Evaluating restoration trajectories using similarity indices: dam mitigation in the Pacific Northwest, USA

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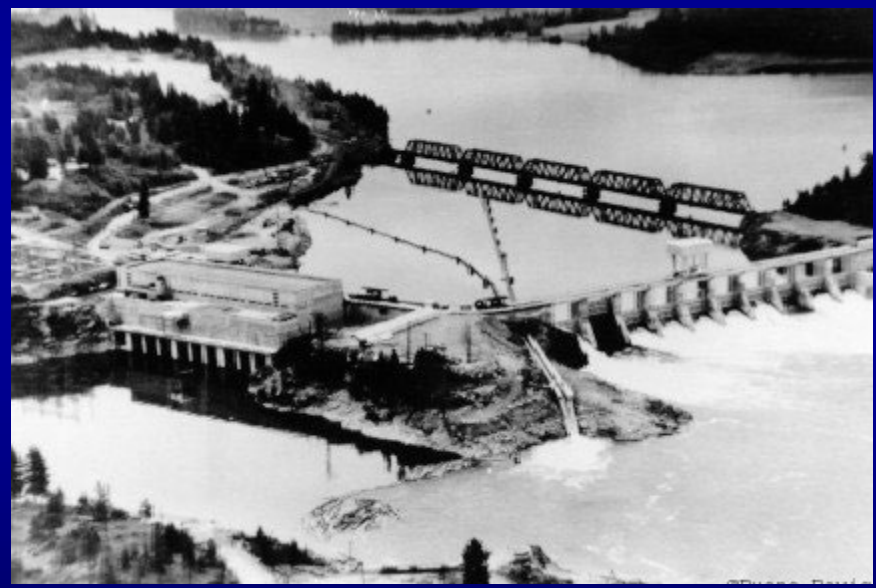
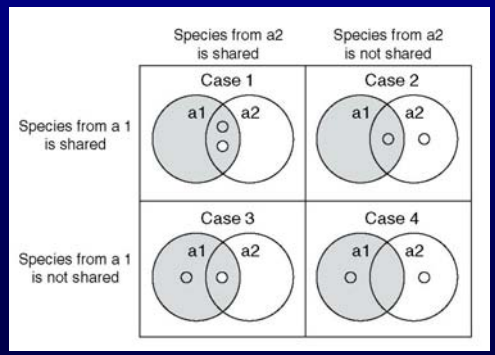


The problem: evaluate wildlife response to habitat restoration efforts resulting from mitigation of wetland losses after dam creation

This talk examines use of similarity measures to evaluate effects of habitat restoration activities

Mediation of habitat loss due to dam construction

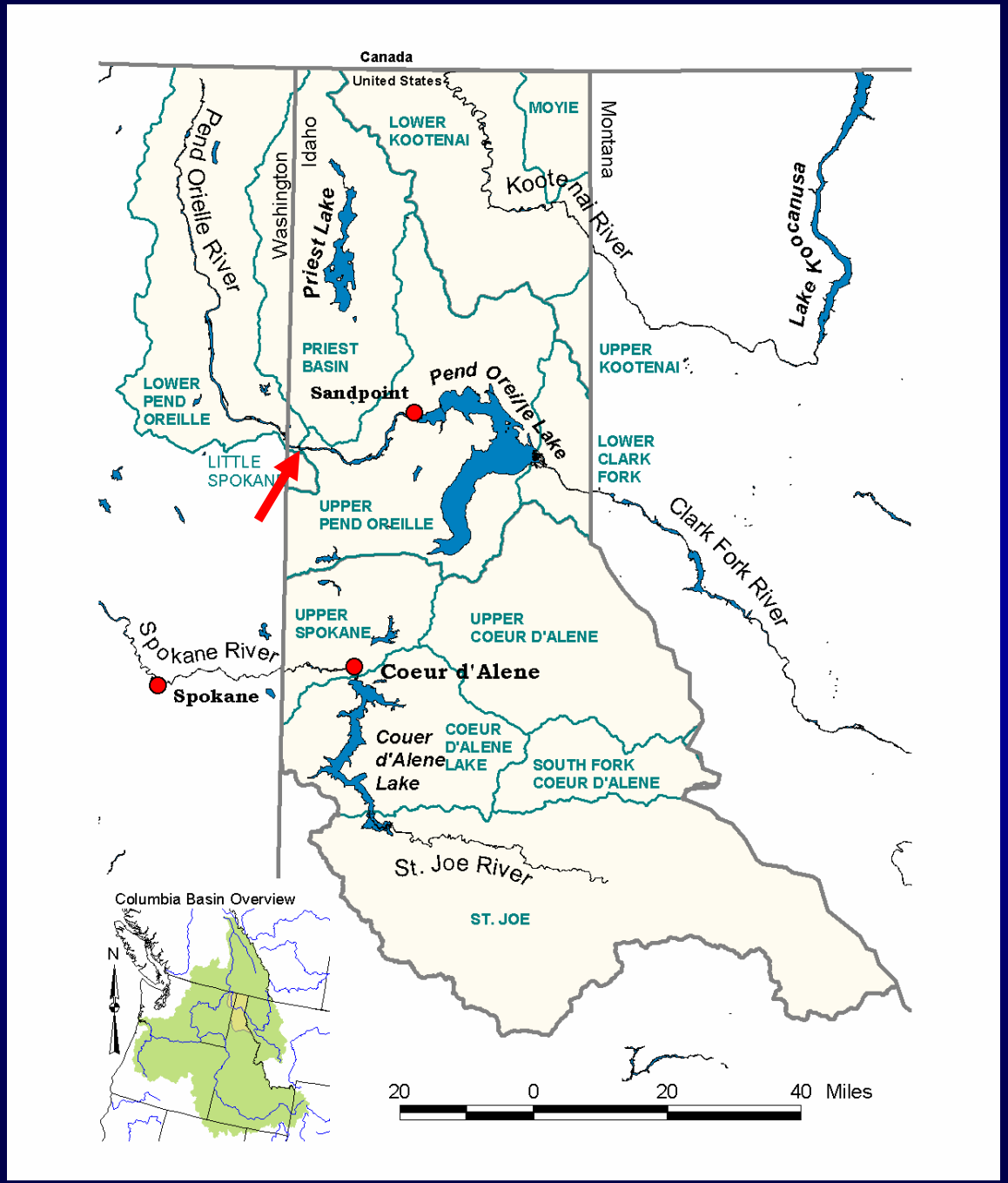
Monitoring of wildlife response to habitat restoration



Analysis of species similarity

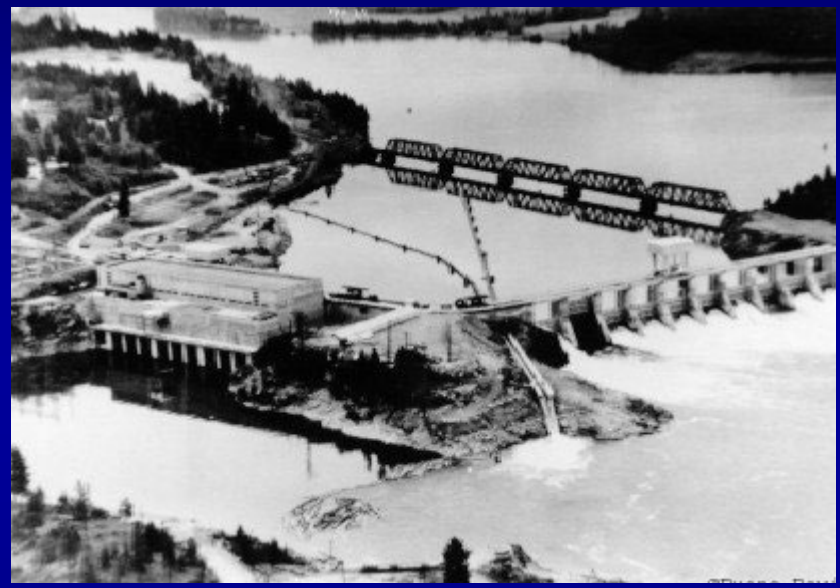
Albeni Falls Dam

1955



Creation of Albeni Falls dam in Idaho converted 6617 acres of wetlands to open water

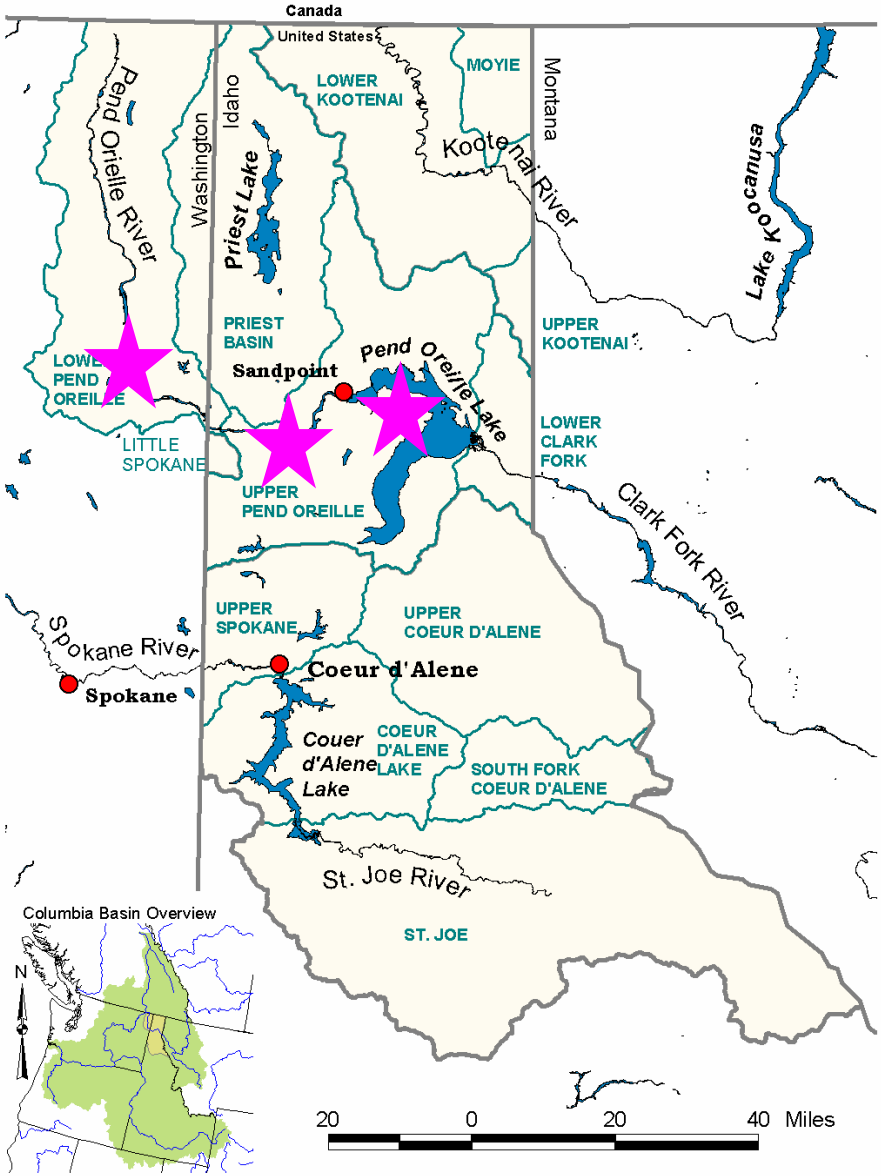
Before



After

Wetlands were lost from Morton Slough, Idaho

Mitigation properties of the Kalispel Tribe of Indians



3096 acres have been purchased for mitigation

1997

Flying Goose Ranch

Water level management

2002

3096 acres have been purchased for mitigation

Exclude grazing

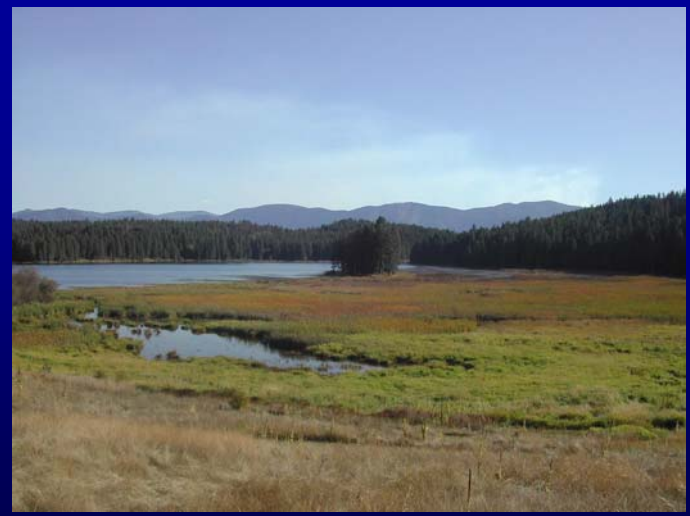
Control weeds

Restore native vegetation

Twelve reference sites provide a baseline for comparison with restoration targets

Scrub-shrub

Floodplain grassland



A stratified-random sample of 30 restoration sites were selected for comparison to reference

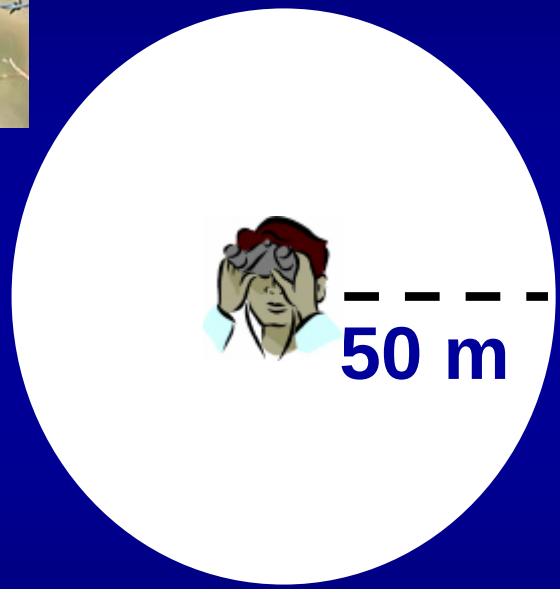
Wildlife and habitat monitoring began in 2002

Point-count bird surveys

- **10 minutes**
- **May to June**
- **7 entries per site**

Reference sites monitored for 3 consecutive years

Restoration sites once every 3 years



Costs prevent exhaustive monitoring

$$\frac{A}{A+B+C}$$

Similarity measures are based on incidence (classic) or on relative abundance (probabilistic)

Classic Jaccard

- A – Species shared in 2 sites
- B – Species unique to site 1
- C – Species unique to site 2

$$\frac{A}{A+B+C}$$

$$\frac{A}{A+B+C}$$

Similarity measures are based on incidence (classic) or on relative abundance (probabilistic)

Probabilistic Jaccard (Chao)

Incorporate relative abundance

↓

Estimate unseen species

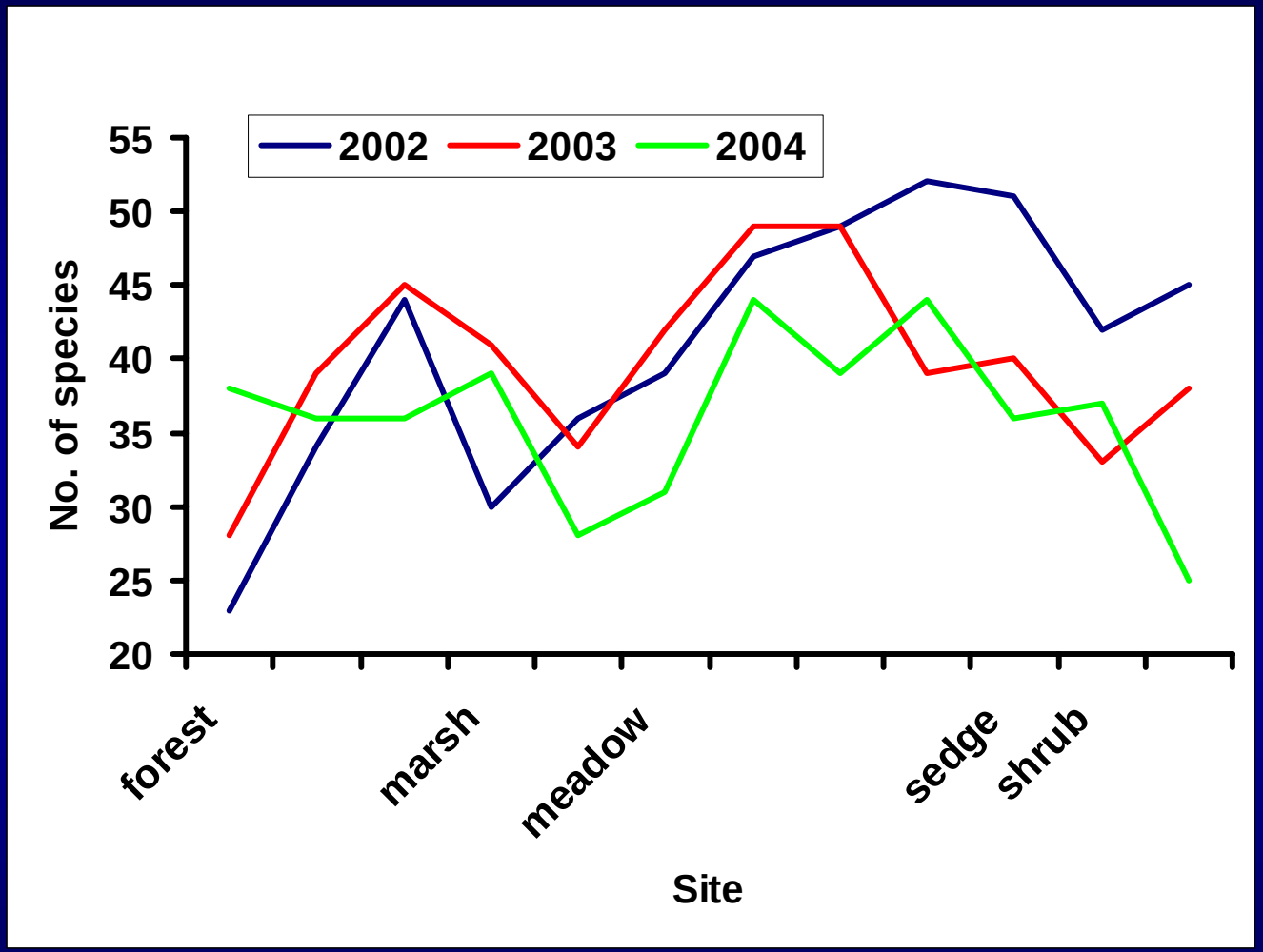
$$\frac{UV}{U+V-UV}$$

U = total abundance of shared species at site 1
V = total abundance of shared species at site 2

Development in Chao et al. 2005. Ecology Letters.

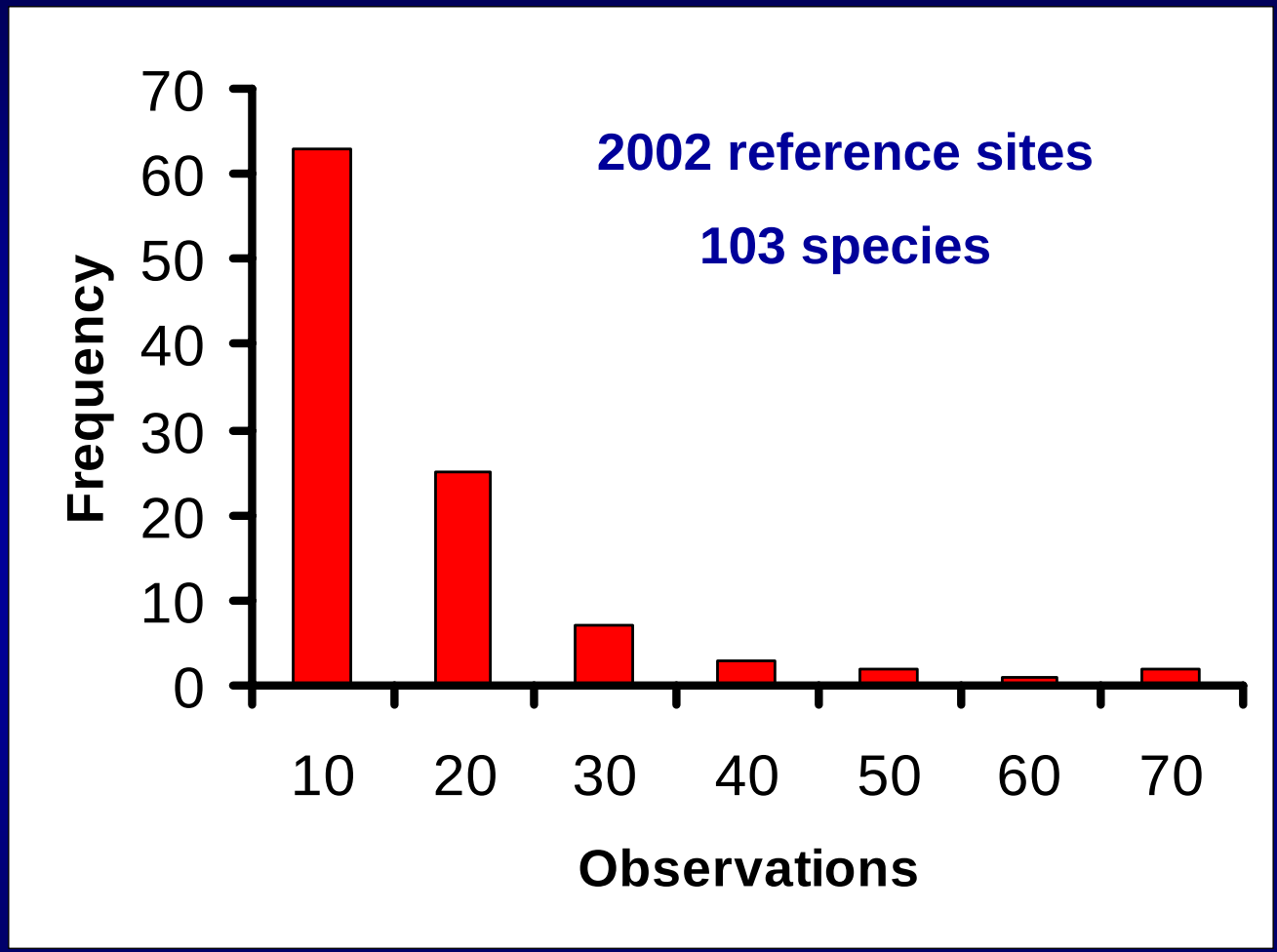
Implementation in Colwell. 2005. EstimateS 7.5
purl.oclc.org/estimates

Species detection of birds varies between years



Maximum number of species detected per year varies by >25% for reference sites

Number of detections varies across species



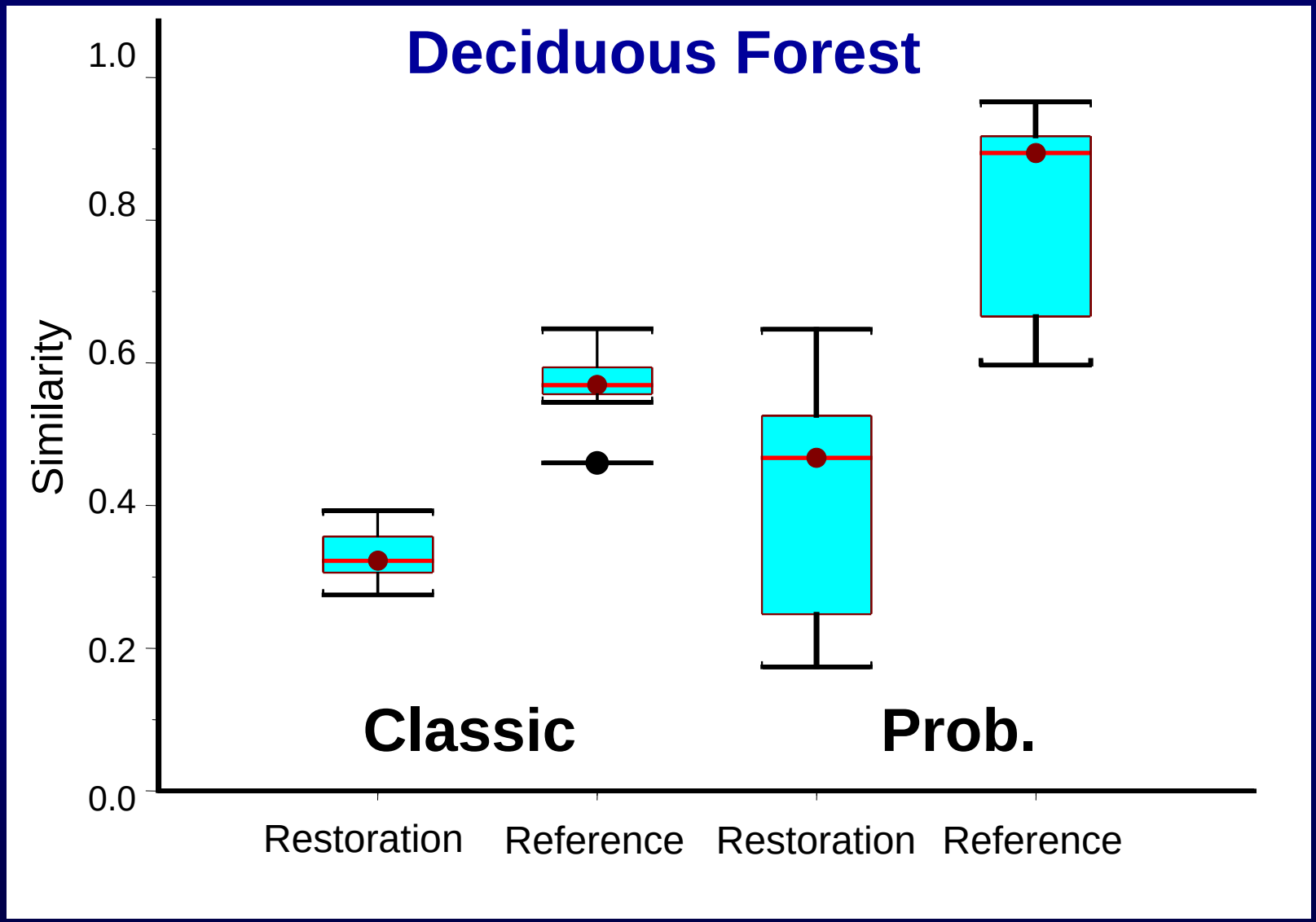
A few species are observed frequently

The similarity between years for reference sites is lower for classic versus probabilistic Jaccard

	Interyear Mean	SD
Classic	0.53	0.05
Probabilistic	0.84	0.06

No correlations between classic and probabilistic estimators

Comparisons of restoration and reference vary with the similarity measure used and habitat



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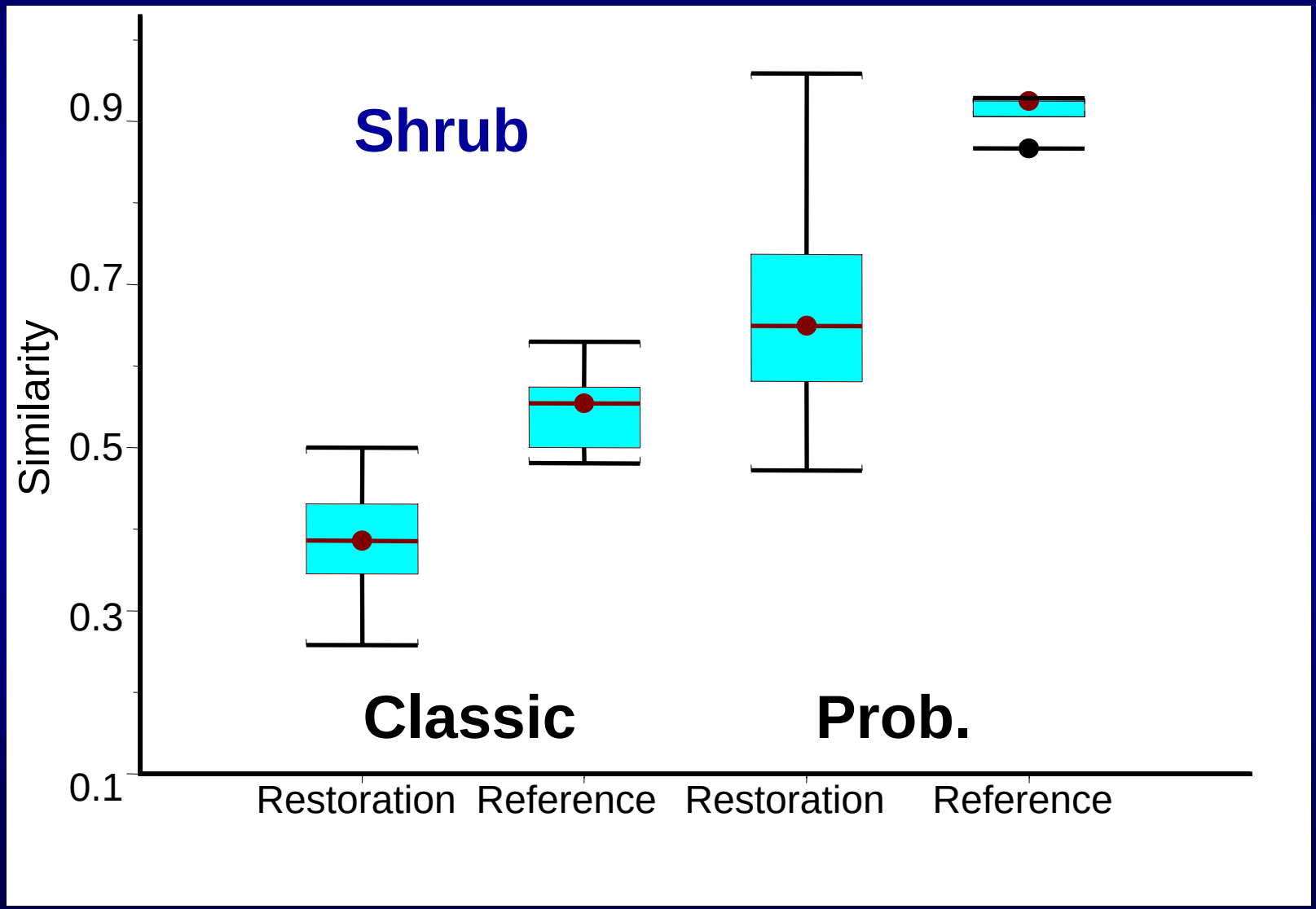

In summary, probabilistic similarity measures avoid the underestimation of incidence based measures

Limited monitoring requires tools that can account for unseen species

Incidence measures underestimate similarity

Probabilistic measures have potential to detect significant changes in composition