**Paper**

Caveats of the panel sampling design dividing and dividing the region of interest into three sub-regions for sampling each year
- Would you miss something?
- Or would you see an "area" trend?

We talked about the sampling design and how you would only compare sites with themselves over time rather than with each other. This would give you points every 3 years for each site.

If you saw similar trends across all 3 divisions then it would suggest that you had good site selection. However, you could also get a similar response for two of the panels and something completely different in the third one (see graph).

Time (years)
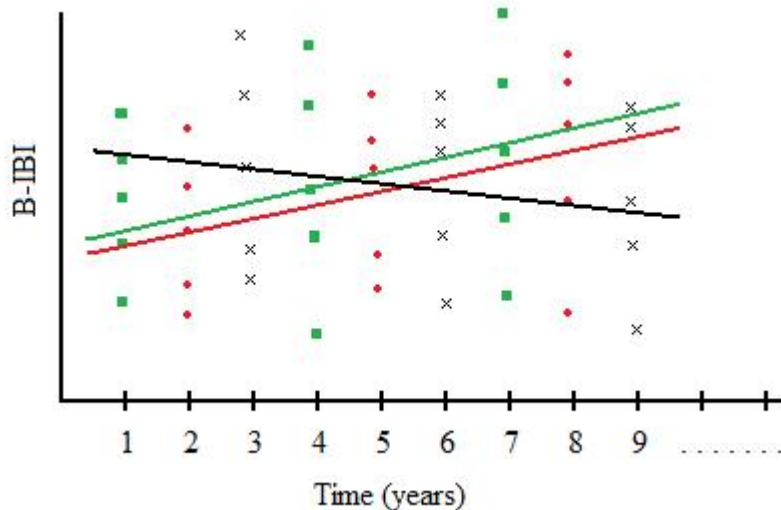
There would be a number of ways in which you could divide your sites into the 3 years:
- Stratify: Land cover (urban/suburban, etc.)
- Geographic
- Randomize through watershed

Someone suggested the idea of using calibration sites every year to avoid missing yearly changes/cycles that you would not be able to see if you only measured every 3 years.

Advantages/Disadvantages for dividing the sites among the different panels:

Stratification
- ADV: With land cover divisions you are able to inform management decisions
- DISADV: Climatic variability may be only associated with certain land use types

Geographic
- ADV: Can account for regional noise if they behave differently, maybe regions are inherently different.
- DISADV: Lose some of the randomness
  - Regions nested within years vs. fully randomized

To get a picture of trends and status use targeted sampling
- 1 site – change over time for one question
- Allocate multiple sites (of the 6 suggested in the paper) for one question, i.e. restoration

Indicators

Fire
- Which direction is good? Higher fire frequency or lower?
- It is hard to get historical data.

Invasive Freshwater Species
- Need and difficulty in quantifying damage caused by invasive species.
- Details on pg. 182, 321
- Species richness of invaders doesn't tell you very much information

How do you pick which species to use as indicators?
- For at risk species, do you pick umbrella species whose protection will create an "umbrella" of protection for many other species.
- However, are you at still at risk of missing protecting some species whose habitats don't overlap?

We got on a bit of a tangent about different management tactics and if the goal should be to try to preserve areas that are most species rich. We also discussed whether or not it is a good idea to pick charismatic macrofauna as indicators that we should try to save. Another idea would be to pick species that embody a variety of functions and/or trophic levels. Someone mentioned that even if your charismatic indicator doesn't respond to management practices that it is still informative because it tells you that something is wrong.

Two problems with charismatic indicators:
- political: There is always someone opposing management actions and if there is no response of the indicator then resistance builds.
- biological: How do you know if what you are doing for management is the best things possible?

Problems: Don't have money or time to measure everything and even if you did, it would be confusing. You also don't know if what you are measuring tells you what you need to know.

Goal: Indicators that tell you something useful about the system,

IBI discussion

Problem with reference sites – B-IBIs depend on only a few reference sites for each region. These reference sites are typically highland sites, which makes it difficult if you are only working with lowland sites for instance.

There is also the problem of circular logic in B-IBIs. To obtain the definition of "impacted," someone picks a site that they would call impacted or degraded and then defines the community that you find there as "degraded."

We need to find out about B-IBI databases – these should be useful.