GROUP ON EARTH OBSERVATIONS

Biodiversity
Observation
Network

GEO Biodiversity Observation Network
GEO BON Concept

Biodiversity
Observation
Network

GEO BON Meeting
Potsdam, 8-10 April 2008
Georgina Mace, Institute of Zoology

ZSL

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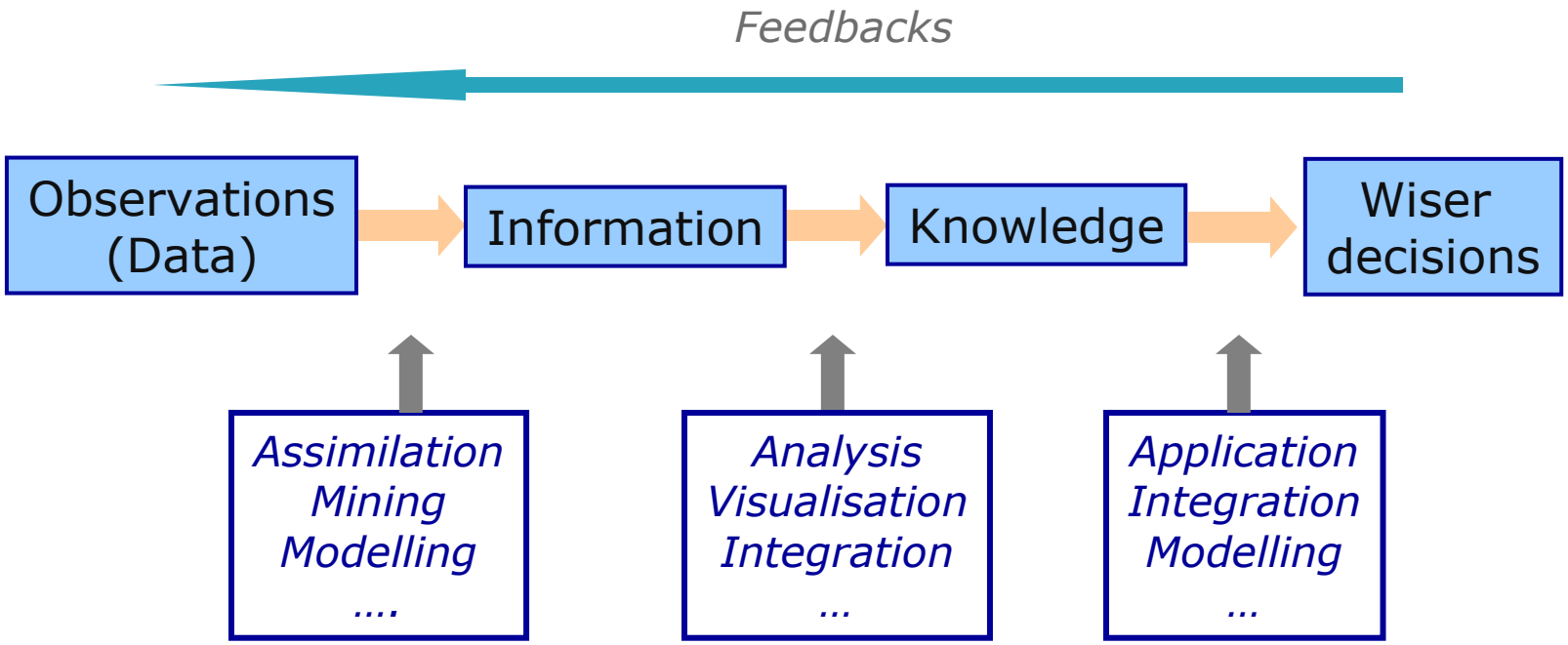
Observing system



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Question about the system

1. What to observe
   - Why?
   - When, where?
   - How?

2. Using the observations
   - Status
   - Trends
   - Change

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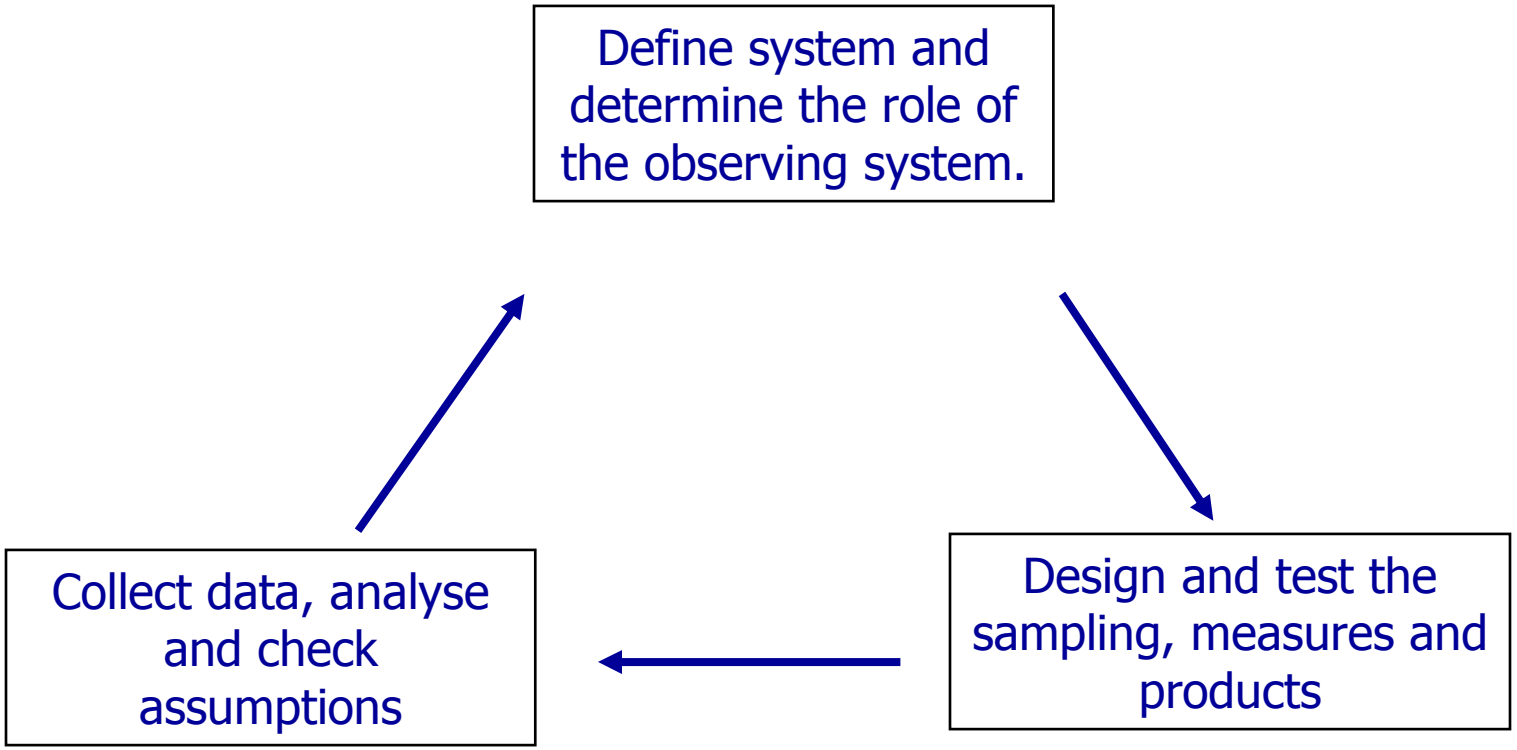
What is biodiversity for ?



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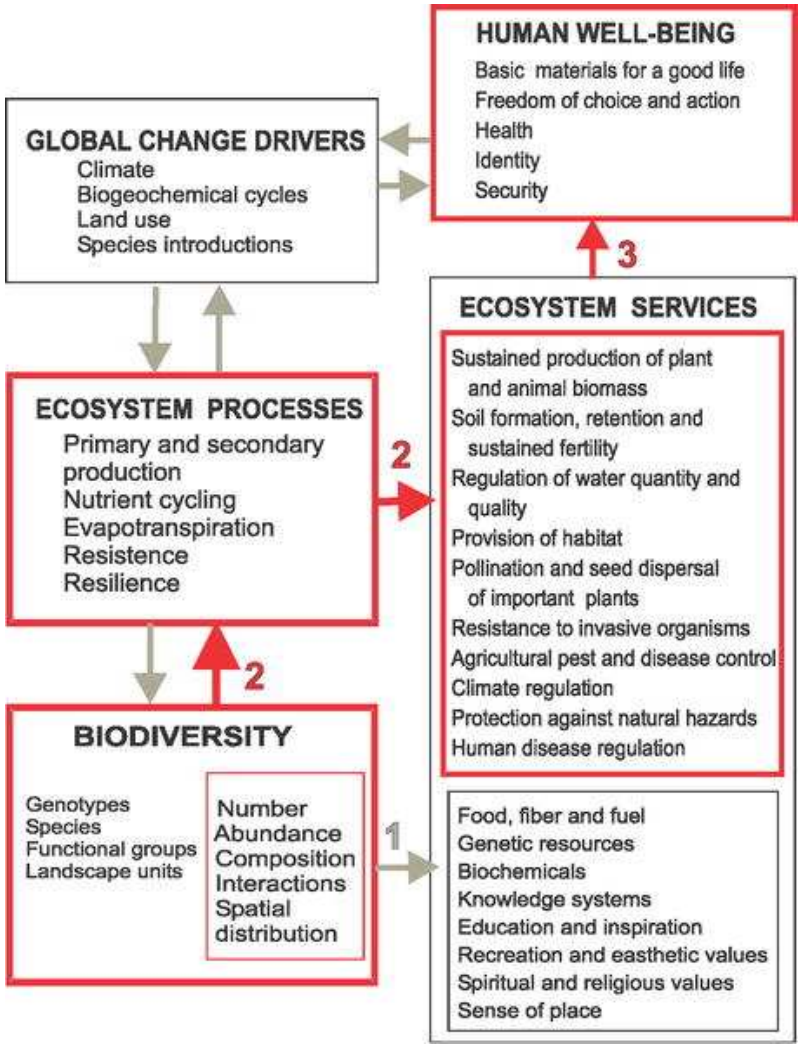
What is biodiversity for ?

Figure from Diaz *et al* *PLoS Biology* (2004)



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Biodiversity elements

Objects
Ecosystems
Species
Genes
Ecosystem goods and services

Measures
Number (diversity)
Uniqueness (irreplaceability, endemism, PD etc)
Functioning
Composition
Interactions
Distribution

Quantity, Rate of change

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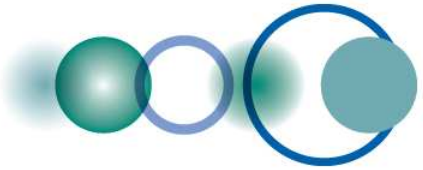

GEO BON suggested species groups

Stratum	Included groups
Provisioning species	Domesticated mammals & birds, food crops, forestry species, medicinal plants, wild-harvested mammals, freshwater fish, coastal reef fisheries, marine high tropic fish, pelagic fish, demersal fish
Treaty species: Migratory, RAMSAR, CBD, etc.	Migratory passerines, migratory waterfowl, sedentary waterfowl, large marine mammals, sea turtles
Key functional groups	Pollinators, N-fixing organisms, soil nematodes, keystone food plants
Top predators	Sharks, raptors, mammalian predators, snakes, spiders
Herbivores	Bovids, caprids, camelids, antelopes, rabbits, hares
Primary producers	Grasses, trees, shrubs, mosses, corals, phytoplankton, seagrass
Detritivores	Crayfish, lobsters, crabs, dung beetles, earthworms, molluscs, termites
Charismatic species	Elephant, rhino, hippo, primates, large cats, wolves, bears, pandas, whales, dolphins
Indicator groups	Salamanders and newts, rainforest frogs, freshwater frogs, butterflies, moths, bats, lichens, fruit-eating birds, ants, seed-eating birds, insect-eating birds
Disease and pest species	Human disease-vector insects, ticks, small rodents, locusts, crop pest insects, crop weeds, aquatic weed plants, toxic algal bloom species
Evolutionary clade representatives	Ferns, cycads, echinoderms, ascidians, crocodiles, tortoises

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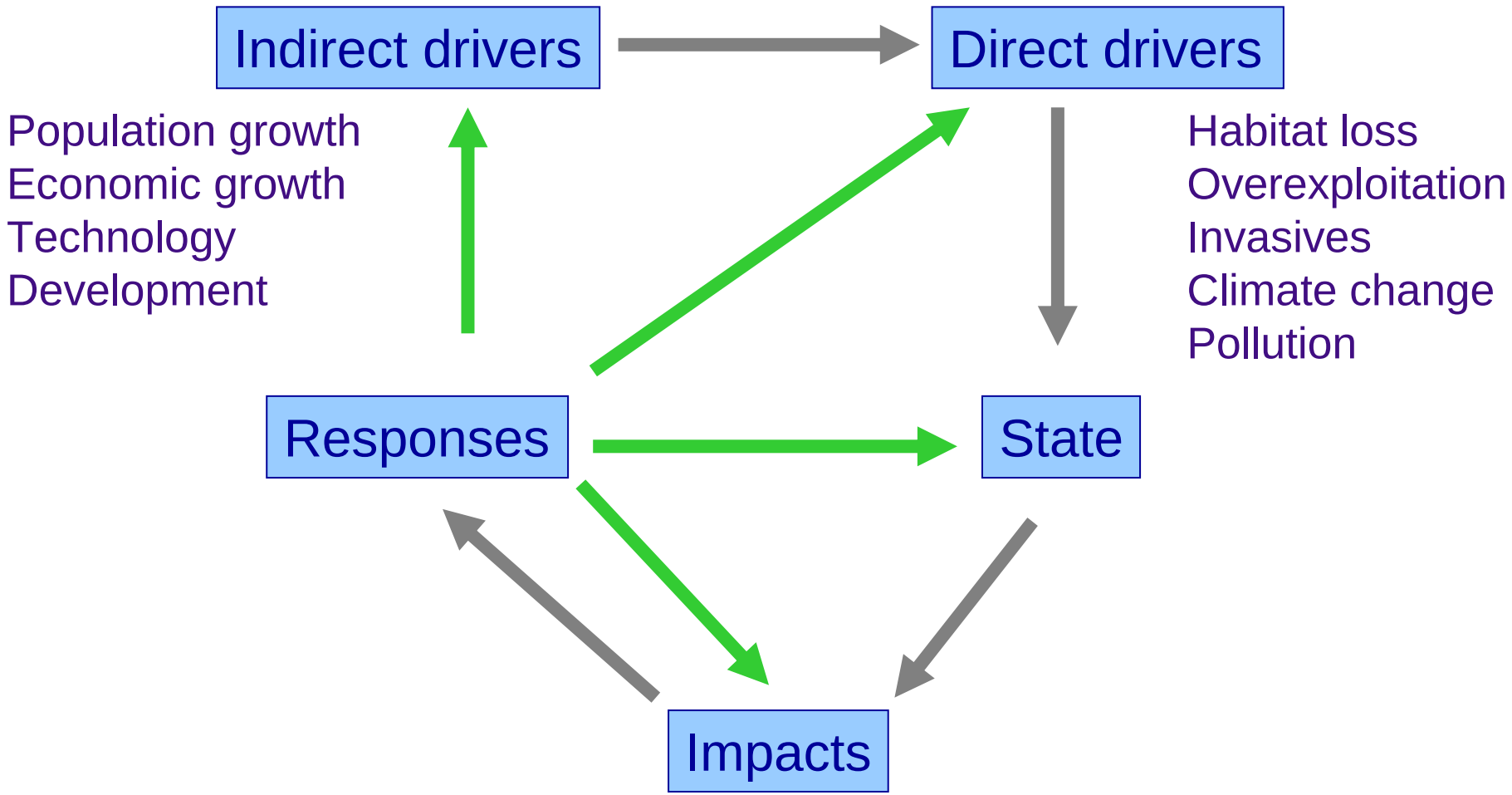
Move back along the chain of cause and effects for biodiversity…



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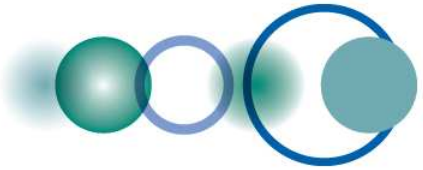

Turning data into information

Data gathering -> measures

1. Representativeness
2. Relevance
3. Measurement uncertainty

Data analysis -> products:

1. Aggregation
2. Gaps
3. Weighting

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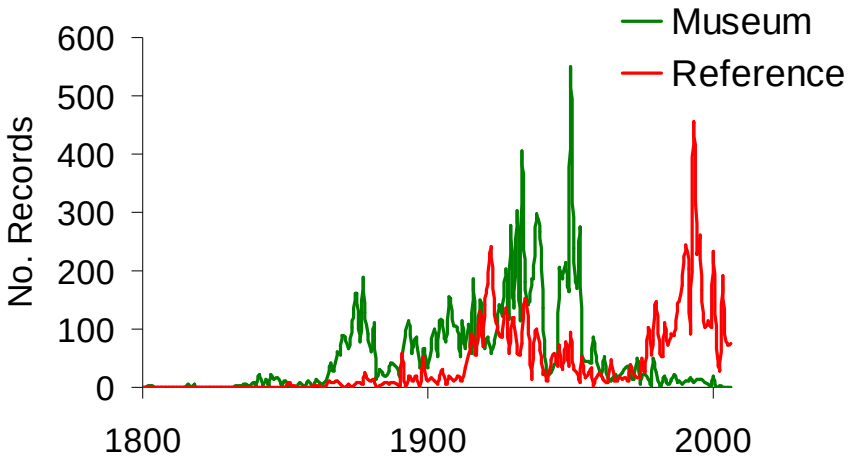
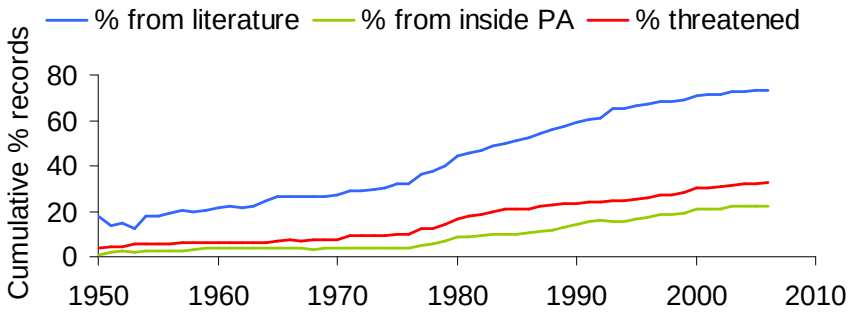
Data biases



***Galliformes**: Museum versus literature sources*

The sources, collecting sites and species being recorded are changing with time – especially recently



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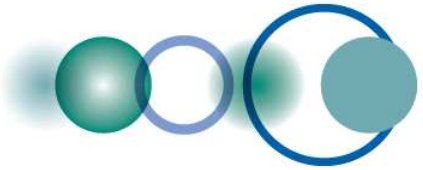

Gathering data efficiently: Sampling decisions

Sampling :

- sample size
- stratification
- time frames
- spatial scales

Products

- weighting
- aggregation
- data gaps

Validation

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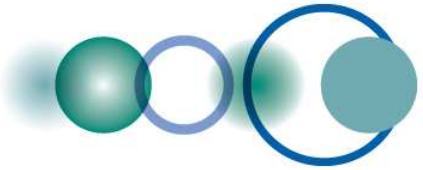

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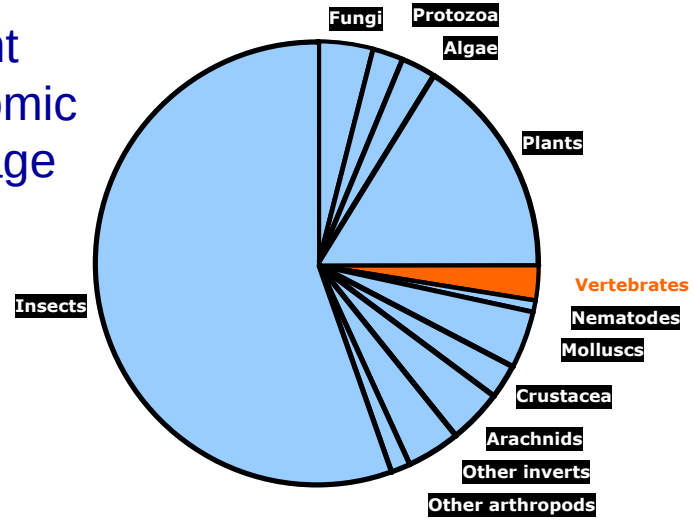
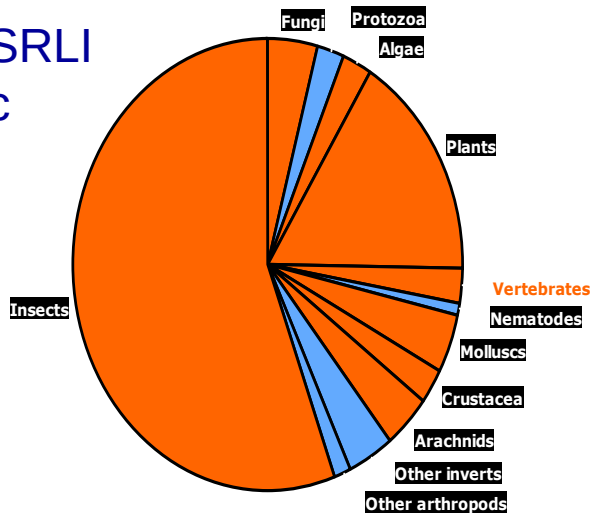
Red List Index : Sampled Approach (SRLI)

- GOAL: **Develop and report on an index of extinction risk for a representative sample of the world's better-known species groups**

Current taxonomic coverage



Possible SRLI taxonomic coverage



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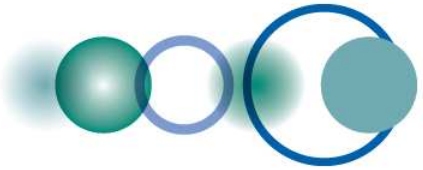

Methods - SRLI

- **Sample Size**
- 1500 species
  - Large enough to explore patterns by realm, habitat types, and provide insight into threat processes and conservation measures
  - up to 40% of species can be DD
- **Sample Process**
  - Random without replacement from list of all species within group
  - Non-stratified
- **Aggregation**
  - Higher taxa Indices
    - Vertebrates, Invertebrates, Plants
    - Fungi and Algae possible in future
- **Weighting**
  - For the overall SRLI, each taxonomic group will get equal weight

- **Selecting Groups**
- Must be broadly representative of biodiversity
  - **Recognizable units** of biodiversity by the intended audience
  - Sufficient **data** available such as complete or near complete species list
  - **Human resources** available to conduct large scale assessments of the group
  - I**nfrastructure** exists to conduct large scale assessments of the group
  - Must be able to apply the IUCN Categories and Criteria

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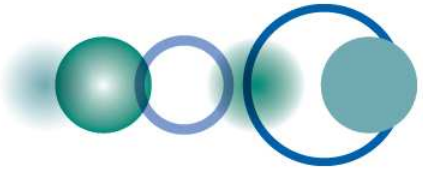

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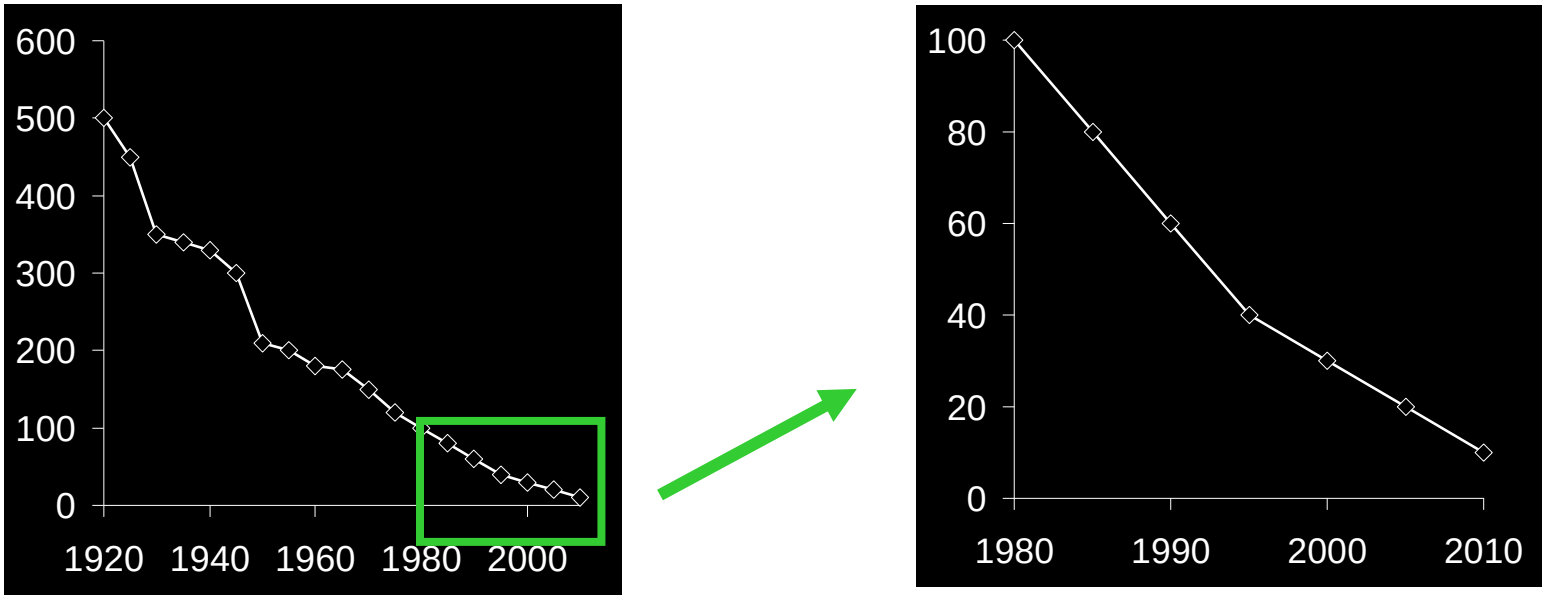
Baselines

Starting points for data series
Back-casting or mining for historical trends



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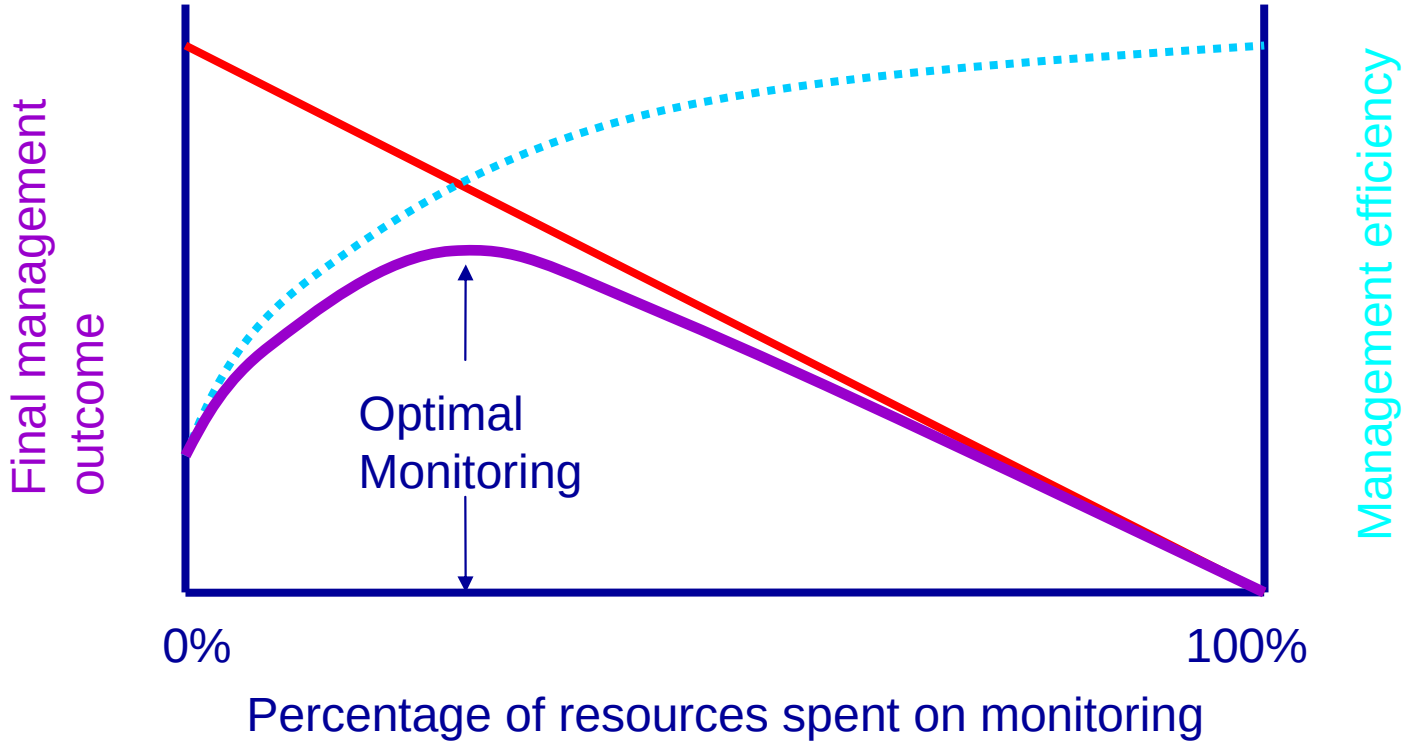
Cost effectiveness: Optimal monitoring



Optimal monitoring when, without money spent on monitoring you can do a fair job of **management**

From Hugh Possingham

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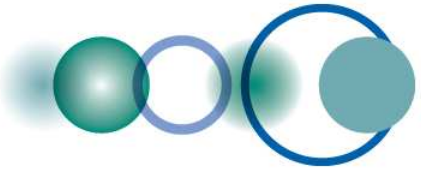

Exploiting new data gathering methods

1. Volunteers
2. Web-based tools
3. Modelling techniques

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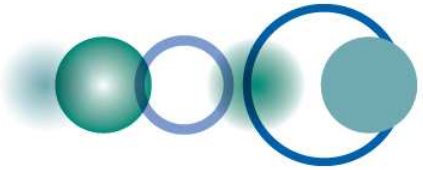

Japanese vascular plants: T. Yahara

- Census periods
  1994-1995 → 2003-2004

- People participated
  Ca. 500 citizens

- Data collected for 4,457grids of 100km^2
  - 1995: pop size and trends for 1,549 taxa
  - 2004: transition in pop size for 1,697 taxa

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Transition between two censuses

		Population size in 1994-1995							
		Extinct	<10	<100	<1000	>1000	Uncertain	No answer	Sum
	Nearly Extinct	24	62	38	4		102	410	640
Population size in 2003-2004	Extinct	1069	199	148	45	11	345	704	2521
	<10	79	1633	446	62	9	377	2815	5421
	<50	44	312	1076	136	21	290	2387	4266
	<100	20	122	2301	311	43	266	1297	4360
	<1000	12	57	313	1066	151	183	1391	3173
	<10000	5	4	37	67	214	58	367	752
	>10000	3		7	10	65	10	77	172
	Uncertain	131	844	880	220	47	2923		5045
	No survey	23	88	67	9	2	103	1569	1861
	No answer	212	380	834	338	71	745	258	2838
	Sum	1622	3701	6147	2268	634	5402	11275	31049

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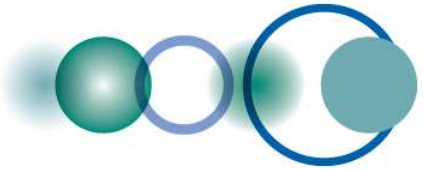

Using new tools and techniques

- Interactive web-based systems
  - E-taxonomy
  - data integration tools

- Adaptive monitoring
  - Monitoring intensity/locations etc. responds to change