Appendix A: A sheet for integrated habitat assessment score (adapted from McMillan 1998).

Integrated Habitat Assessment System (IHAS)

River Name:						
Site Name:				Date:		
SAMPLING HABITAT	0	1	2	3	4	5
Stones in current (SIC)						
Total length (m) of broken water (riffles/rapids)	none	0-1	>1-2	>2-3	>3-5	>5
Total length (m) of submerged stones in current (run)	none	0-2	>2-5	>5-10	>10	
Number of separate SIC areas kicked	0	1	2-3	4-5	6+	
Average size (cm) of stones kicked (gravel<2; bedrock>20)	none	<2, >20	2-10	11-20	2-20	
Amount of stone surface clear (of algae, sediment, silt, etc.) (%)	n/a	0-25	26-50	51-75	>75	
Protocol: Time (mins) spent actuallly kicking SIC (gravel/bedrock=0)	0	<1	>1-2	2	>2-3	>3
SIC Scores: (A=SIC boxes total; B=adjustment to equal 20; C=final total)	actual	A	adj.	B	max. 20	C
Vegetation						
Length (m) of fringing vegetation sampled (banks)	none	0-½	>½-1	>1-2	2	>2
Amount (m2) of aquatic vegetation/algae sampled	none	0-½	>½-1	>1		
Fringing vegetation sampled in:	none		run	pool		mix
Type of veg. (% leafy veg. vs. stems/shoots) (aq. veg. only=49)	none	0	1-25	26-50	51-75	>75
Veg Scores: (D=Veg boxes total; E=adjustment to equal 15; F=final total)	actual	D	adj.	E	max. 15	F
Other habitats						
Stones Out Of Current (SOOC) sampled (m2) (protocol=1m2)	none	0-½	>½-1	1	>1	
Sand sampled (mins) (protocol=1min) (under=present below stones)	none	under	0-½	>½-1	1	>1
Mud sampled (mins) (protocol=½min) (under=present below stones)	none	under	0-½	½	>½	
Gravel sampled (mins) (protocol=½min) (if all, SIC stone size=<2)*	none	0-½	½	>½*		
Bedrock sampled (all=no SIC/sand/gravel) (if all, SIC stone size=>20)*	none	some			all*	
Algal presence (1-2m²=algal bed; rocks=on rocks; isol.=isolated clumps)	>2m²	rocks	1-2m²	<1m²	isol.	none
Tray identification (using time as per protocol)		under		correct		over
Other Habitat Scores: (G=Other Habitat boxes total; H=adjustment to equal 20; I=final total)	actual	G	adj.	H	max. 20	I
HABITAT TOTALS: (J=total adjustment [B+E+H]; K=Habitat Total [C+F+I])			adj.	J	max. 55	K
Stream condition						
Physical						
River make-up (2/3 mix = 2/3 types)	pool		run	rapid	2 mix	3 mix
Average stream width (m)		>10	>5-10	<1	1-2	>2-5
Average stream depth (m)	>2	>1-2	1	>½-1	½	<½
Approximate stream velocity (slow=<½m/s; fast=>1m/s)	still	slow	fast	med.		mix
Water colour (disc.=visibly discoloured but still clearish)	silty	opaque		discol.		clear
Recent disturbances due to: (constr.=construction)	flood	fire	constr.	other		none
Bank/riparian vegetation is: (grass=incl. reeds; shrubs=incl. trees)	none		grass	shrubs	mix	

Surrounding impacts (erosn.=erosion/shear banks; farm=farmland)	erosn.	farm	trees	other		open
Anthropogenic litter	absent		similar		mix	
Anthropogenic litter effect			severe		none	
Left bank cover (%) (rocks and vegetation)	0-50	51-80	81-95	>95		
Right bank cover (%) (rocks and vegetation)	0-50	51-80	81-95	>95		
Stream Condition Total:					max. 45	L
Total IHAS Score: (K+L)					%	

Appendix B: Invertebrates habitat assessment system scoring guidelines [29].

IHAS score	Description	Ecological category
>75	Excellent/Natural - Unmodified or almost natural conditions; natural biotic template will not be modified. Minimal risk or reduction in habitat availability.	A
65 - 75	Good - Largely natural with few modifications; only a small risk of modifying the natural biotic template. Risk to the availability of habitat moderate, availability of unique habitats at risk	B
55 - 64	Adequate/Fair - Modified state; moderate risk of modifying the biotic template occurs. Habitat unavailable to certain aquatic invertebrates.	C
<55	Poor - Largely modified unnatural state; large risk of modifying the biotic template. Natural required habitat generally unavailable to most aquatic invertebrates.	D

Appendix C: The SASS5 scoring sheet, with quality values next to the taxa.

SASS Version 5 Score Sheet

Date: / /200__

Collector: . .

Grid Reference: WGS-84 Cape datum

S: ° ' , " E: ° ' , "

Site code:

River:... ... .

Site description:.....

Weather Condition:.....

Temp:.....°C pH:.....

DO:.....mg/l Cond:.....mS/m

Biotopes sampled:

SIC ..... Time.....minutes

SOOC..... Time.....minutes

Average size of stones.....cm

Bedrock.....

Aquatic veg'n..... Dom. sp.....

MvegIC..... Dom. sp.....

MvegOOC..... Dom. sp.....

Gravel..... Sand.....

Mud.....

Hand picking/Visual observation.....

Flow: Low/Medium/High/Flood

Turbidity: Low/Medium/High

Riparian land use:

Disturbance in the river: eg. sandwinning, cattle drinking point, floods etc.

Observations: eg. smell and colour of water, petroleum, dead fish, etc.

Taxon		S	Veg	GSM	TOT
PORIFERA	5				
COELENTERATA	1				
TURBELLARIA	3				
ANNELIDA					
Oligochaeta	1				
Leeches	3				
CRUSTACEA					
Amphipoda	13				
Potamonautidae*	3				
Atyidae	8				
Palaemonidae	10				
HYDRACARINA	8				
PLECOPTERA					
Notonemouridae	14				
Perlidae	12				
EPHEMEROPTERA					
Baetidae 1sp	4				
Baetidae 2 sp	6				
Baetidae > 2 sp	12				
Caenidae	6				
Ephemeridae	15				
Heptageniidae	13				
Leptophlebiidae	9				
Oligoneuridae	15				
Polymitarcyidae	10				
Prosopistomatidae	15				
Teloganodidae SWC	12				
Tricorythidae	9				
ODONATA					
Calopterygidae ST,T	10				
Chlorocyphidae	10				
Chlorolestidae	8				
Coenagrionidae	4				
Lestidae	8				
Platycnemidae	10				
Protoneuridae	8				
Aeshnidae	8				
Corduliidae	8				
Gomphidae	6				
Libellulidae	4				
LEPIDOPTERA					
Pyralidae	12				

Taxon		S	Veg	GSM	TOT
HEMIPTERA					
Belostomatidae*	3				
Corixidae*	3				
Gerridae*	5				
Hydrometridae*	6				
Naucoridae*	7				
Nepidae*	3				
Notonectidae*	3				
Pleidae*	4				
Veliidae/M...veliidae*	5				
MEGALOPTERA					
Corydalidae	8				
Sialidae	6				
TRICHOPTERA					
Dipseudopsidae	10				
Ecnomidae	8				
Hydropsychidae 1 sp	4				
Hydropsychidae 2 sp	6				
Hydropsychidae > 2 sp	12				
Philopotamidae	10				
Polycentropodidae	12				
Psychomyiidae/Xiphocen	8				
Cased caddis:					
Barbarochthonidae SWC	13				
Calamoceratidae ST	11				
Glossosomatidae SWC	11				
Hydroptilidae	6				
Hydrosalpingidae SWC	15				
Lepidostomatidae	10				
Leptoceridae	6				
Petrothrincidae SWC	11				
Pisuliidae	10				
Sericostomatidae SWC	13				
COLEOPTERA					
Dytiscidae*	5				
Elmidae/Dryopidae*	8				
Gyrinidae*	5				
Haliplidae*	5				
Helodidae	12				
Hydraenidae*	8				
Hydrophilidae*	5				
Limnichidae	10				
Psephenidae	10				

Taxon		S	Veg	GSM	TOT
DIPTERA					
Athericidae	10				
Blepharoceridae	15				
Ceratopogonidae	5				
Chironomidae	2				
Culicidae*	1				
Dixidae*	10				
Empididae	6				
Ephydridae	3				
Muscidae	1				
Psychodidae	1				
Simuliidae	5				
Syrphidae*	1				
Tabanidae	5				
Tipulidae	5				
GASTROPODA					
Ancylidae	6				
Bulininae*	3				
Hydrobiidae*	3				
Lymnaeidae*	3				
Physidae*	3				
Planorbinae*	3				
Thiaridae*	3				
Viviparidae* ST	5				
PELECYPODA					
Corbiculidae	5				
Sphaeriidae	3				
Unionidae	6				
SASS Score					
No. of Taxa					
ASPT					

Sample collection effort exceeds method? .....

Other biota including juveniles:

Comments:

Procedure: 'Kick SIC & bedrock for 2 mins, max. 5 mins; Kick SOOC & bedrock for 1 min; Sweep marginal vegetation (IC & OOC) for 2m total and aquatic veg 1m²; Stir & sweep gravel, sand, mud for 1 min total; * = airbreathers; Hand picking & visual observation for 1 min — record in biotope where found; Score for 15 mins/biotope but stop if no new taxa seen after 5 mins; 'Estimate abundances: 1 = 1, A = 2–10, B = 10–100, C = 100–1 000, D = >1 000; S = Stone, rock & solid objects; Veg = All vegetation; GSM = Gravel, sand, mud; SWC = South Western Cape; T = Tropical; ST = Sub-tropical; Rate each biotope sampled: 1 = very poor (i.e. limited diversity), 5 = highly suitable (i.e. wide diversity)

Fig. A1. Anthropogenic litter observed in the Apies River.