water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

MVOTI to UMZIMKULU EWR SUMMARY

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Mvoti NWRCS integrated steps

1: Delineate units of analysis and describe the status quo

2: Initiation of stakeholder process and catchment visioning

3: Quantify EWRs

4: Identification and evaluation of scenarios within IWRM

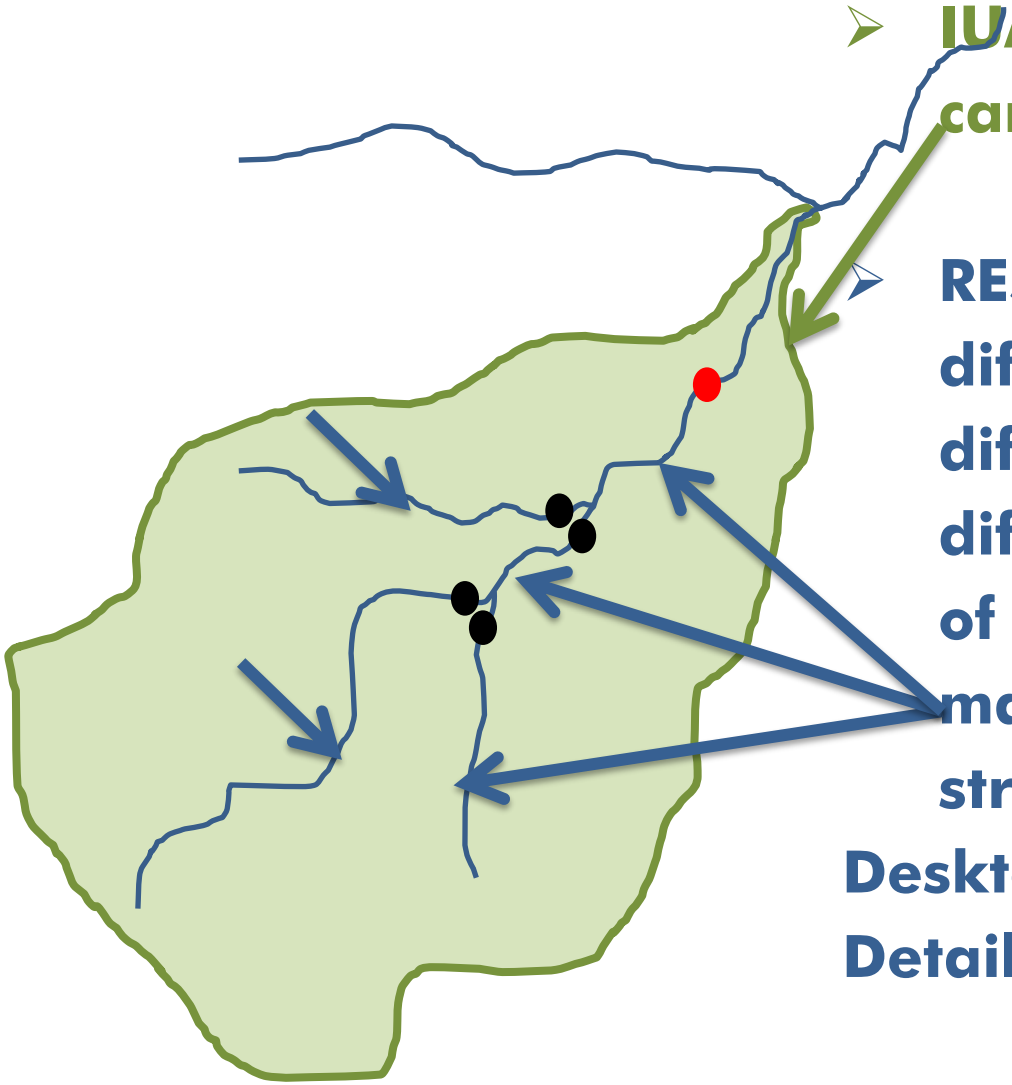
5: Draft Management Classes

6: Resource Quality Objectives (EcoSpecs & water quality (user))

7: Gazette class configuration

EWR determination: Where does it fit in?

BACKGROUND AND CONTEXT

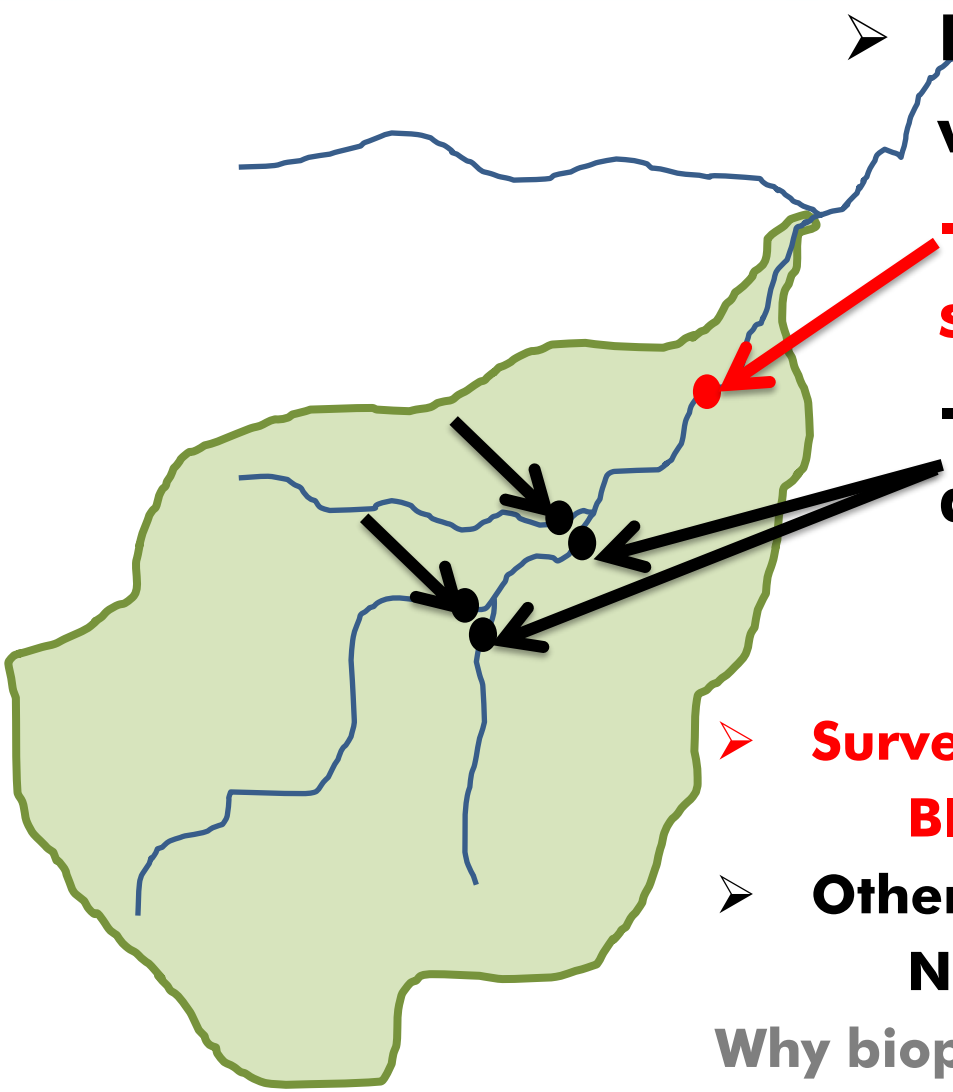


- **IUA: Homogenous area that can be managed as an entity.**
- **RESOURCE UNITS: RUs require different EWRS (& therefore different RQOs). (Due to different flow patterns, reaction of habitat and biota to stress, management and operational structures).**

Desktop RUs (low priority)

Detailed RUs (high priority)

BACKGROUND AND CONTEXT



- **NODES: A point in the river which**
  - **can be a survey site (EWR site) situated in the MRU or**
  - **is located at the downstream end of a RU.**

- **Survey sites = EWR sites = KEY BIOPHYSICAL NODES.**
- **Other points = DESKTOP BIOPHYSICAL NODES.**

Why biophysical? Nodes which have biological and physical attributes.

WHAT ARE EWRs?

ECOLOGICAL WATER REQUIREMENTS (EWRS):

FLOW & ITS ASSOCIATED CHARACTERISTICS (water quality, sediment, patterns) that should be left or provided in the river system for those biota dependant on it as well as any people dependant on a natural functioning river (goods and services or Ecosystem Services).

WHY DO WE NEED THE EWRS?

- STEP 3 OF CLASSIFICATION – Need EWRS at catchment scale and not just for one main river
- Focus on desktop and key biophysical nodes to cover catchment
- KEY NODES = EWR SITES – DETAILED ASSESSMENT
  - where scenarios are evaluated and
  - detailed numerical RQOs are supplied
- DESKTOP NODES = EWR ESTIMATES. Usually important for licensing or water quality scenarios – provides detailed information for the catchment configuration

HOW DO WE DETERMINE EWRS?

What state do you want your river to be in future?

- WHAT state is the river in NOW and WHY
  = ***PRESENT ECOLOGICAL STATE (PES)***
- Is the river ecological important (fixed list of criteria to assess)?
  = ***ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)***
- If the river is important, is it in a present state that requires improvement?
- If yes, is it realistic/attainable (from an ecological viewpoint) to improve?
  = ***RECOMMENDED ECOLOGICAL CATEGORY (REC)***

THEN SET FLOW REGIME FOR PES, REC AND IN SOME CASES FOR OTHER RIVER STATES.

NOTE: THE REC IS ONLY FROM AN ECOLOGICAL VIEWPOINT

HOW DO WE DETERMINE EWRS?

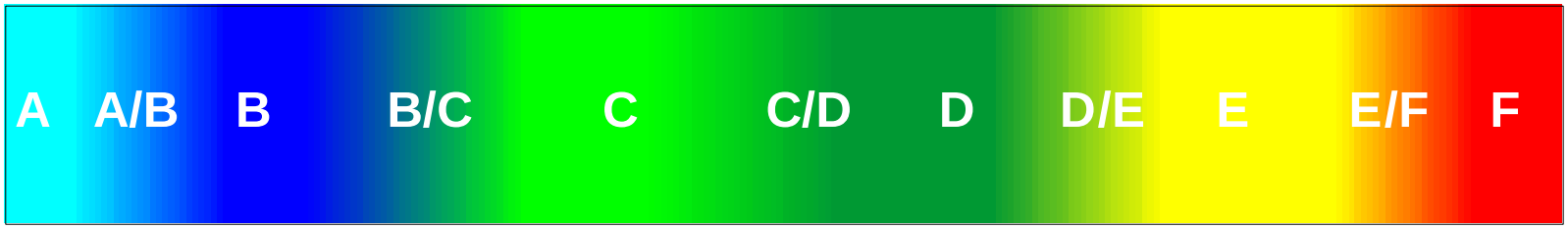
- Once you know the type of flow regime that will result in different ecological states, then
- this information can be used to evaluate and predict the response to different scenarios.
- Response is measured in terms of the change in river status.

Ecological status described in terms of Ecological Categories:

A – near natural, B – largely natural

C – moderately modified D – largely modified

E – seriously modified F - critically modified.



PURPOSE OF THIS PRESENTATION

- Provide EWR estimates at desktop biophysical nodes.
- Provide EWR results at EWR sites (key biophysical nodes).

EWR ASSESSMENTS

Secondary catchment	Desktop EWR	New EWR sites	Existing EWR sites	Extrapolated from EWR sites	Excluded
T4	14	1	0	5	17
T5	24	0	14	11	6
U8	14	0	0	0	19
U1	21	3	0	10	5
U7	10	1	0	3	2
U6	10	0	0	0	4
U2	33	4	0	5	11
U3	7	0	0	0	4
U4	22	2	0	3	0
U5	3				
TOTAL	**158**	**11**	**14**	**37**	**68**

DESKTOP BIOPHYSICAL NODES

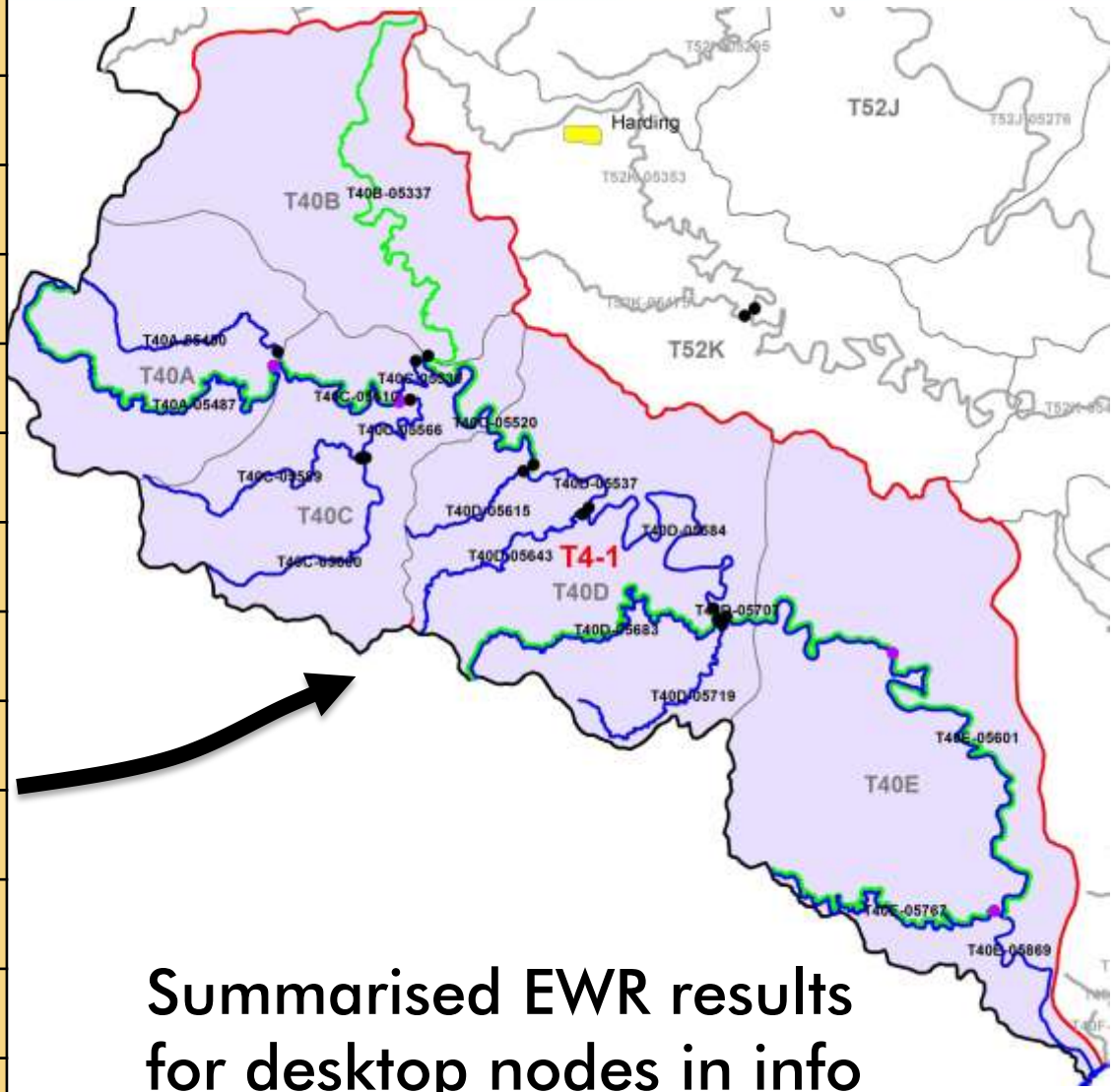
- Each of the 288 nodes are situated in SQ river reaches.
- EWRs will be determined at these nodes as follow:
- A desktop model will be used to estimate the flow component of the EWR at 158 nodes.
- Comprehensive method will be used to determine EWRs at 11 nodes (EWR sites)
- EWR results at a detailed level at 14 EWR sites in T5 will be used in further assessments.
- EWRs will be extrapolated fro the total 25 EWR sites at 37 nodes. These nodes are upstream or downstream of EWR sites.

EWR DETERMINATION AT DESKTOP NODES

- The results at 158 nodes were determined using the Revised Desktop Reserve Model (RDRM).
- The RDRM includes 4 submodels:
- - Hydrology: Natural and present day hydrology.
- - Hydraulics: Hydraulic parameters, likely channel characteristics, geomorphological zones.
- - Ecology low flow: Estimate the low flows using hydrology, hydraulics and the indicator fish species.
- - Ecology high flow: Estimate the flood regime.
- Flows are estimated using the above information as well as the Ecological Category – the REC determined during step 1 of this study.

IUA T4: EWR RESULTS

NODE	REC	%nMAR (low)	%nMAR (tot)
T40A-05450	B/C	22.5	32
T40A-05487	B/C	21	31
T40B-05337	C	19	27
T40C-05566	B	26	36
T40C-05589	B	29	39
T40C-05600	B	30	40
T40D-05615	B	29	40
T40D-05643	B	28	39
T40D-05683	B/C	23	33
T40D-05707	C	19	27
T40D-05719	B	27	38
T40E-05767	B/C	19	31
T40F-05666	B	18	32
T40G-05616	B/C	20	31

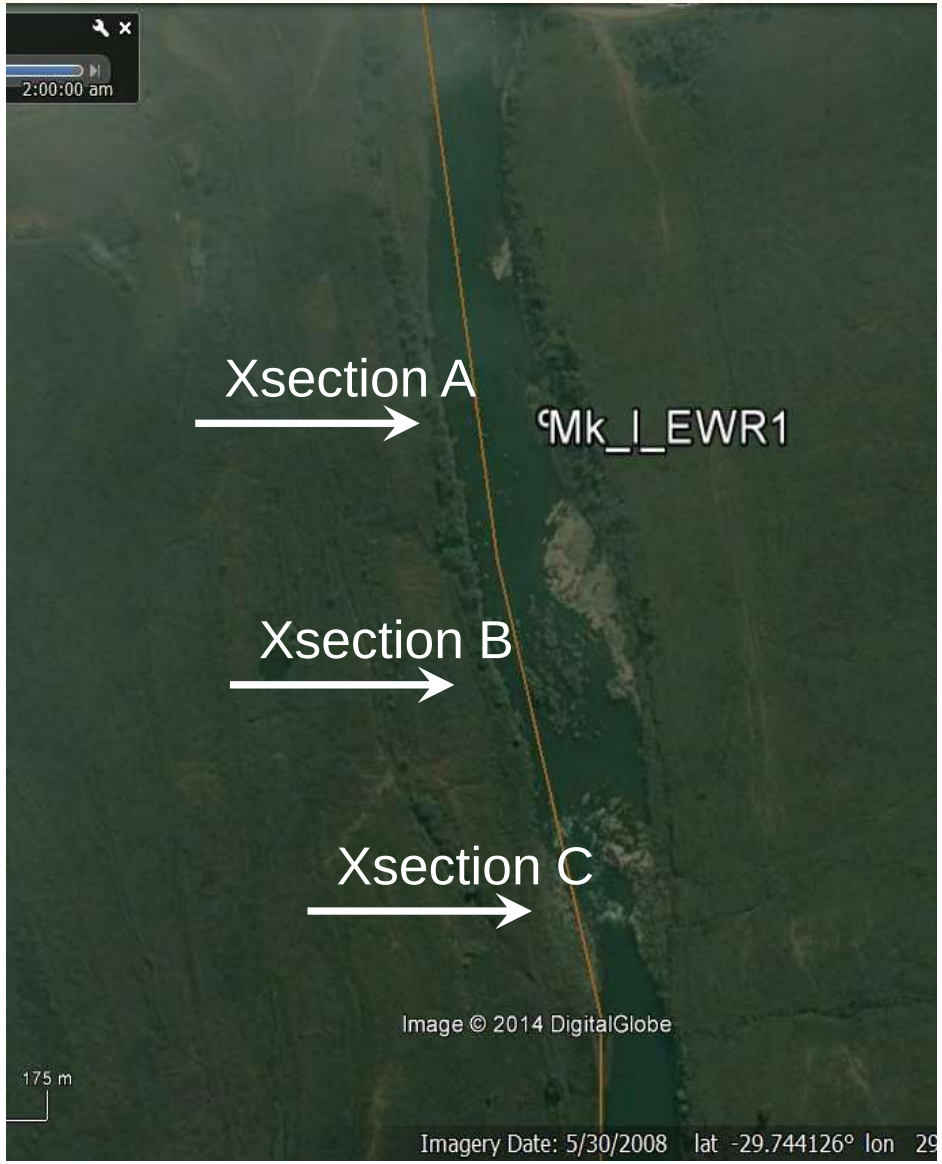


Summarised EWR results for desktop nodes in info pack

EWRs for Mkomazi, Mvoti and uMgeni Rivers

- Followed the Habitat Flow Stressor Response method to determine flows.
- Determination preceded by hydrological and hydraulic modelling, biophysical and xsection surveys.
- Multi-disciplinary specialist meeting.
- EcoClassification (PES, EIS, REC)
- EWR determination for above categories for
  - low (base) flows – instream components
  - floods – riparian and geomorphology
  - combining the requirements to provide EWRs as flow duration tables.

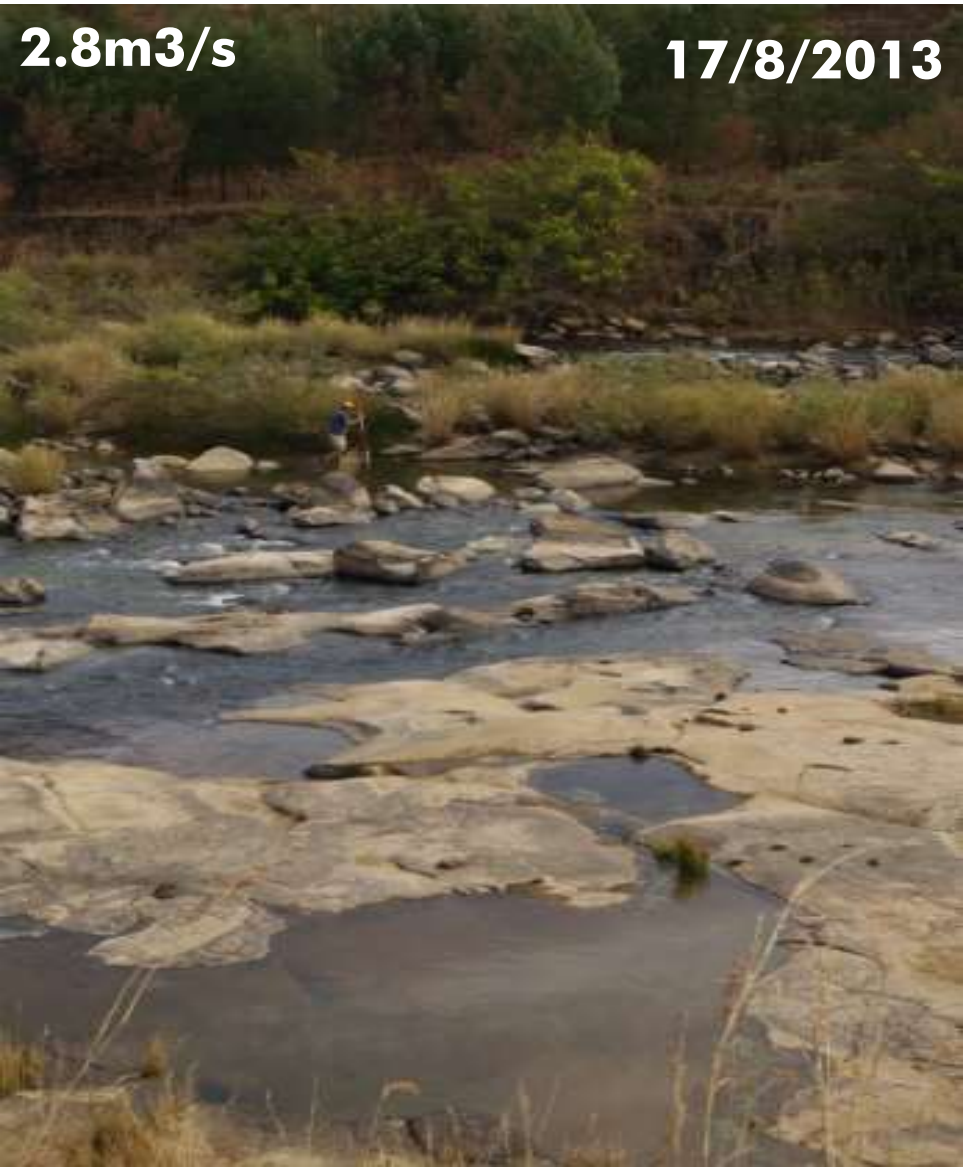
MKOMAZI EWR 1



6m³/s (May 2008)

Feb 2014

MKOMAZI EWR 1



MKOMAZI EWR 1

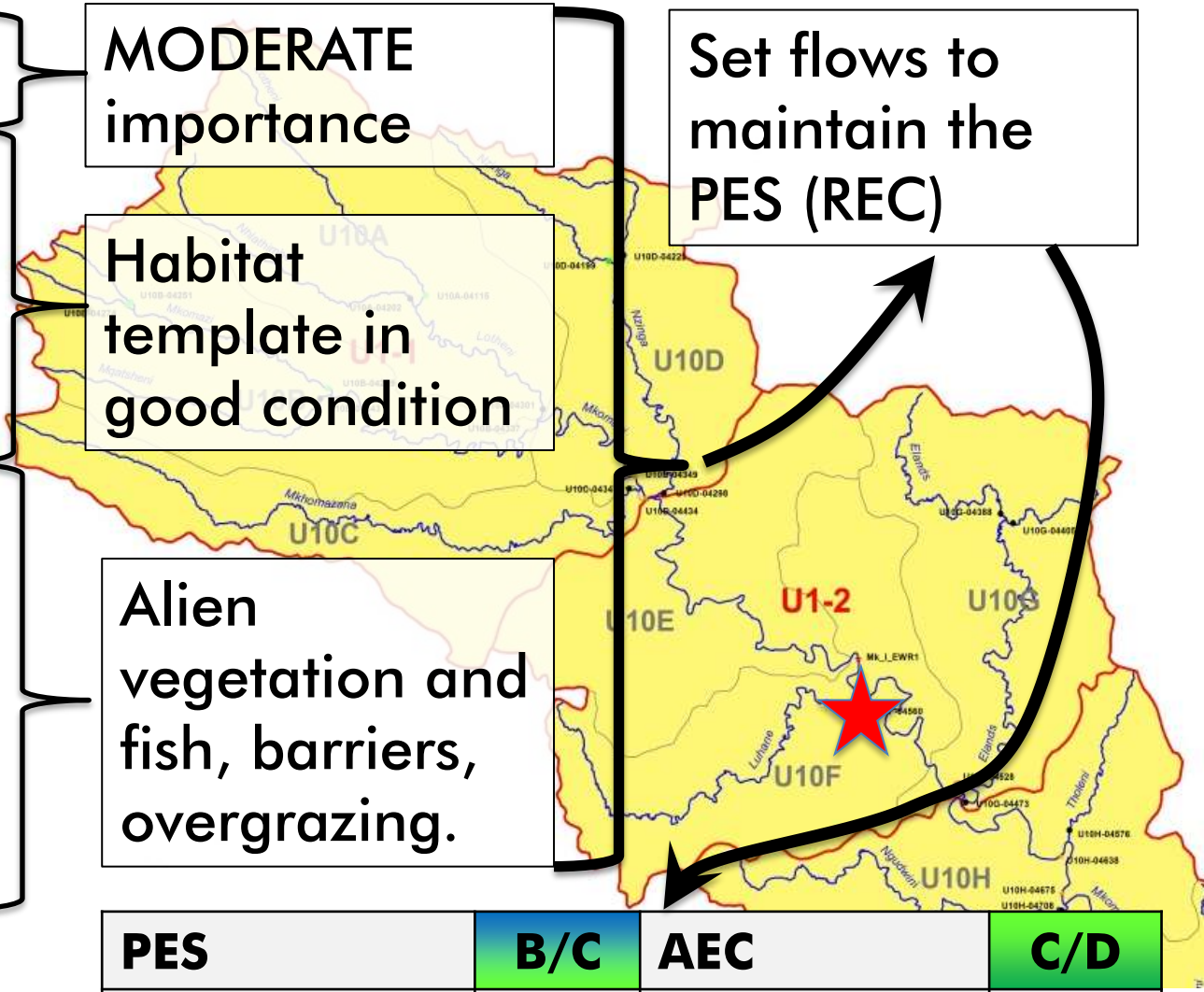
Component	PES & REC
IHI Hydrology	A/B
Physico chemical	A/B
Geomorph	A/B
Fish	C
Invertebrates	B/C
Instream	B/C
Riparian vegetation	C
EcoStatus	**C**

MODERATE importance

Habitat template in good condition

Alien vegetation and fish, barriers, overgrazing.

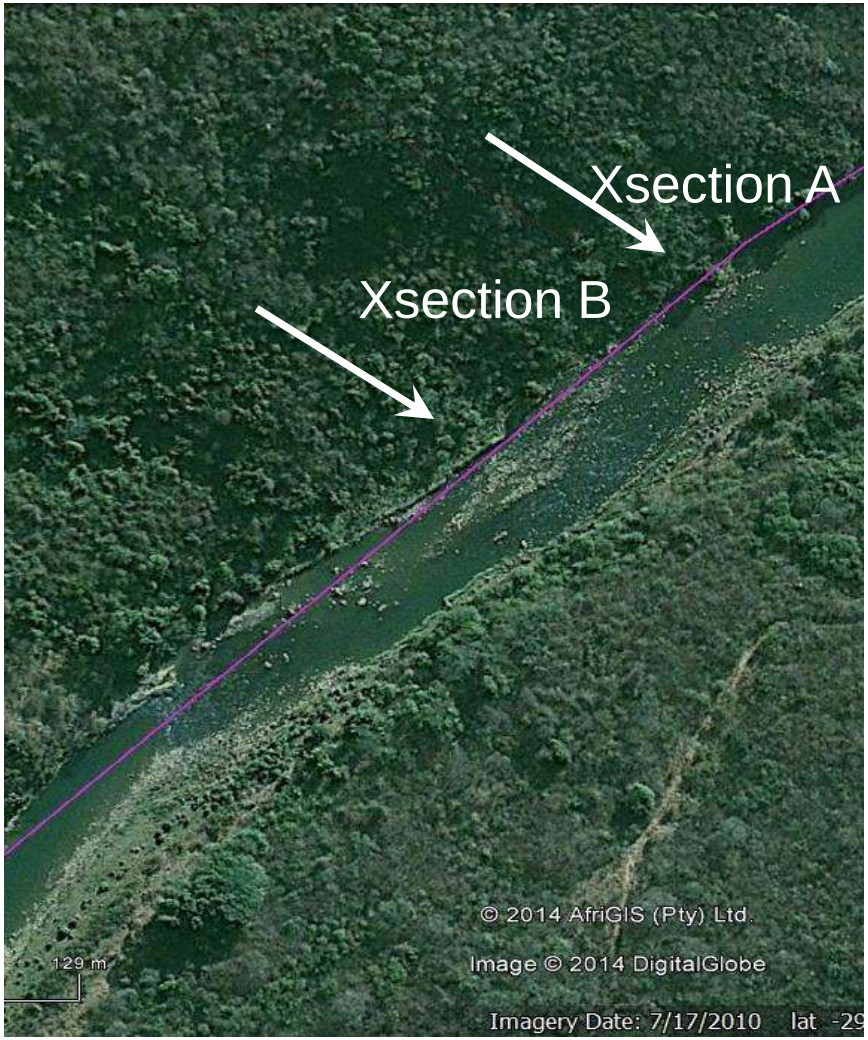
Set flows to maintain the PES (REC)



PES	B/C	AEC	C/D
%MAR (low)	25	%MAR (low)	13
%MAR (tot)	30	%MAR (tot)	21

MKOMAZI EWR 2

June 2008



July 2010

MKOMAZI EWR 2

MKOMAZI EWR 2

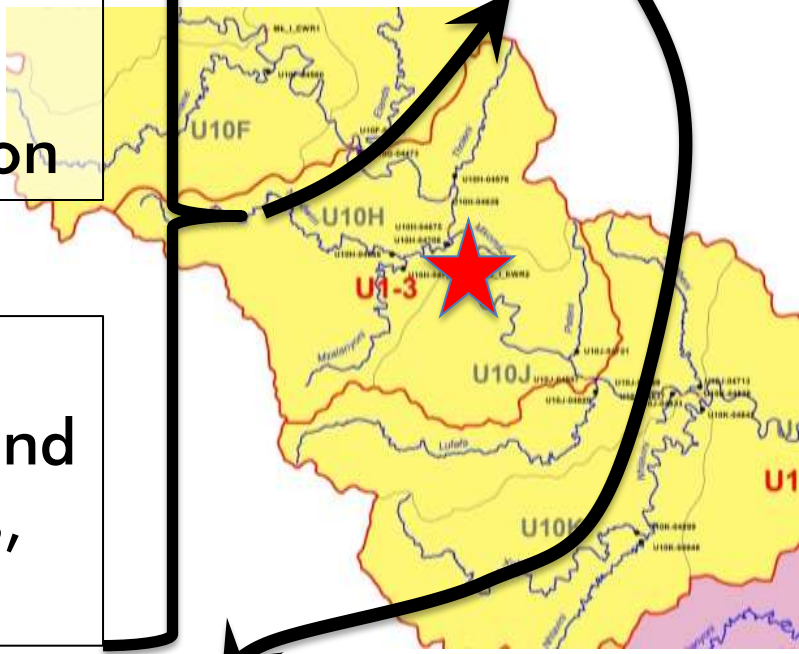
Component	PES & REC
IHI Hydrology	A/B
Physico chemical	A/B
Geomorph	B
Fish	C
Invertebrates	B
Instream	B
Riparian vegetation	B
EcoStatus	**B**

HIGH importance

Habitat template in good condition

Alien vegetation and fish, barriers, overgrazing.

Set flows to maintain the PES (REC)



PES	B	AEC	C
%MAR (low)	25	%MAR (low)	19
%MAR (tot)	30	%MAR (tot)	28

MKOMAZI EWR 3

7/5/02 – 8.2m^3/s

23/9/13 – 3.1m^3/s

MKOMAZI EWR 3

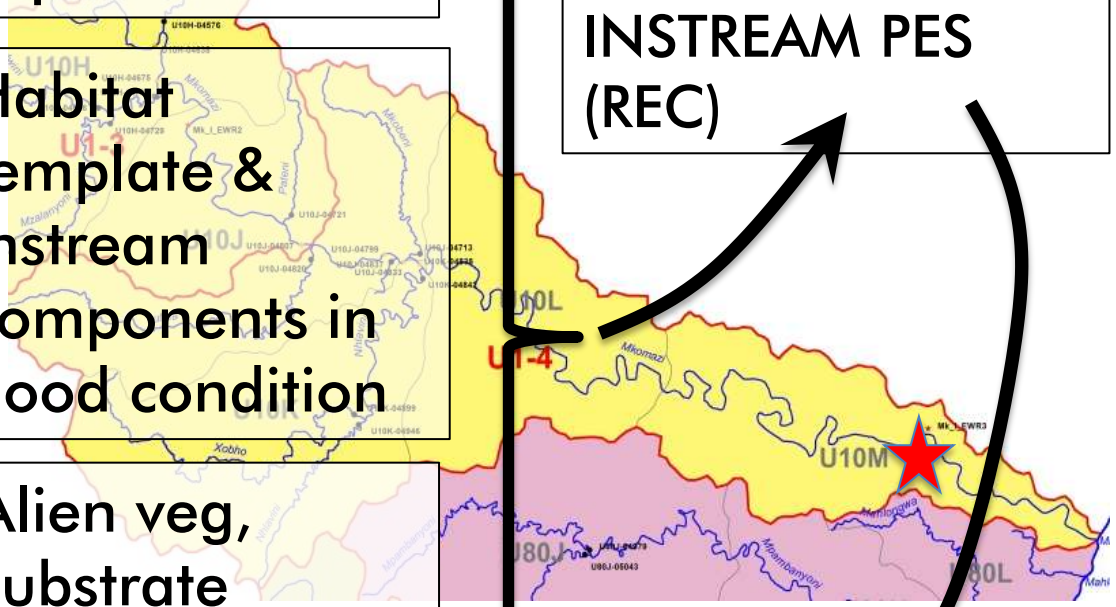
MKOMAZI EWR 3

Component	PES & REC
IHI Hydrology	A/B
Physico chemical	A/B
Geomorph	B
Fish	B
Invertebrates	B
Instream	B
Riparian vegetation	D
EcoStatus	**C**

MODERATE importance

Habitat template & instream components in good condition

Alien veg, substrate exposure, erosion



Set flows to maintain the INSTREAM PES (REC)

PES	B	AEC	C
%MAR (low)	21	%MAR (low)	14
%MAR (tot)	31	%MAR (tot)	23

uMNGENI EWR 2

uMNGENI EWR 2

15/8/2013, 2.1m³/s

6/3/2014, 14m³/s

uMNGENI EWR 2

Component	PES (REC)
IHI Hydrology	C/D
Physico chemical	C/D
Geomorph	D
Fish	E* (D)
Invertebrates	C
Instream	D
Riparian vegetation	C
EcoStatus	C/D

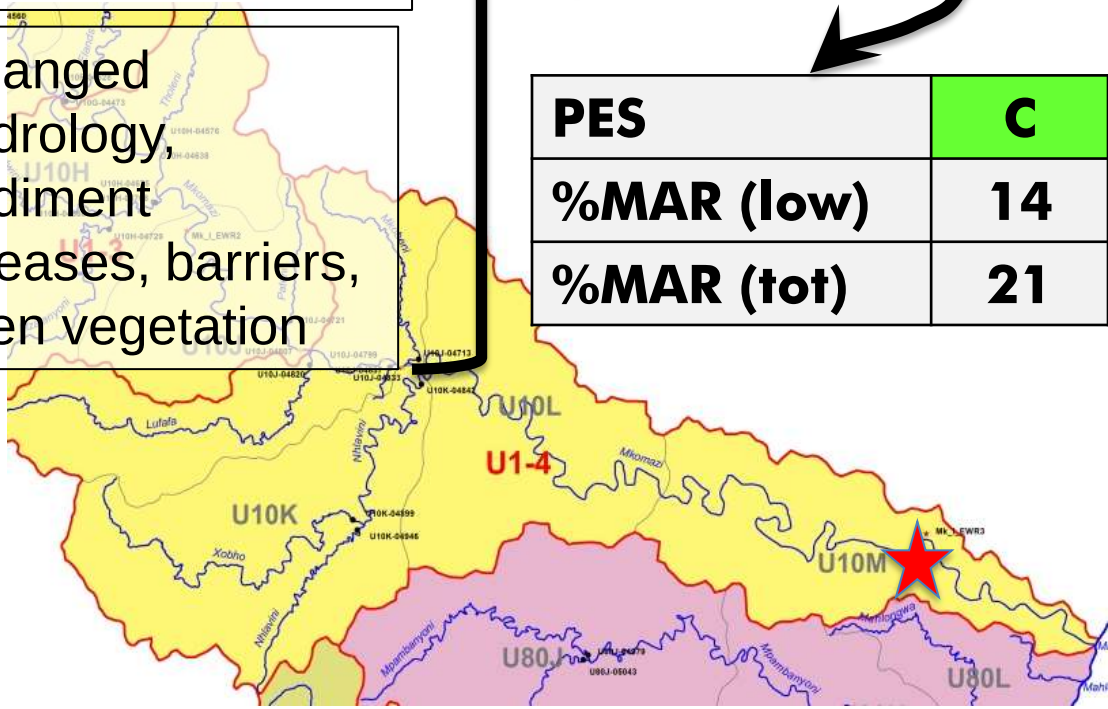
MODERATE IMPORTANCE

Habitat template in bad condition: Flow regime changes, barriers, water quality

Changed hydrology, sediment releases, barriers, alien vegetation

Set flows to maintain the C PES (REC) for bugs

PES	C
%MAR (low)	14
%MAR (tot)	21



uMNGENI EWR 5

9/5/04

14/2/13

23/8/13

uMNGENI EWR 5

6/3/2014, 9m³/s

uMNGENI EWR 5

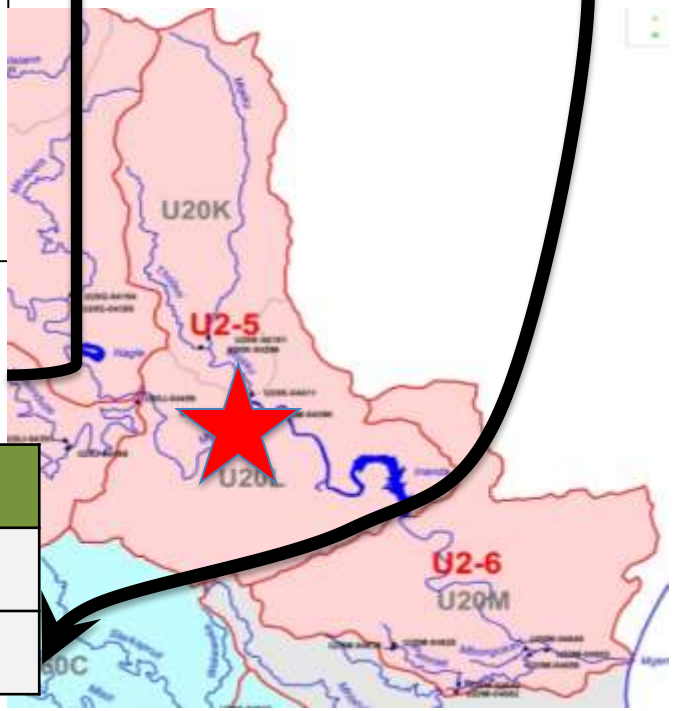
Component	PES (REC)
IHI Hydrology	C/D
Physico chemical	C/D
Geomorph	C/D
Fish	D
Invertebrates	C/D
Instream	C/D
Riparian vegetation	D
EcoStatus	**D**

MODERATE IMPORTANCE

Habitat template in bad condition: Flow regime changes, barriers, water quality, alien fish, alien veg

Set flows to maintain the instream C/D

PES	C/D
%MAR (low)	22
%MAR (tot)	27



HEYNESPRUIT (MVOTI) EWR 1

6/3/05

26/8/13

HEYNESPRUIT (MVOTI) EWR 1

20/6/2013,
0.08m³/s

5/3/2014,
0.26m³/s

HEYNESPRUIT (MVOTI) EWR 1

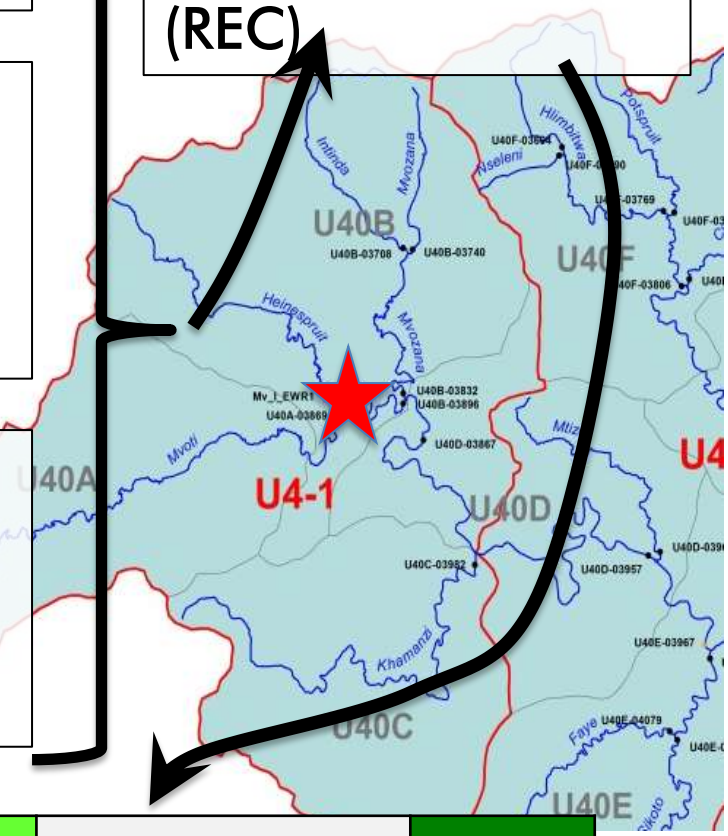
Component	PES & REC
IHI Hydrology	C
Physico chemical	C
Geomorph	B
Fish	C
Invertebrates	C
Instream	C
Riparian vegetation	B/C
EcoStatus	**C**

MODERATE IMPORTANCE

Decreased base flow (dam) and water quality - Greytown

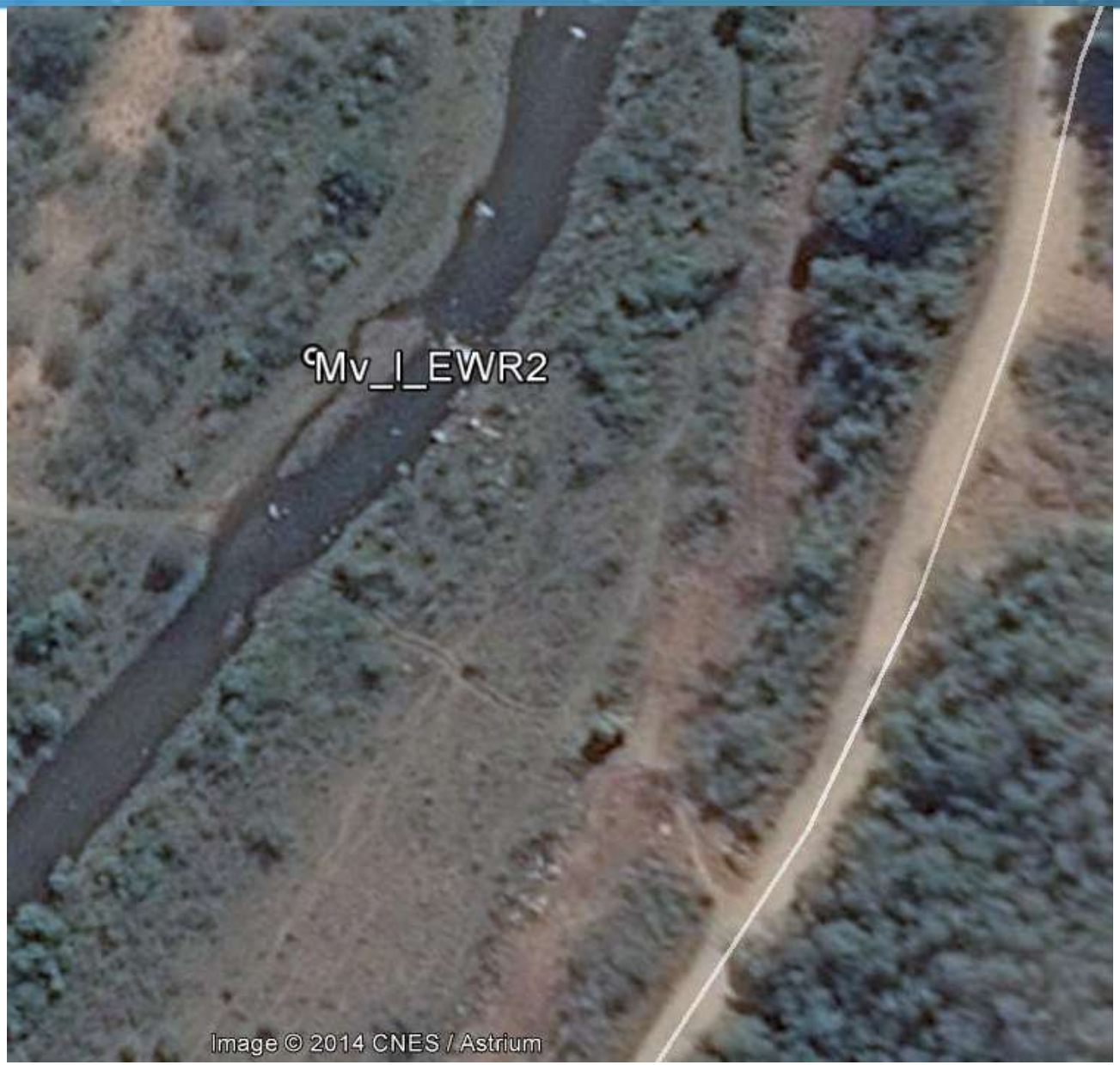
Alien veg & fish, water quality and flow

Set flows to maintain the INSTREAM PES (REC)



PES	C	AEC	D
%MAR (low)	18	%MAR (low)	13
%MAR (tot)	31	%MAR (tot)	23

MVOTI EWR 2



23/8/13

MVOTI EWR 2

14/8/2013,
2.3m3/s

5/3/2014,
7.9m^3/s

MVOTI EWR 2

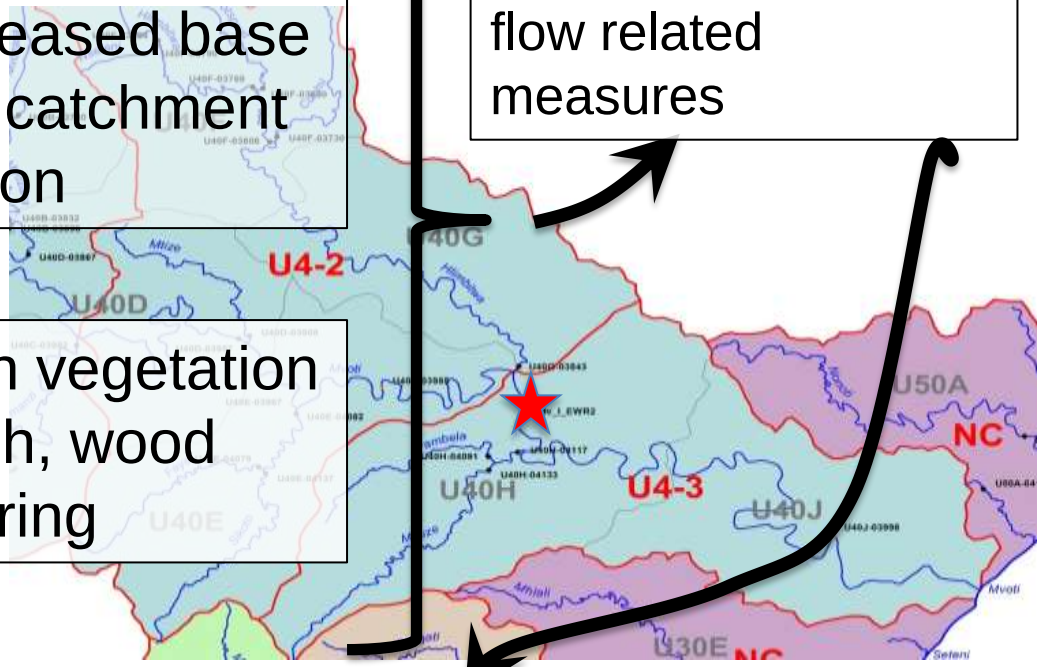
Component	PES & REC
IHI Hydrology	B/C
Physico chemical	C
Geomorph	C
Fish	B/C
Invertebrates	B/C
Instream	B/C
Riparian vegetation	C/D
EcoStatus	**C**

HIGH instream importance

Decreased base flow, catchment erosion

Alien vegetation & fish, wood clearing

Set flows to maintain the INSTREAM PES as improvement can be achieved by non-flow related measures



PES	B/C	AEC	C/D
%MAR (low)	17	%MAR (low)	26
%MAR (tot)	31	%MAR (tot)	19

WHERE TO NOW?

- EWRs available for scenario evaluation.
- Once scenarios are agreed on, a variety of scenarios will be modelled (yield model).
- Some of these scenarios will include EWRs or 'parts' of EWRs.

THEN

- The scenarios will be evaluated to determine the ecological category at each relevant EWR site and the estuary.
- ECOLOGICAL CONSEQUENCES OF EACH SCENARIO THEREFORE DESCRIBED IN TERMS OF THE PREDICTED ECOLOGICAL CATEGORY AT THE EWR SITES.

QUESTIONS FOR CLARIFICATION