La Parguera

Relationships Between Watershed Activities & Coral Reef Ecosystems (Ridge to Reef Approach)

- Sediment Loading and Associated Impacts
- Water Column Transport Processes
- Physical Oceanography
- Transport of watershed-based materials: Sediment studies

Major Disturbance – Land clearing

- Road Construction
- Development
- Land Clearing
- Agriculture

What's the concern?

Coastal development has led to increased terrestrial sediment accumulation in coral reef areas

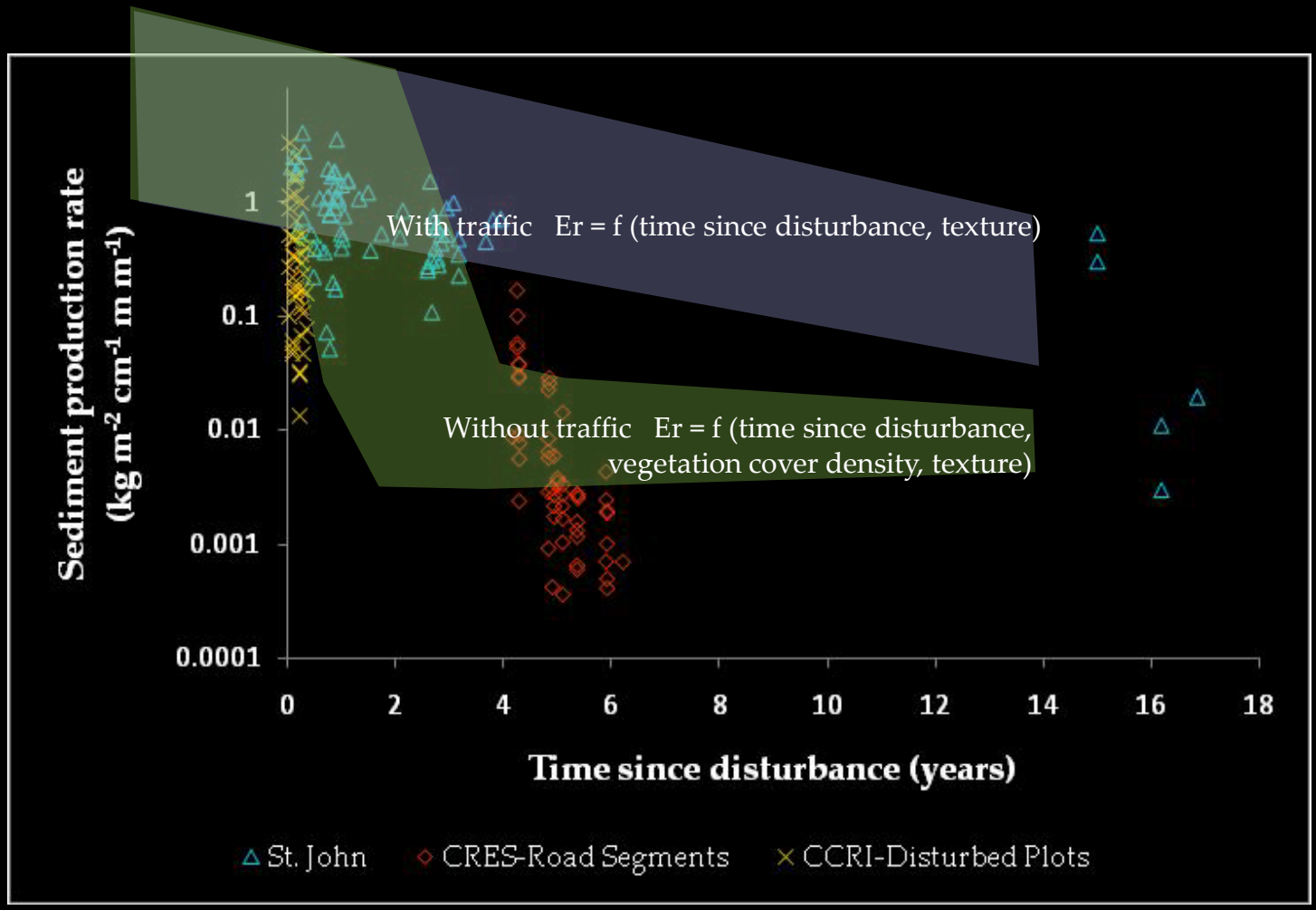
Sediment production measurements

- Unpaved roads; 10 sites
- Cutslopes; 11 sites
- Fillslopes; 3 sites
- Undisturbed hillslopes:11 sites
- Rain gage

Sediment Production Model

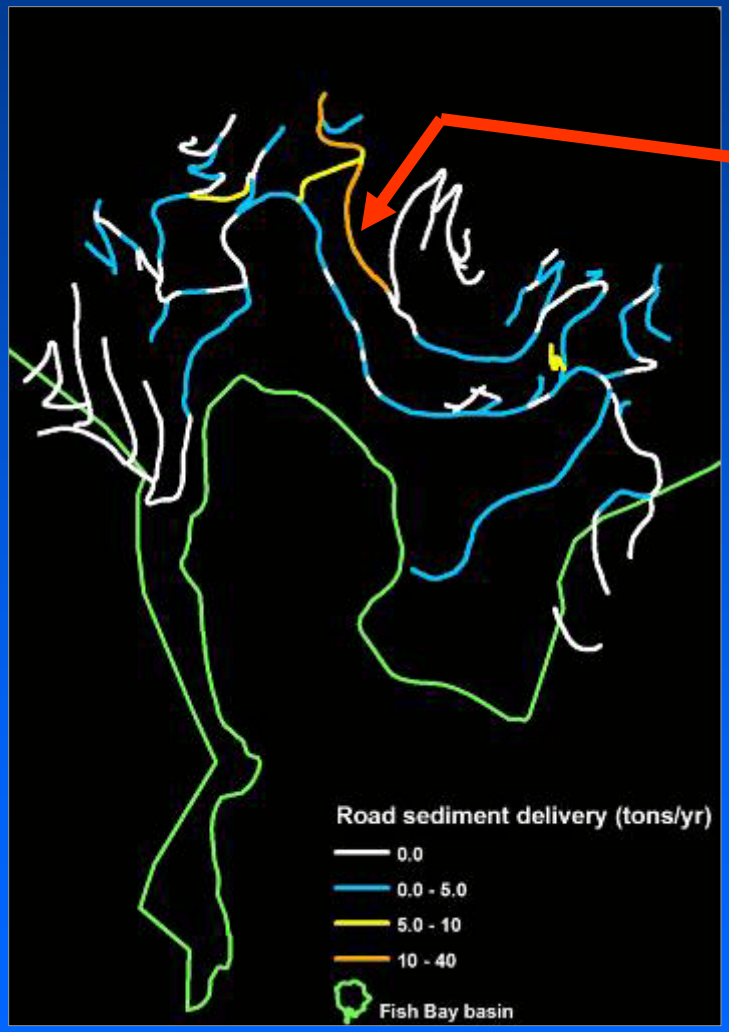
Slope, Rainfall Intensity and Frequency, Disturbance Regime, Vegetation Cover

ArcView Extension



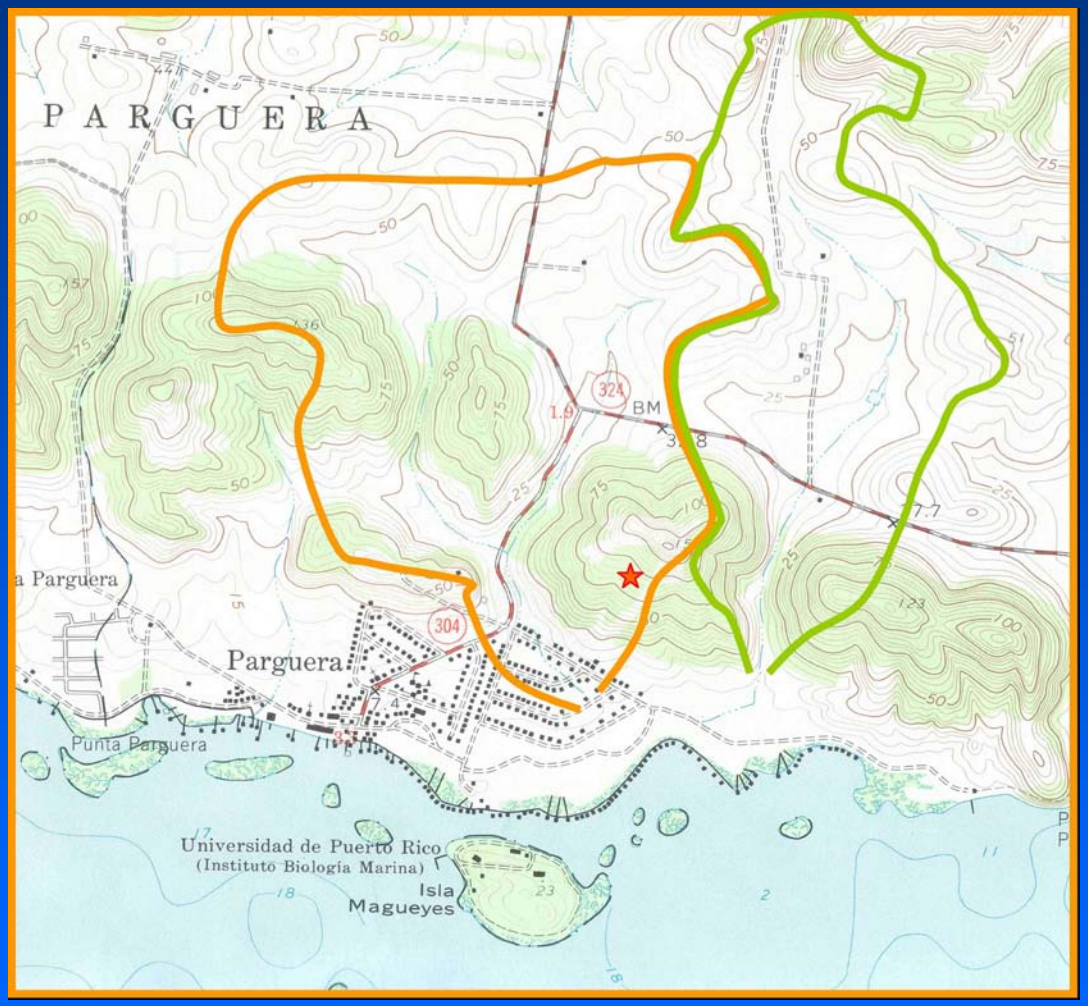
GIS Modeling of Sedimentary Runoff

Problem Identification



Restoration

Watershed-scale runoff/sediment yield



"Natural" Watershed

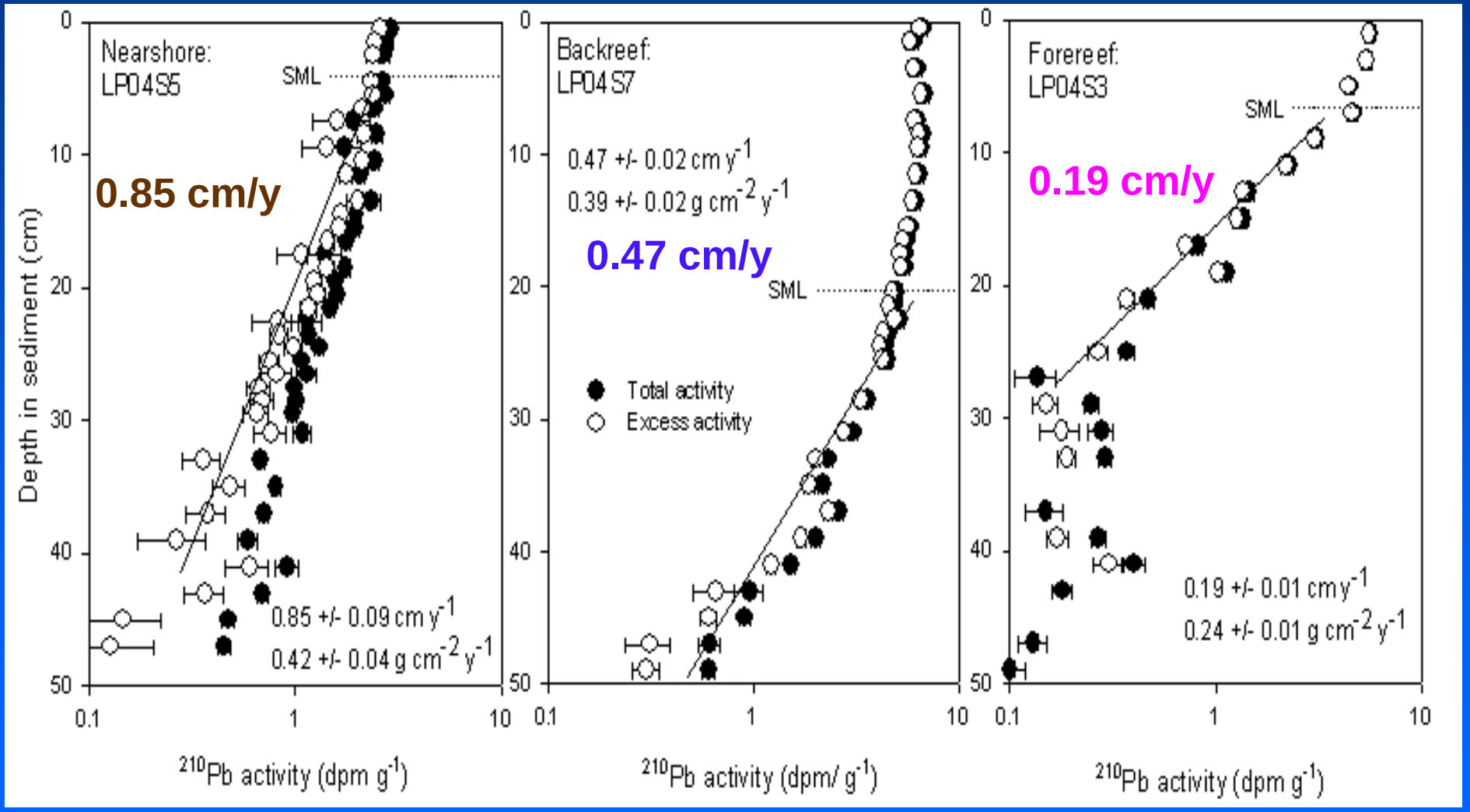
Disturbed Watershed

Raingauge

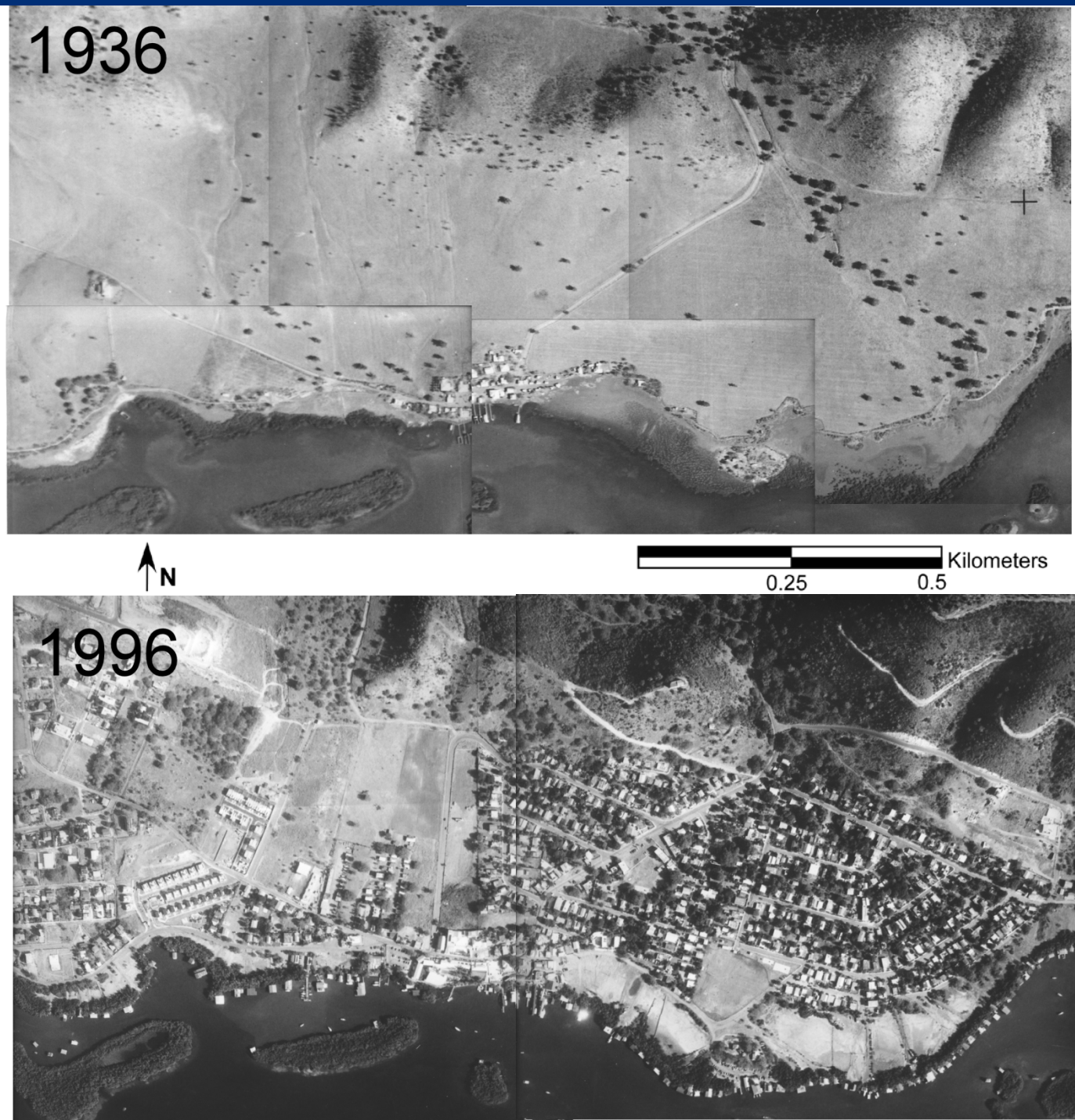
Disturbed runoff is 3-9 times greater than Natural runoff and is on the high-end of for severely disturbed watersheds with similar climate

Sediment Accumulation Rates

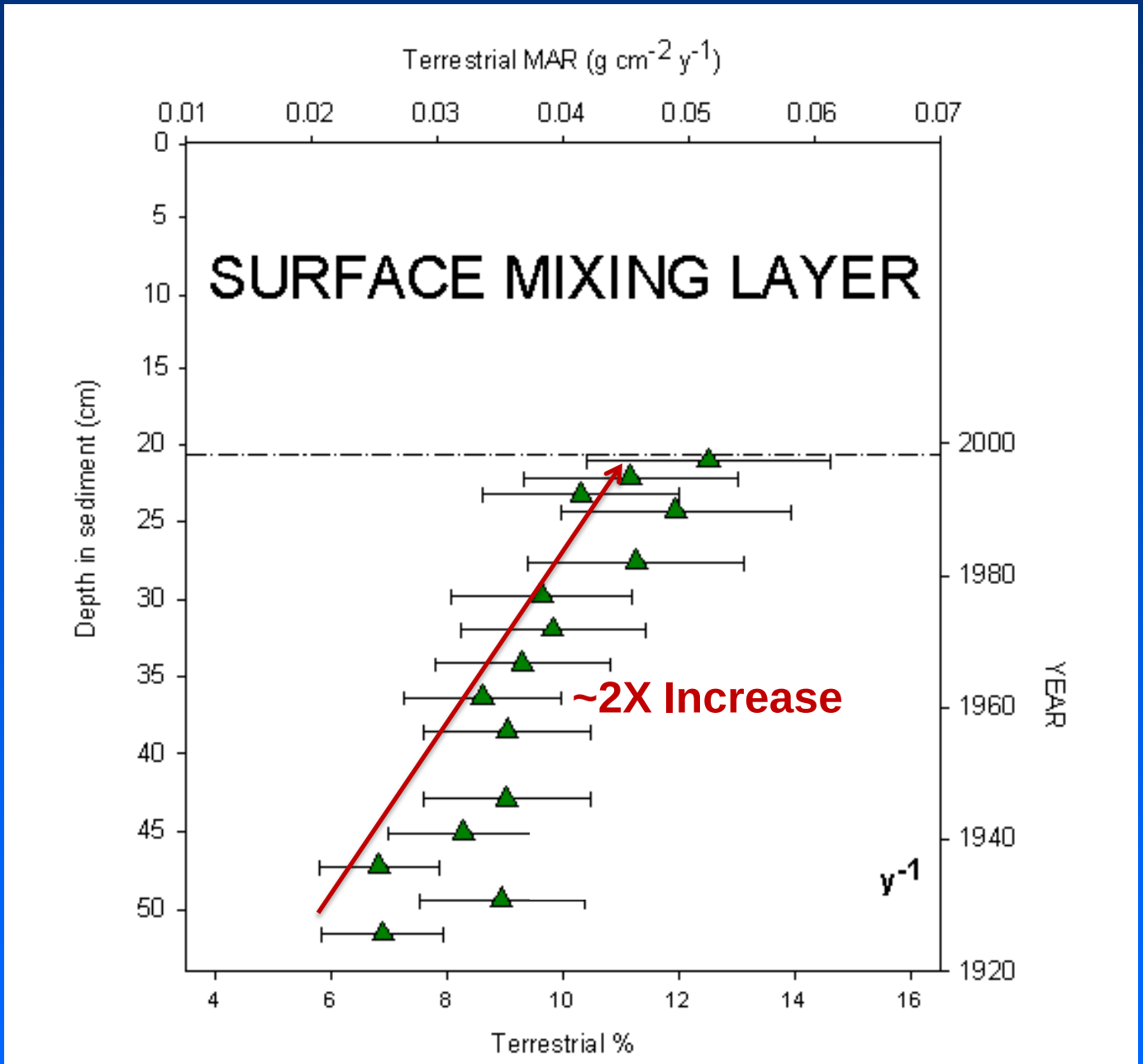
Nearshore Backreef Lagoon Forereef



Is land-use change recorded in the seabed?



Change in Terrestrial Sedimentation

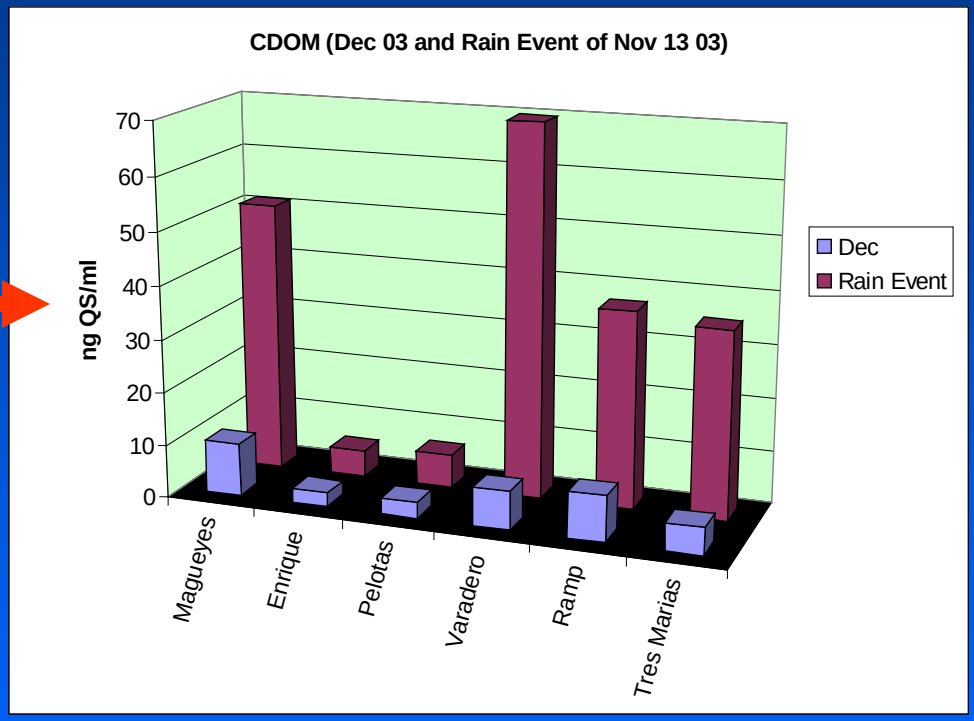


Water-borne Transport

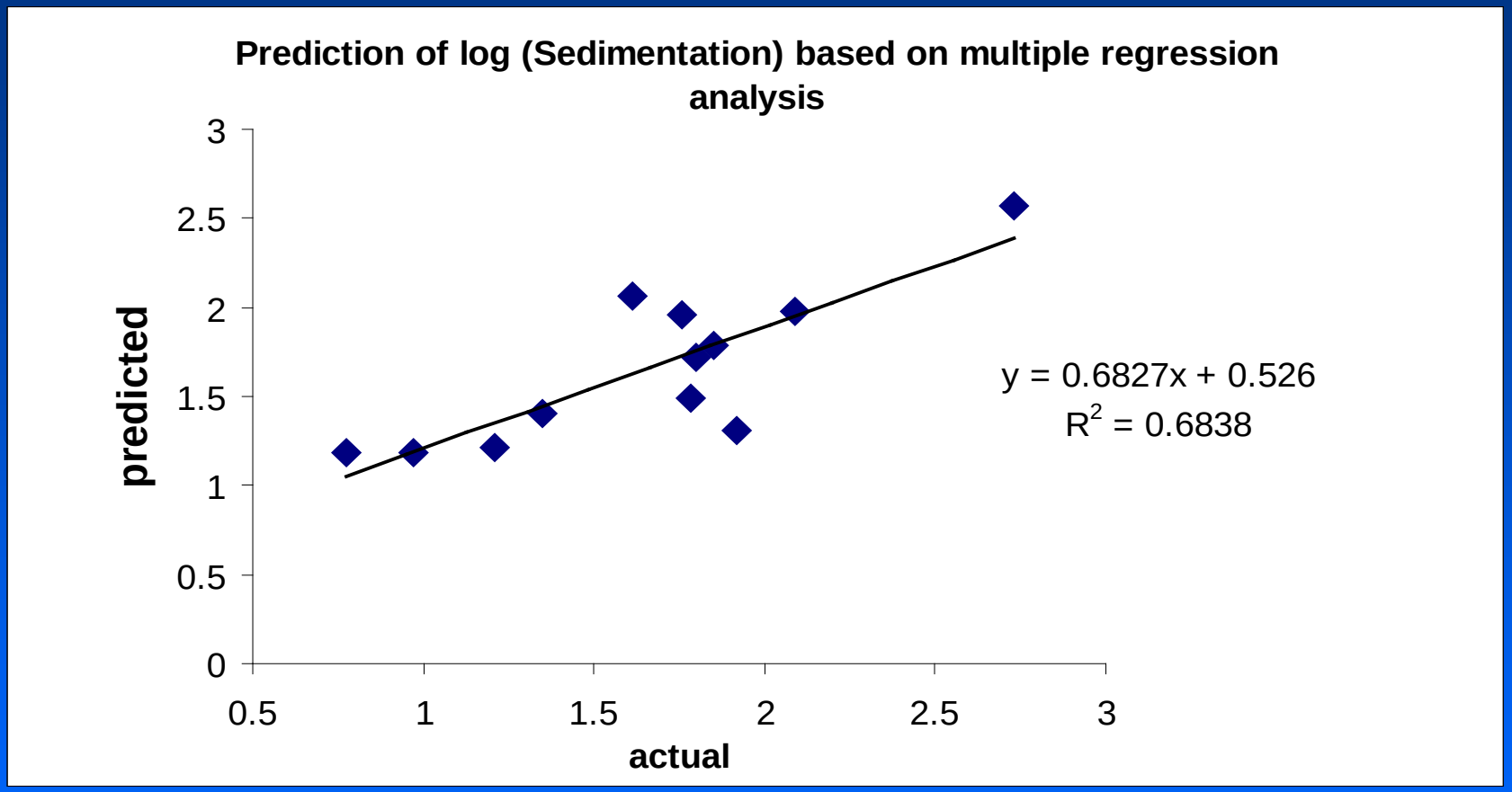
- Chlorophyll a
- Turbidity
- Nutrient Concentrations
- Bacterial Activity
- Bacterial Counts
- Colored Dissolved Organic Matter
- N^{15} Sediment Concentration
- Algal Tissue Nitrogen Concentration

Water-borne Transport

- Sharp inshore-offshore gradient
- Pulsed activity due to weather events
- Values at Shelf Edge are very low

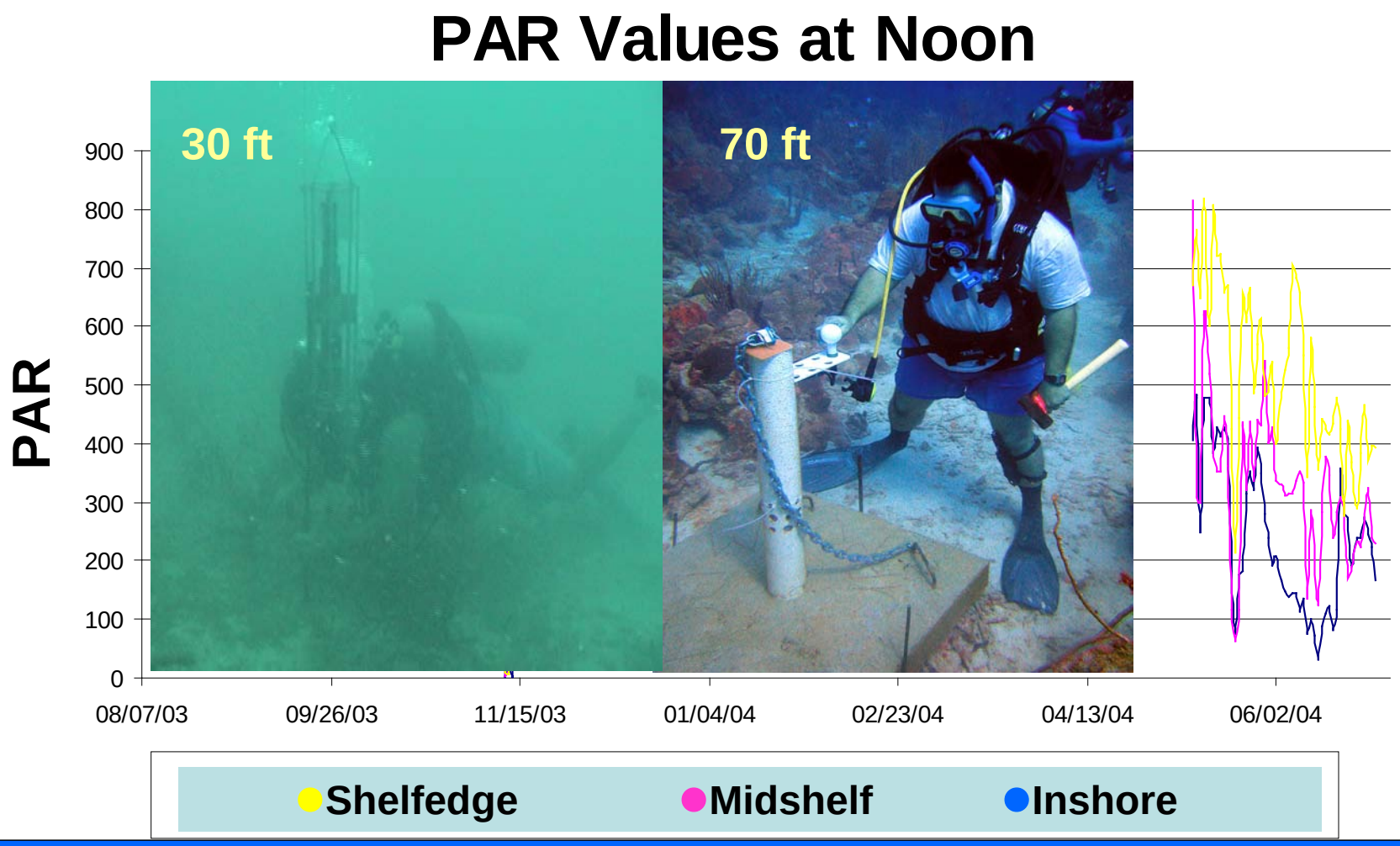


Relationship of Turbidity, Depth & Sedimentation

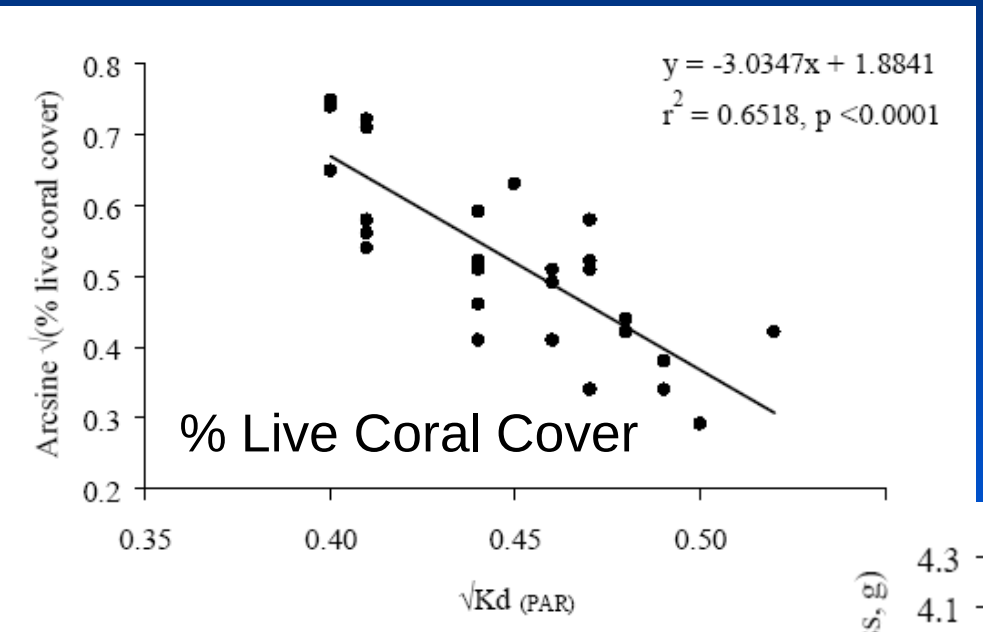


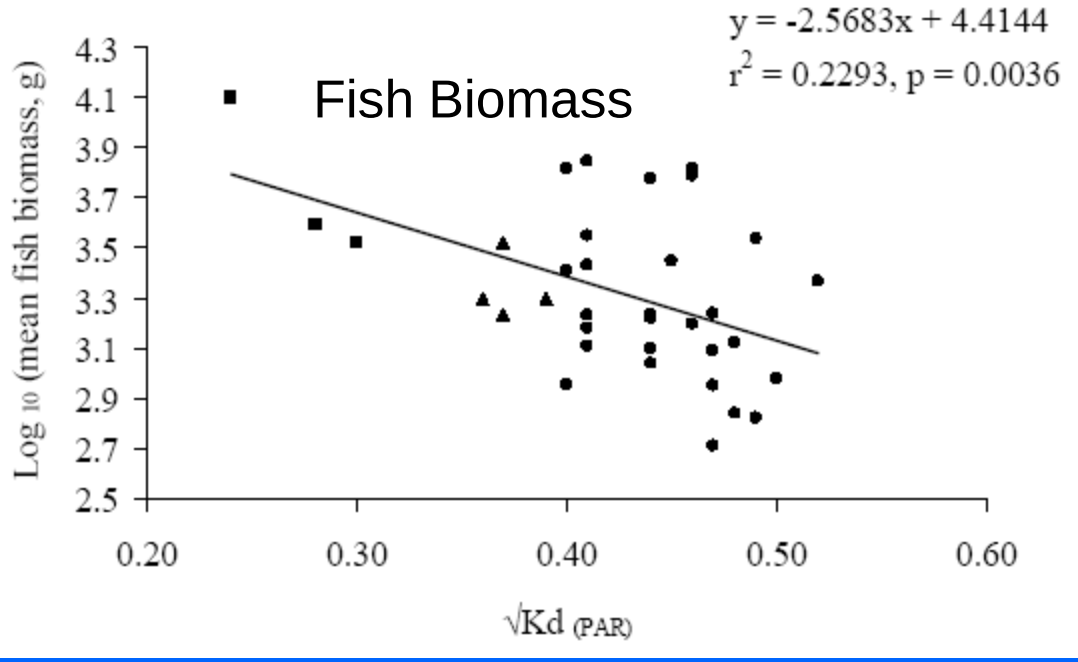
Prediction: log sedim(mg m^{-2} d^{-1}) = 1.29 log NTU + 0.6 log depth (m) +1.10

Inshore turbidity adversely affects coral communities



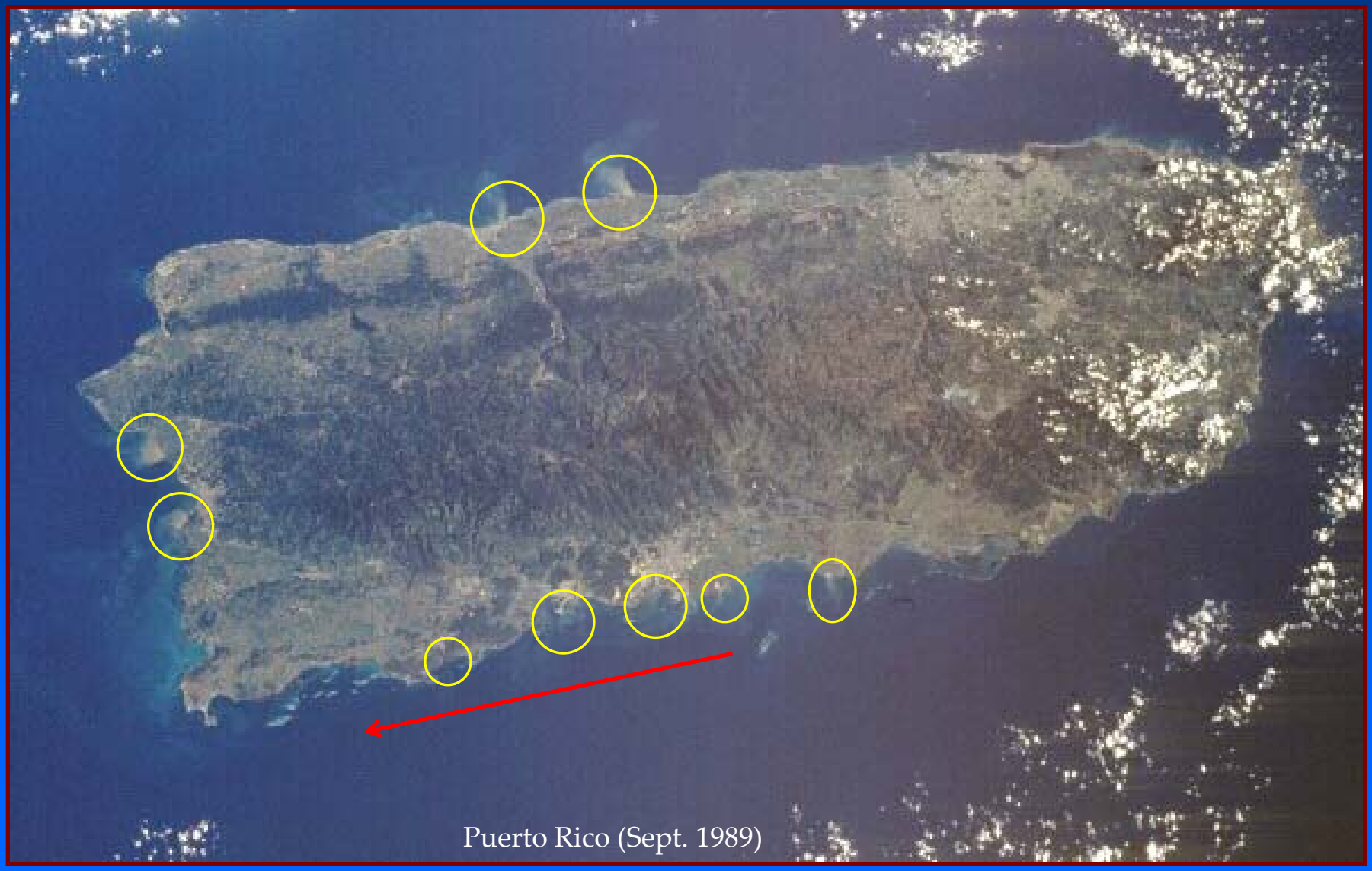
Low Light = Low % coral cover and low fish biomass & abundance





What is your watershed?

Effects of Land Disturbance: Downstream Effects



Puerto Rico (Sept. 1989)