

# Using ecological indicators in water-quality monitoring - a beginners guide

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*'Leaving no-one behind'*

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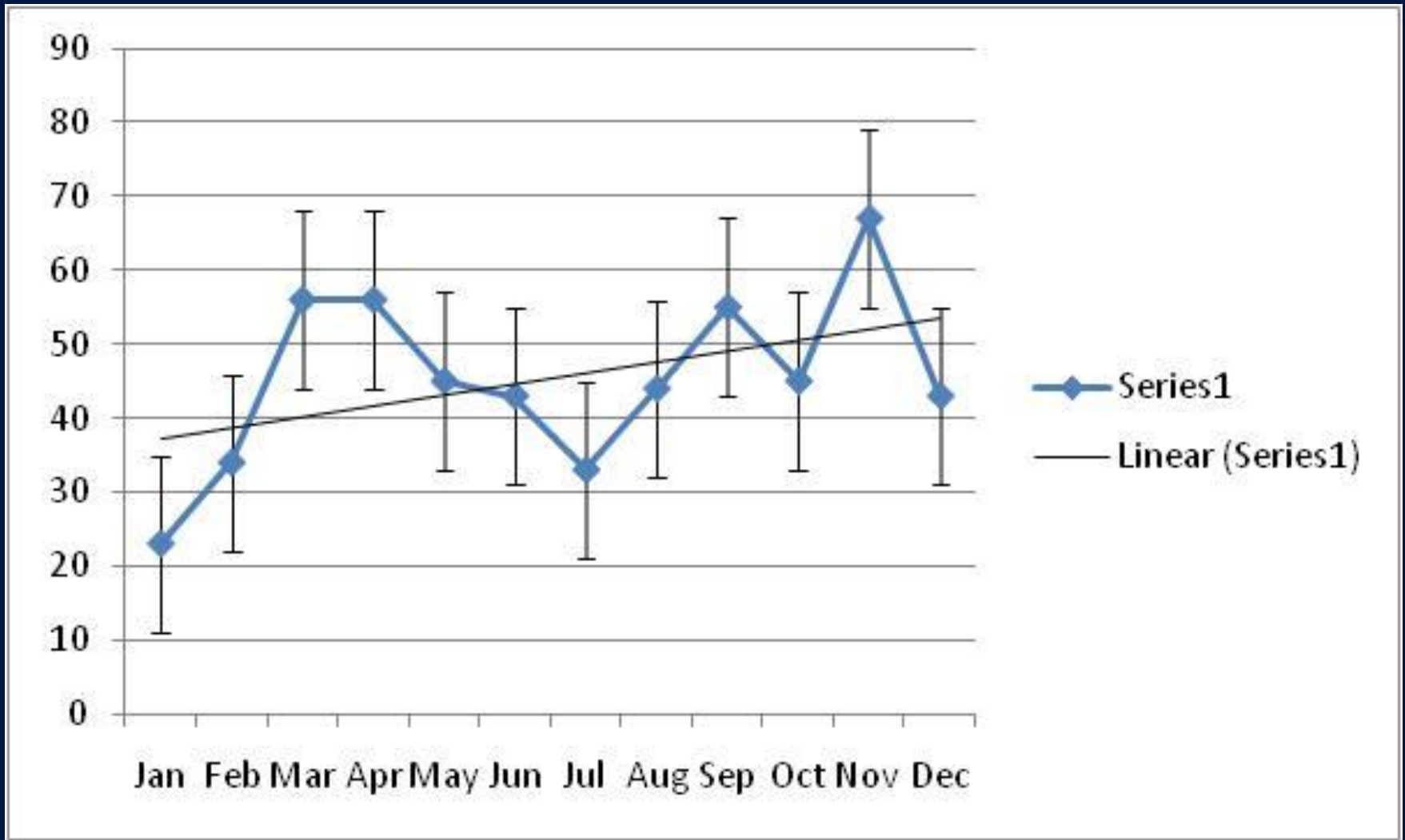
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# Introduction

- Ecological Indicators:
  - What are ecological indicators?
  - Why are they used?
  - Where (in what circumstances) are/can they be used?
  - What is monitored?
  - Examples



# How things have changed!



# How things have changed!

- Ad
- Ec

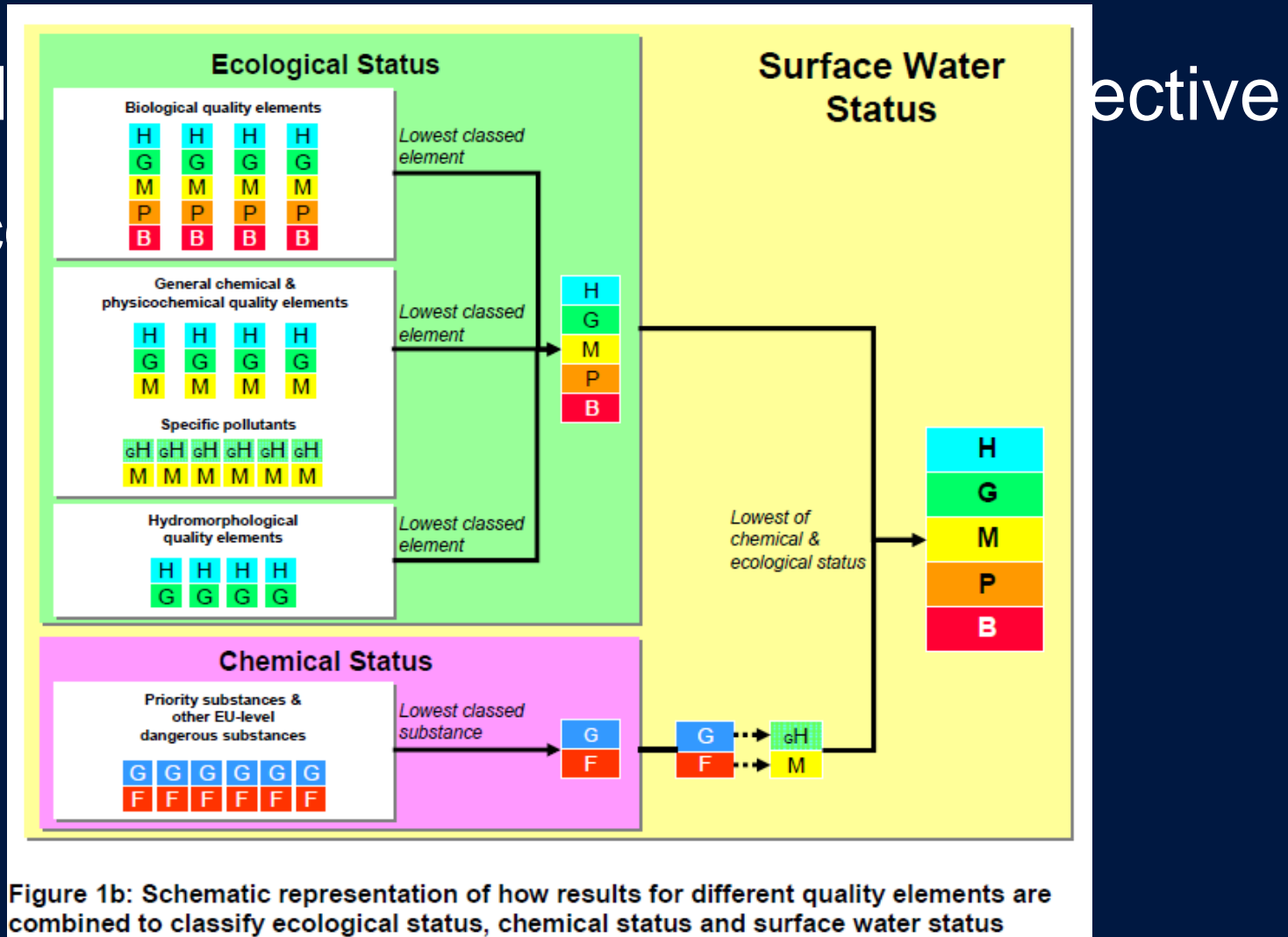


Figure 1b: Schematic representation of how results for different quality elements are combined to classify ecological status, chemical status and surface water status



# What are ecological indicators?

Score	Colour	Index Habitat integrity
$\leq 1.5$	A	Unmodified, natural
1.5-2.49	B	Largely natural with few modifications
2.5-3.49	C	Moderately modified
$\geq 3.50$	D	Largely modified





# Why do we use ecological indicators?



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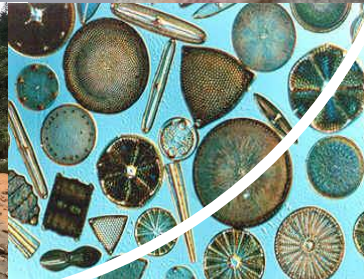


# Why do we use ecological indicators?

- “Traditional” approaches are not holistic



+



# Where/when are they used?

- Where a specific issue is suspected, e.g. intermittent pollution
- Where “traditional” forms of monitoring are expensive and/or difficult to implement
- Where there is a specific biodiversity issue





# Where/when are they used?

- Increasingly “as the norm” due to legislation – RSA reserve determination, EU WFD etc
- Where we want to be sure we are taking account of the whole system



# Examples?

- The Southern African Scoring System (SASS) – *Dickens and Graham, 2002*



- Requires sampling main habitats for a set time period



Aquatic  
vegetation

Marginal veg.  
in current

Marginal veg.  
out of current



Bedrock



# SASS



Stones out of  
current

Stones in  
current



Gravel, Sand  
or Mud





Date (dd:mm:yr):						Grid reference (dd mm ss.s) Lat: S					dd.ddddd					Biotopes Sampled (tick & rate)					Rating		Weight		ne (min)	
Site Code:						Long: E					#VALUE!					Stones In Current (SIC)							FALSE			
Collector/Sampler:						Datum (WGS84/Cape):					#VALUE!					Stones Out Of Current (SOOC)							FALSE			
River:						Altitude (m):										Bedrock							FALSE			
Level 1 Ecoregion:						Zonation:										Aquatic Veg							FALSE			
Quaternary Catchment:																MargVeg In Current							FALSE			
Site Description:	Temp (°C):					Routine or Project? (circle one)					Flow:					MargVeg Out Of Current							FALSE			
	pH:					Project Name:					Clarity (cm):					Gravel							FALSE			
	DO (mg/L):										Turbidity:					Sand							FALSE			
	Cond (mS/m):										Colour:					Mud							FALSE			
	Riparian Disturbance:															Hand picking/Visual observation							#####		Category	
Instream Disturbance:															OVERALL BIOTOPE SUITABILITY					0.0		#####		#VALUE!		
Taxon	QV	S	Veg	GSM	TOT	Taxon	QV	S	Veg	GSM	TOT	Taxon	QV	S	Veg	GSM	TOT	Taxon	QV	S	Veg	GSM	TOT			
PORIFERA (Sponge)	5					HEMIPTERA (Bugs)						DIPTERA (Flies)						Athericidae (Snipe flies)	10							
COELENTERATA (Cnidaria)	1					Belostomatidae* (Giant water bugs)	3					Blepharoceridae (Mountain midges)	15					Chironomidae (Midges)	2							
TURBELLARIA (Flatworms)	3					Ceriodae (water boatmen)	3					Coratopogonidae (Diving midges)	5					Chironomidae (Midges)	2							
ANNELIDA						Gerridae* (Pond skaters/Water striders)	5					Chironomidae (Midges)	2					Chironomidae (Midges)	2							
Oligochaeta (Earthworms)	1					Hydromedusidae* (Water wasp larvae)	6					Culicidae* (Mosquitoes)	1					Dixidae* (Dixid midge)	10							
Hirudinea (Leeches)	3					Naucoridae* (Creeping water bugs)	7					Empididae (Dance flies)	6					Ephydriidae (Shore flies)	3							
CRUSTACEA						Nepidae* (Water scorpions)	6					Muscidae (House flies, Stable flies)	1					Psychodidae (Moth flies)	1							
Amphipoda (Scuds)	13					Notonectidae* (Backswimmers)	3					Corydalidae (Fishflies & Dobsonflies)	8					Syrphidae* (Rat tailed maggots)	1							
Potamonautidae* (Crabs)	3					Pleidae* (Pygmy backswimmers)	4					Sialidae (Alderflies)	6					Tabanidae (Horse flies)	3							
Atyidae (Freshwater Shrimps)	8					Veliidae/M...veliidae* (Ripple bugs)	5					TRICHOPTERA (Caddisflies)						Tipulidae (Crane flies)	5							
Palaemonidae (Freshwater Prawns)	10					MEGALOPTERA (Fishflies, Dobsonflies & Alderflies)						Dipseudopsidae	10					GASTROPODA (Snails)								
HYDRACARINA (Mites)	8					Corydalidae (Fishflies & Dobsonflies)	8					Ecnomidae	8					Ancylidae (Limpets)	6							
PLECOPTERA (Stoneflies)						Sialidae (Alderflies)	6					Hydropsychidae 1 sp	4					Bulininae*	3							
Notonemouridae	14					TRICHOPTERA (Caddisflies)						Hydropsychidae 2 sp	6					Hydrobiidae*	3							
Perlidae	12					Dipseudopsidae	10					Hydropsychidae > 2 sp	12					Lymnaeidae* (Pond snails)	3							
EPHEMEROPTERA (Mayflies)						Ecnomidae	8					Philopotamidae	10					Physidae* (Pouch snails)	3							
Baetidae 1sp	4					Hydropsychidae 1 sp	4					Polycentropodidae	12					Planorbinae* (Orb snails)	3							
Baetidae 2 sp	6					Hydropsychidae 2 sp	6					Psychomyiidae/Xiphocentronidae	8					Thiaridae* (=Melanidae)	3							
Baetidae > 2 sp	12					Hydropsychidae > 2 sp	12					Cased caddis:						Viviparidae* ST	5							
Ceriodae (Squaregills/Cainflies)	6					Philopotamidae	10					Barbarochthonidae SWC	13					PELECYPODA (Bivalves)								
Ephemeridae	15					Polycentropodidae	12					Calamoceratidae ST	11					Corbiculidae (Clams)	5							

# Examples?

- miniSASS – *Graham, Dickens and J Taylor (2010)*
- Namibian Scoring System (NASS) – *Palmer and E Taylor (2004)*
- Proportion of Sediment-sensitive Invertebrates (PSI) – *Extence et al (2011)*



# Examples?

- Diatoms
- Fish
- Macrophytes
- Habitat
- Single species





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