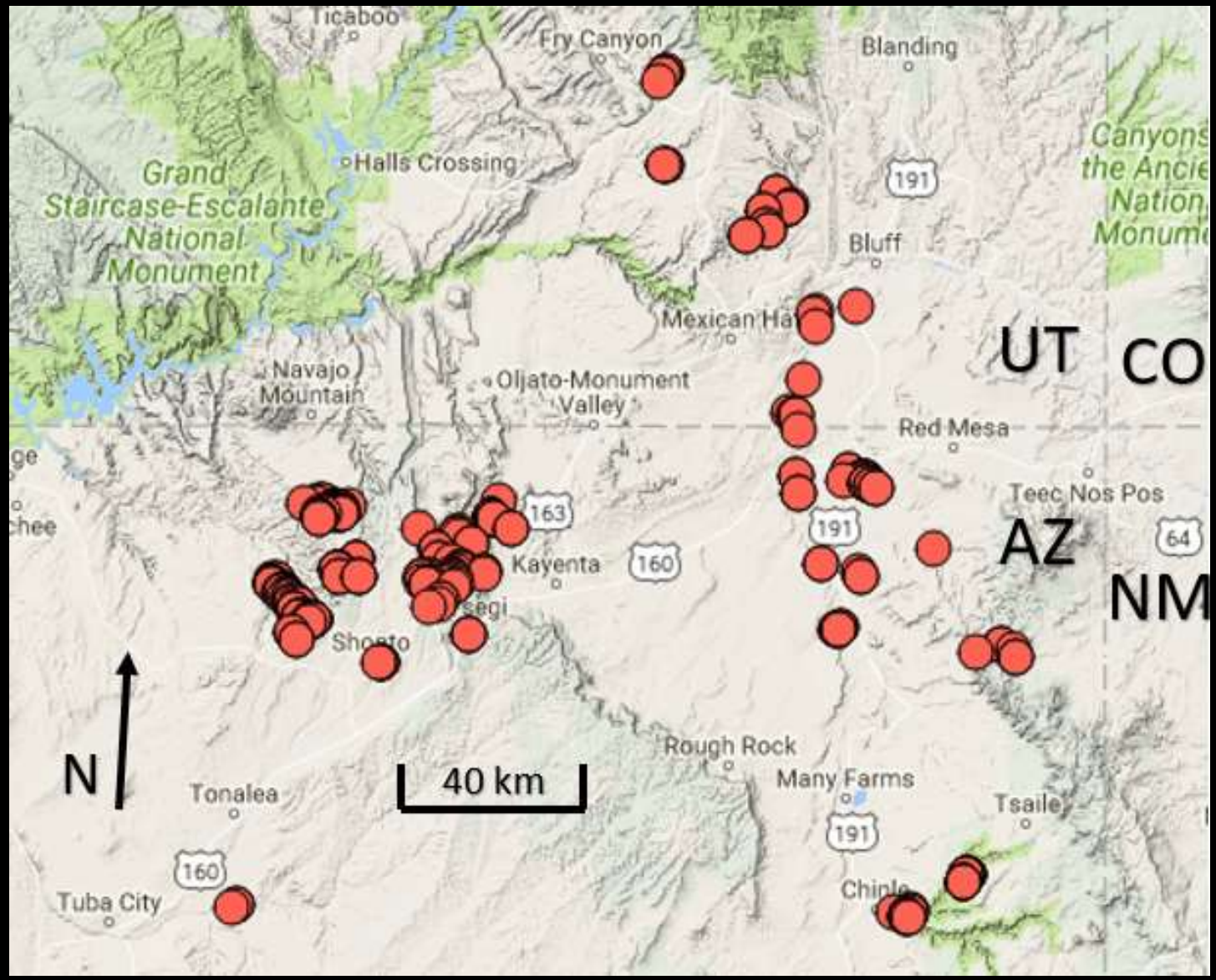
Lessons from work on Navajo sedge, Listed Threatened

Known range of Navajo sedge,
when listed (1985)

Maps adapted from SEINet

Present (2018) known range of Navajo sedge.



Today, listing efforts are preceded by a more careful review process.

All of the work until just a few years ago indicated that the species was in serious decline.

This wasn't real; rather it resulted from flawed monitoring approaches.

These flawed approaches included:

Lack of adequate site location documentation.

Result: inability to relocate sites.

Nearly complete lack of documenting negative results of surveys.

Result: we don't know which areas have been searched,
but more importantly, we can't document dispersal events.

Lack of reasoned protocol for documenting plant abundance at sites.

Result: past documentation of plant abundance has little value.

Vouchers often not collected or curated in herbaria, or collected but mis-ID-ed.

Result: sites eliminated after re-visits showed that plant IDs were wrong.

Nature Serve 'fit' this species into their broader protocols

Result: we have a skewed understanding of "populations", wholly based on poor assumptions.

1) Lack of adequate site documentation.

Both of these sites were “lost” for 30 years, thus considered extirpated.

A more accessible and much larger, wetter hanging garden below this one was presumed to be the one originally documented and it does not have Navajo sedge.

The first explorer made a mistake about which canyon he found this site in. Later he fessed up to the mistake, but in an obscure letter that didn’t re-surface for 30 years.

Navajo sedge was reported at three sites in this canyon, but we didn't have adequate information to relocate these sites. Later, they could not be found, so they were presumed extirpated.

Terrain very complicated and difficult to navigate.

Both of the personnel who took on this monitoring are acrophobic.

Clearly, this is not appropriate terrain for an acrophobic person to monitor plants that grow on cliffs.

Three days of arduous searching revealed that these sites were extant,
with the benefit of discovering an additional 12 previously unrecorded sites.

Issues:

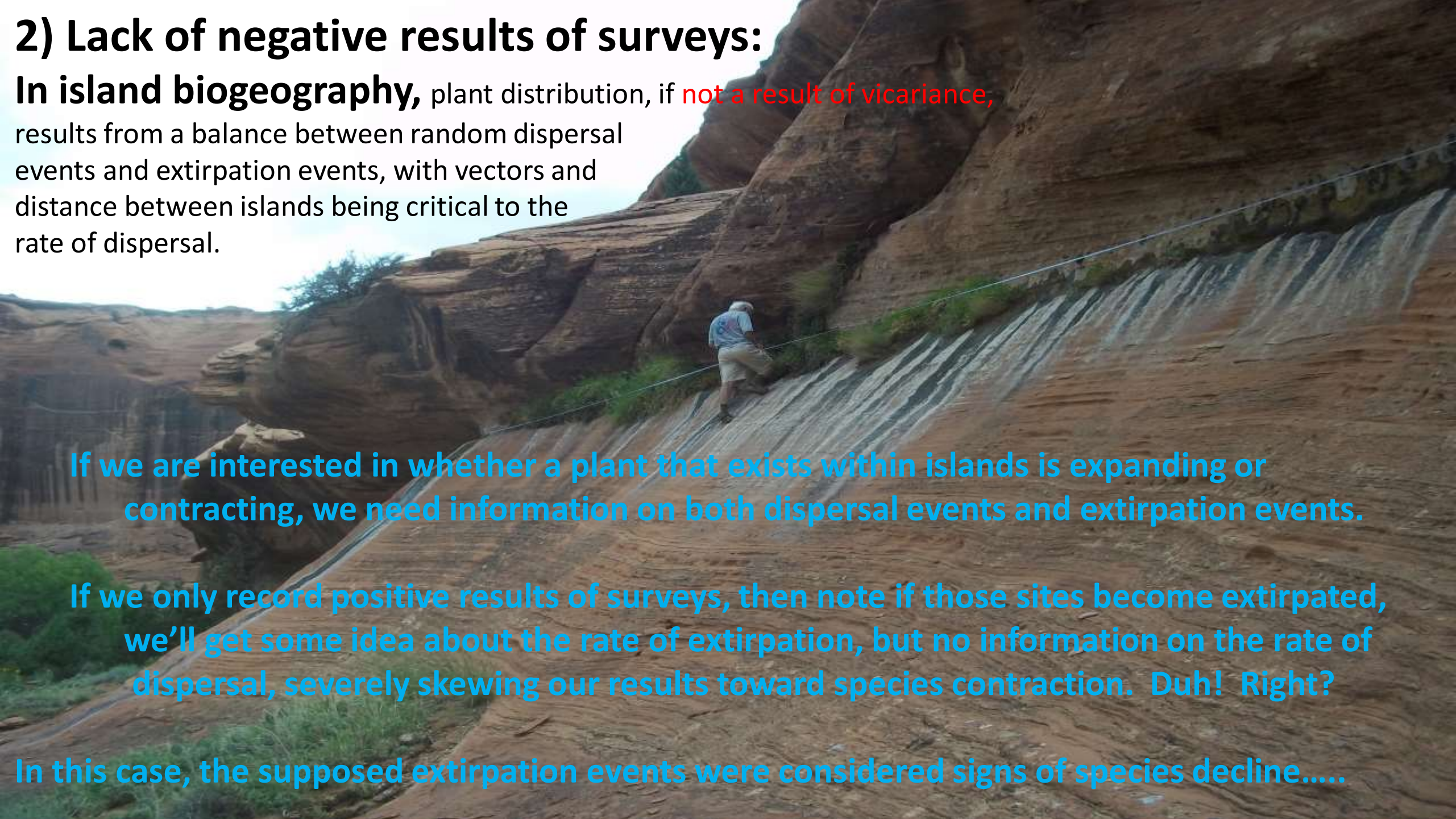
1) locations not marked on maps while in the field
2) no georeference
3) no photos


1990 map shows
this access route
& sedge location
CASP
We found a 200’ sheer cliff,
with no way down,
and a dry alcove w/no sedge.


Instead, we found
a route off the cliff here
and found sedge here.
This could be interpreted as an
extirpation event; we interpret it
as a mis-mapping event.

2) Lack of negative results of surveys:

In island biogeography, plant distribution, if not a result of vicariance, results from a balance between random dispersal events and extirpation events, with vectors and distance between islands being critical to the rate of dispersal.



If we are interested in whether a plant that exists within islands is expanding or contracting, we need information on both dispersal events and extirpation events.

If we only record positive results of surveys, then note if those sites become extirpated, we'll get some idea about the rate of extirpation, but no information on the rate of dispersal, severely skewing our results toward species contraction. Duh! Right?

In this case, the supposed extirpation events were considered signs of species decline…..

3) We failed to establish a repeatable protocol for measuring plant quantity from year to year.

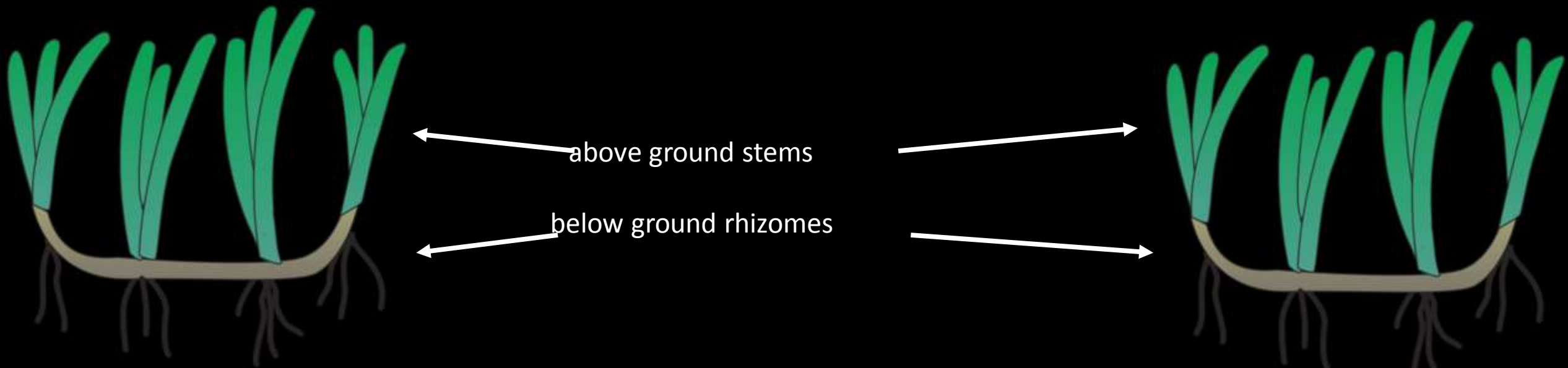
Plants don't move around like animals; so they should be easy to count. Right? Right???

The issue is, how to define the individual?

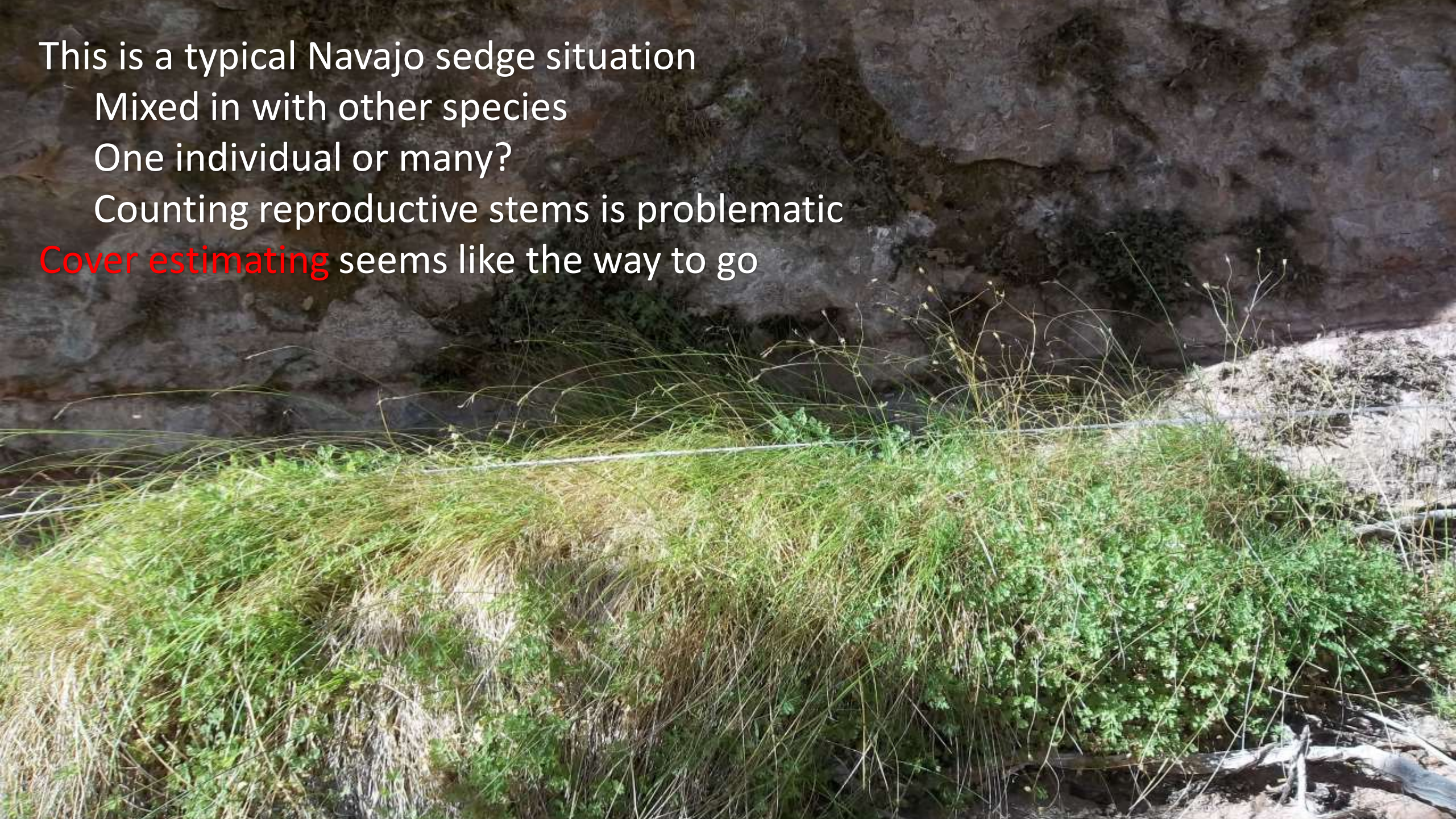
In the case of Navajo sedge, a rhizomatous perennial, with stems connected by underground roots, all of the plants in an individual hanging garden might be just one individual.

We don't know how each monitor approached this problem, so their counts are just about **useless**.

For rhizomatous perennials, an improvement to counting stems, or some other protocol, is to estimate cover.




Okay, let’s start counting plants!


This is a typical Navajo sedge situation
Mixed in with other species
One individual or many?
Counting reproductive stems is problematic
Cover estimating seems like the way to go

4) Vouchers, taxonomic understanding, and review are critical.

Navajo sedge is presently known from: Navajo sedge is primarily known from the Navajo Nation and Cedar Mesa. It is also known Navajo, Canyon de Chelly, and Natural Bridges national monuments; and in Glen Canyon NRA.

Often vouchers were mis-determined from golden sedge (*Carex aurea*); others were re-assigned to Utah sedge (*Carex utahensis*), a taxon that was named after Navajo sedge was listed. Other reports remain to be vouchered. These mistakes led to a skewed understanding of the species' range.

golden sedge

Navajo sedge

Utah sedge

All photos by Max Licher

5) Problems with unsupported assumptions about what constitutes a “population”.

This canyon is now the home to what NatureServe calls an Element Occurrence (EO), ie. a population, which is defined as a group of organisms genetically interacting. We now know of 16 “sites” within this EO.

However, we don’t know if the Navajo sedge plants within each site are interacting with those of nearby sites.

NatureServe wants to standardize their procedures, which is great, but in order to serve the species they are attempting to conserve, they should take into account individual species’ biology.

Lessons:

Take detailed field notes, photographs, georeference; with an eye for repeatability.

Record negative results. Benefits:

Ability to trace species' dispersal events
Ability to track which areas have been searched

Use a well-defined "repeatable" methodology. "Counting plants" may be flawed.

Vouchers and review by qualified specialists is essential for some taxa.

We need to tailor our approaches to each rare plant species' unique biology.

EO issue

Threats to Navajo sedge used to include:

- grazing
- trampling
- aquifer draw down
- climate change

Threats to Navajo sedge now include:

- climate change