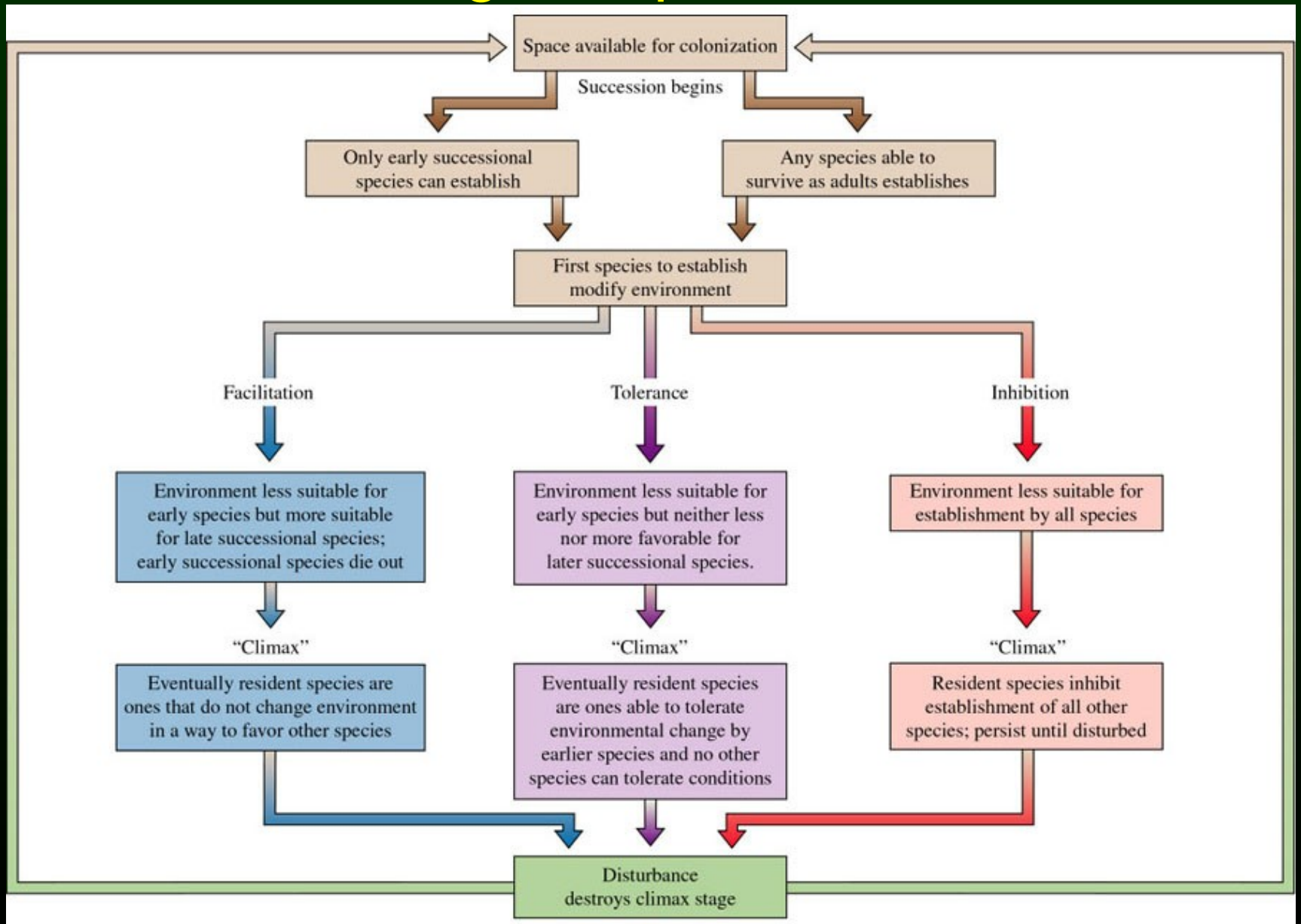
Does this model work in our under 2-month successional sequence???







Mechanisms of Succession – it's not a random change in species over time!!!

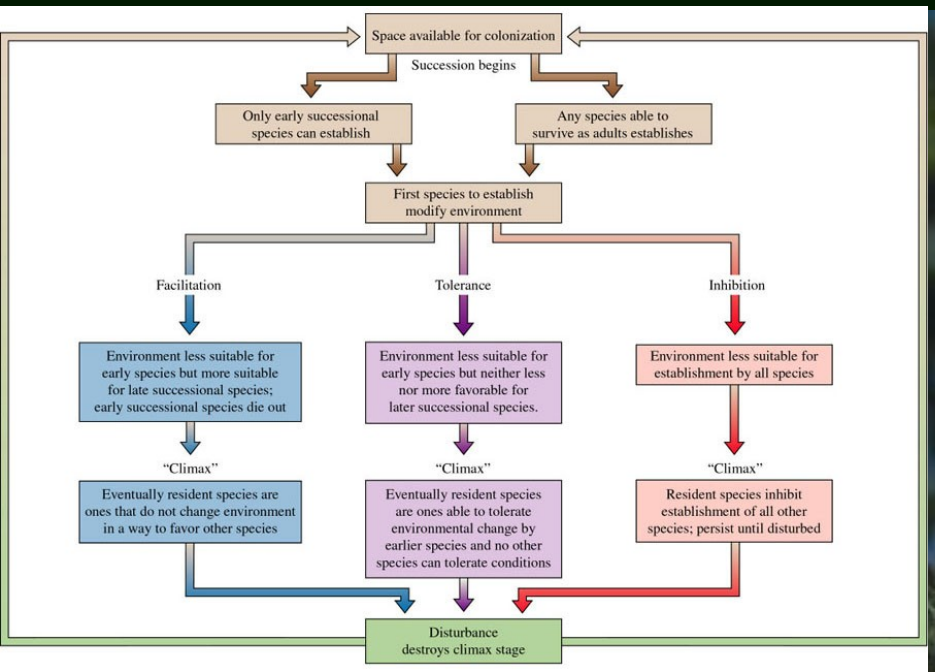


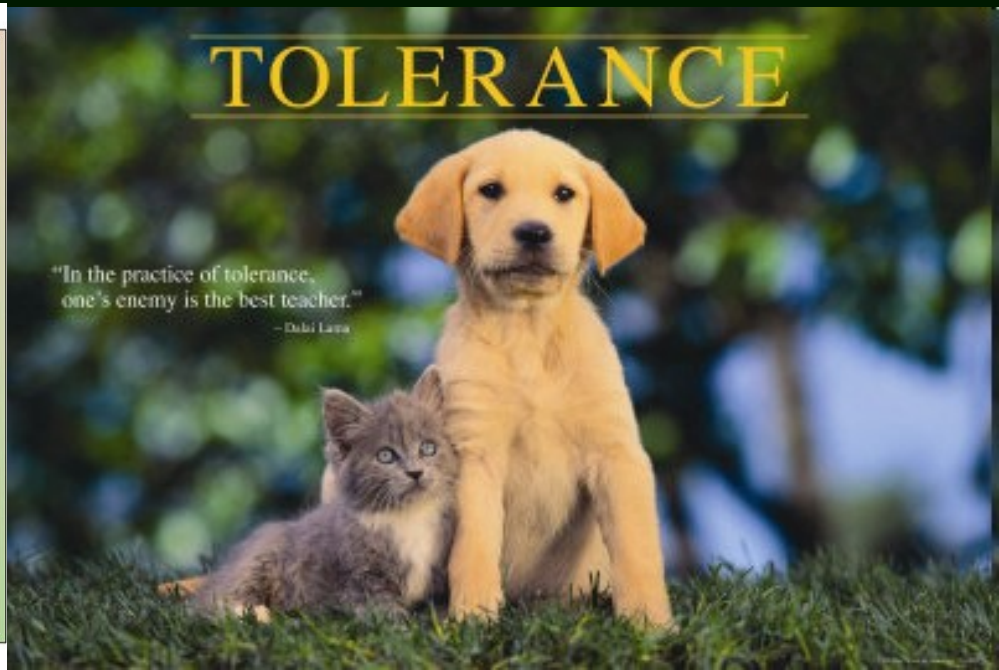
Facilitation

- Proposes many species may attempt to colonize newly available space.
  - Only certain species will establish.
    - Colonizers “Pioneer Species” modify environment so it becomes less suitable for themselves and more suitable for species of later successional stages.

Tolerance

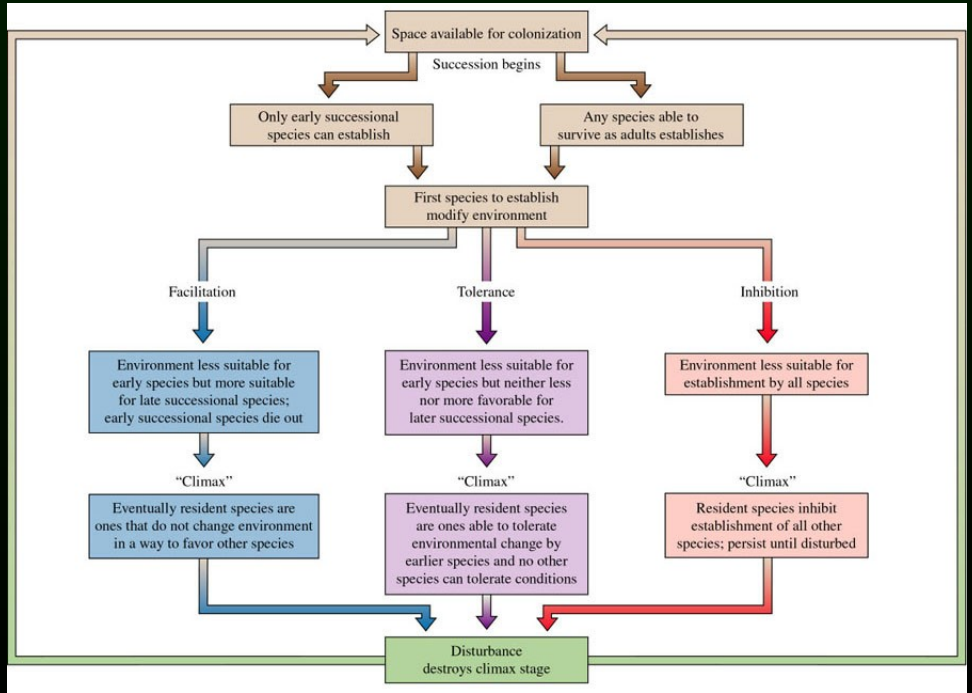
- Initial stages of colonization are not limited to pioneer species.
  - Early successional species do not facilitate later successional species.
  - Not as supported by studies as the other two models





Inhibition

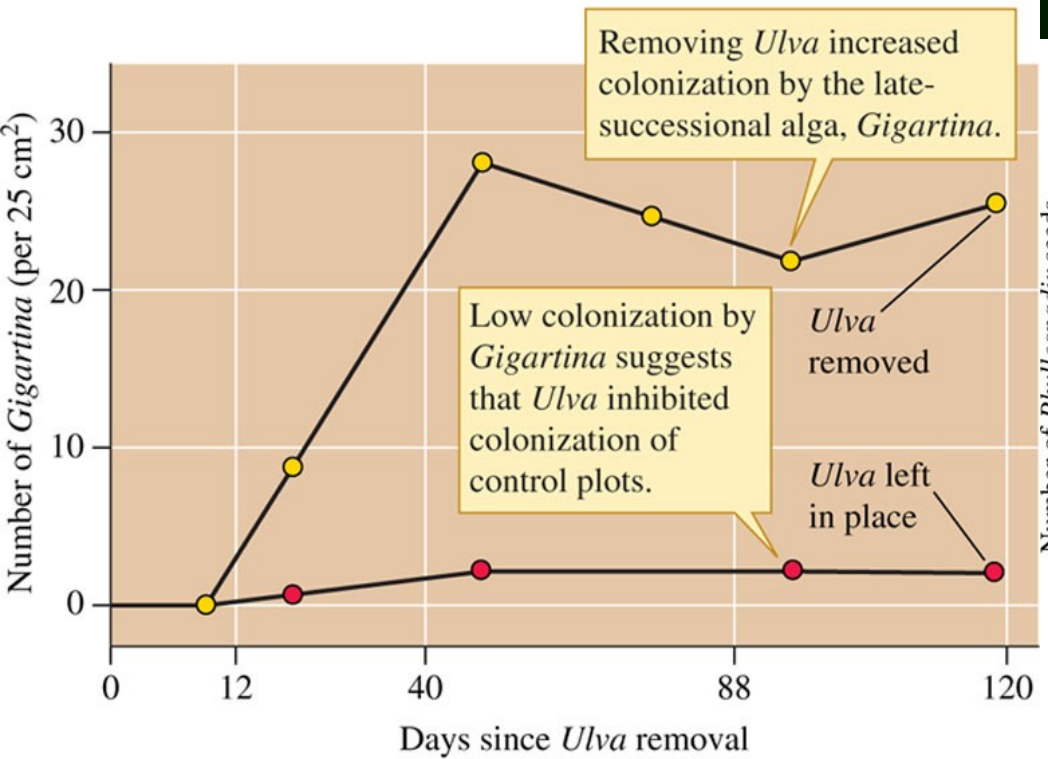
- Early occupants of an area modify the environment in a way that makes it less suitable for both early and late successional species.
  - Early arrivals inhibit colonization by later arrivals.
  - Assures late successional species dominate an area because they live a long time and resist damage by physical and biological factors.

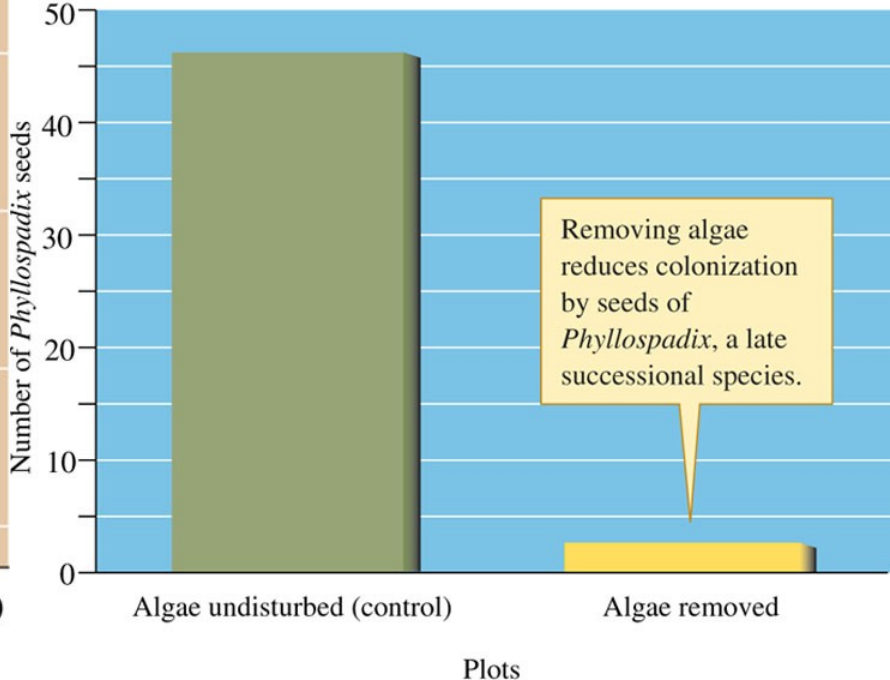


Successional Mechanisms in Rocky Intertidal Zone (found elsewhere too!)

- Evidence of inhibition and facilitation!

You can even find both in some cases since succession can involve many species over time!





Community and Ecosystem Stability

- Community stability may be due to lack of disturbance or community resistance or resilience in the face of disturbance

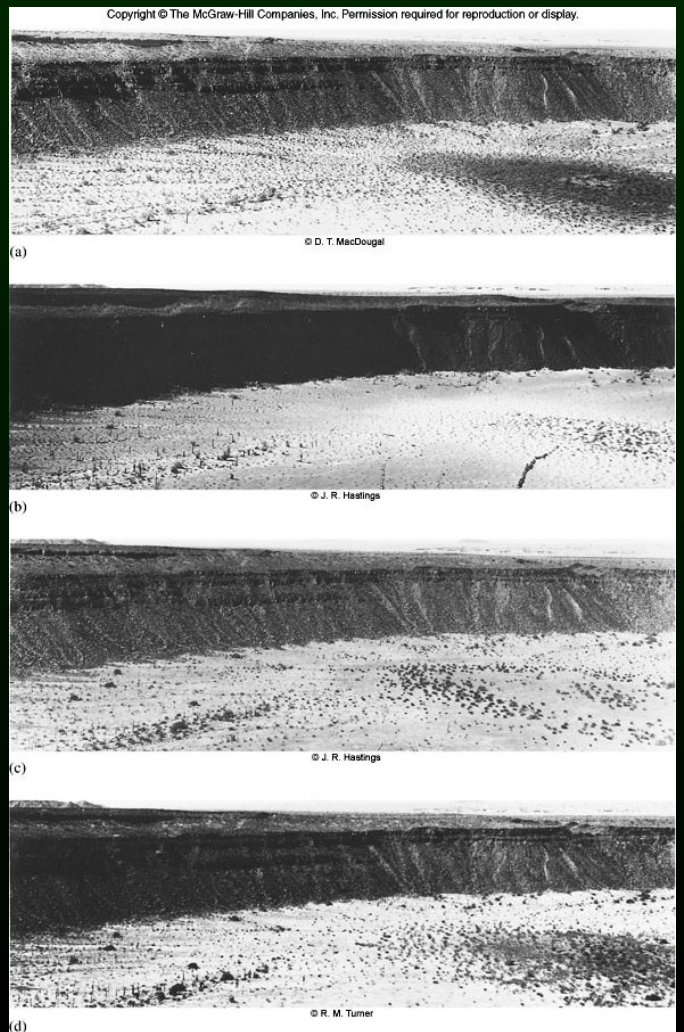
Some definitions -

- Stability: Absence of change (ex. deep sea).
- Resistance: Ability to maintain structure and function in face of potential disturbance.
- Resilience: Ability to recover from disturbance.

One major problem with successional studies

- Hint – most successional studies have been successfully done in the intertidal.

Most successional changes can't be seen in the short term!



1907, 1959, 1972, 1984