



Melbourne School of Land and
Environment

Water sharing for the environment and agriculture in the Broken catchment

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A global challenge

- Water sharing between irrigation and the environment
- Food requirements for a growing world population
- Increasing environmental concerns
- Limited water supplies
- Irrigation expanding to meet the demand for food

- The *Water Act 2007* changed priorities for water use in the Murray-Darling Basin
 - the environment first, then agriculture
- MDBA Guide (2010) proposed Sustainable Diversion Limits for each catchment
- A Basin Plan in 2011
- Adverse public reaction to the draft SDLs
- Policy question in evaluating SDLs

- What about outcomes from different SDLs – trade offs?
- Aggregate future water supply (drier?)
- Modelling of responses (agric & env)
 - Level of detail in models
- Consider different shares to agric & env
- Consider different levels of environmental compliance or risk
- A conversation between disciplines



- Doing ‘more with less water’
- Broken catchment
- Engineers, ecologists, water modellers, economists
- This paper reports development of thinking about an analytical framework
- Results are preliminary



Water balance (SDL policy)

Catchment water scenarios

Historical 2030 Dry

90:10

a₁

b₁

70:30

a₂

b₂

50:50

a₃

b₃

30:70

a₄

b₄

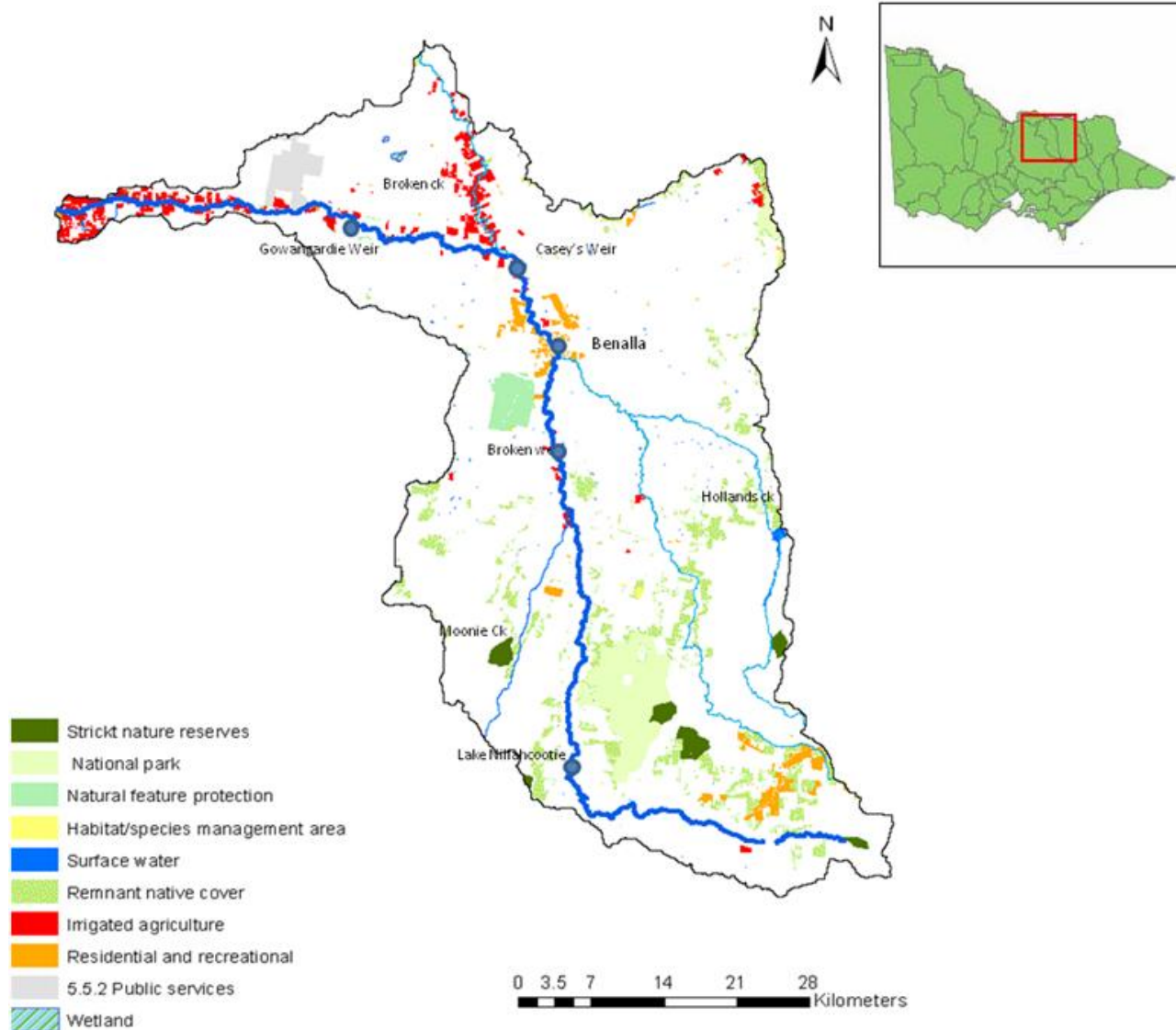
10:90

a₅

b₅



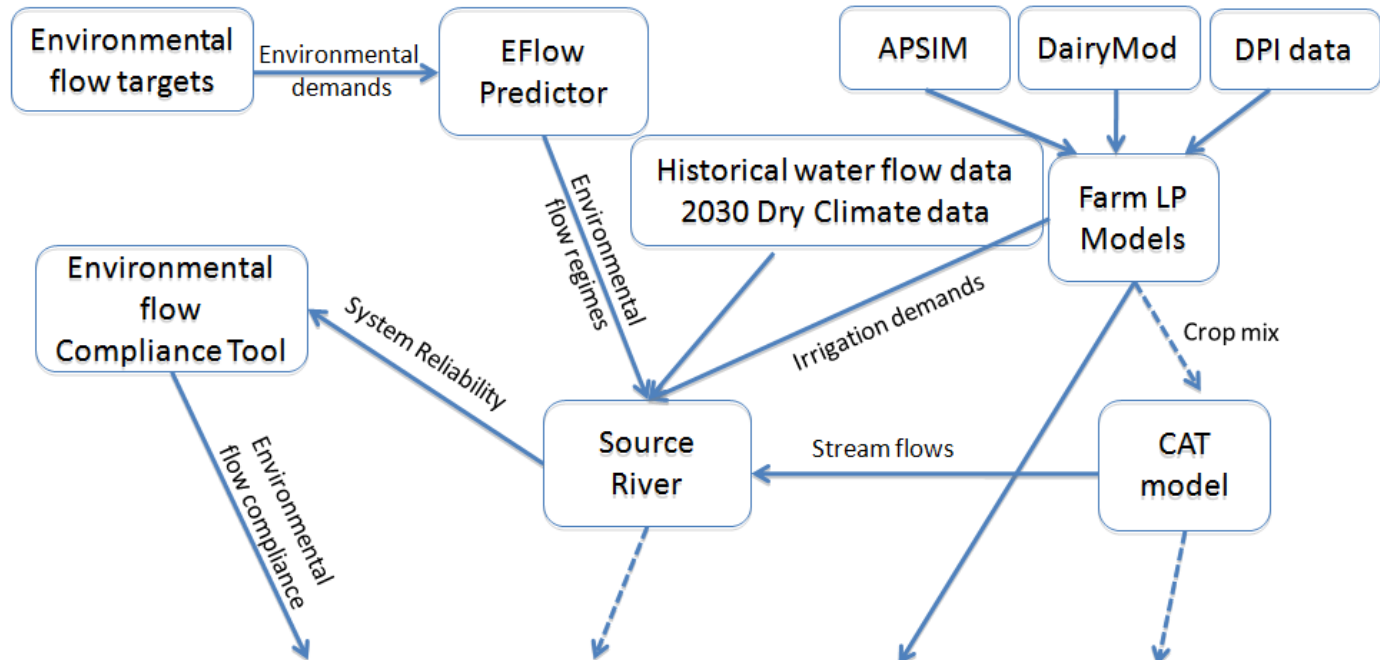
Broken River Catchment





Main research activity

Sustainable Diversion Limits Policy



SDL	Prob of achieving env objectives	Irrigation water supply reliability	Irrigated agricultural production & land use	ΔCatchment (groundwater) yield
10%				
30%				
50%				
70%				
90%				

Demand and supply of water to meet catchment goals



Ecological goals

- *Water Act 2007* - 'protect, restore and provide for ecological values and ecosystem services for the Murray-darling Basin'
- Environmental assets in the Broken River
 - Native fish
 - Macroinvertebrates
 - Riverine vegetation and
 - Geomorphology



Ecological objectives

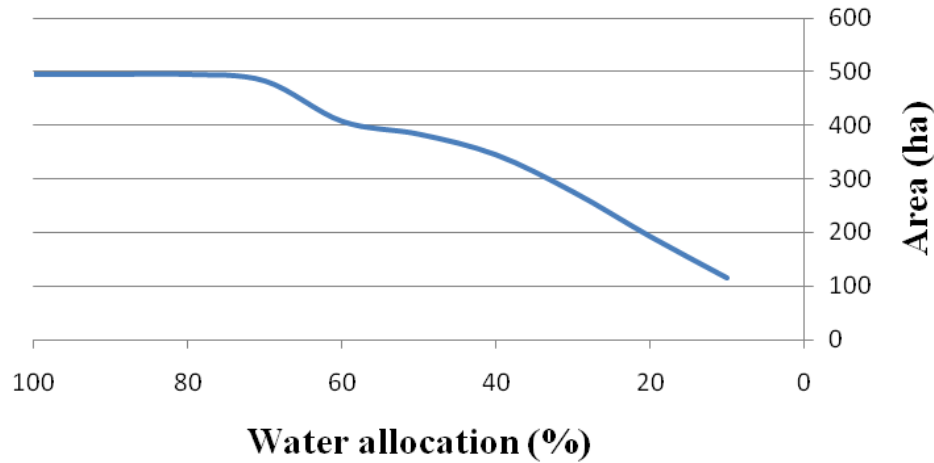
- 17 objectives/priorities to meet the overall goal for 4 environmental assets
- Expert panel of ecologists
 - Ranked & prioritised the objectives
 - Divided into 3 levels of river health
 - Meet all 17 (low risk of not achieving env. goals)
 - Meet top 10 (medium risk of not achieving)
 - Meet top 5 (high risk of not achieving)
 - Different probabilities/levels of water use
- eFlow Predictor, flow regimes

- Representative farm LP models
 - Irrigated dairy & horticulture (vit. & dryland)
- Varied water allocation shares (90, .. 10)
 - Optimal farm plans
 - Monthly water demand
 - Short-term responses
- Scaled up to catchment-level demand

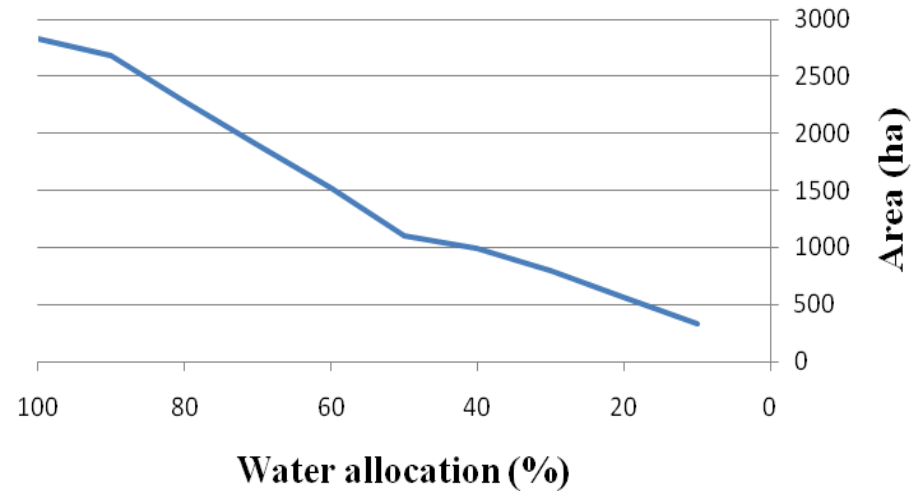


Farm irrigated areas

Catchment horticulture area



Catchment dairy area





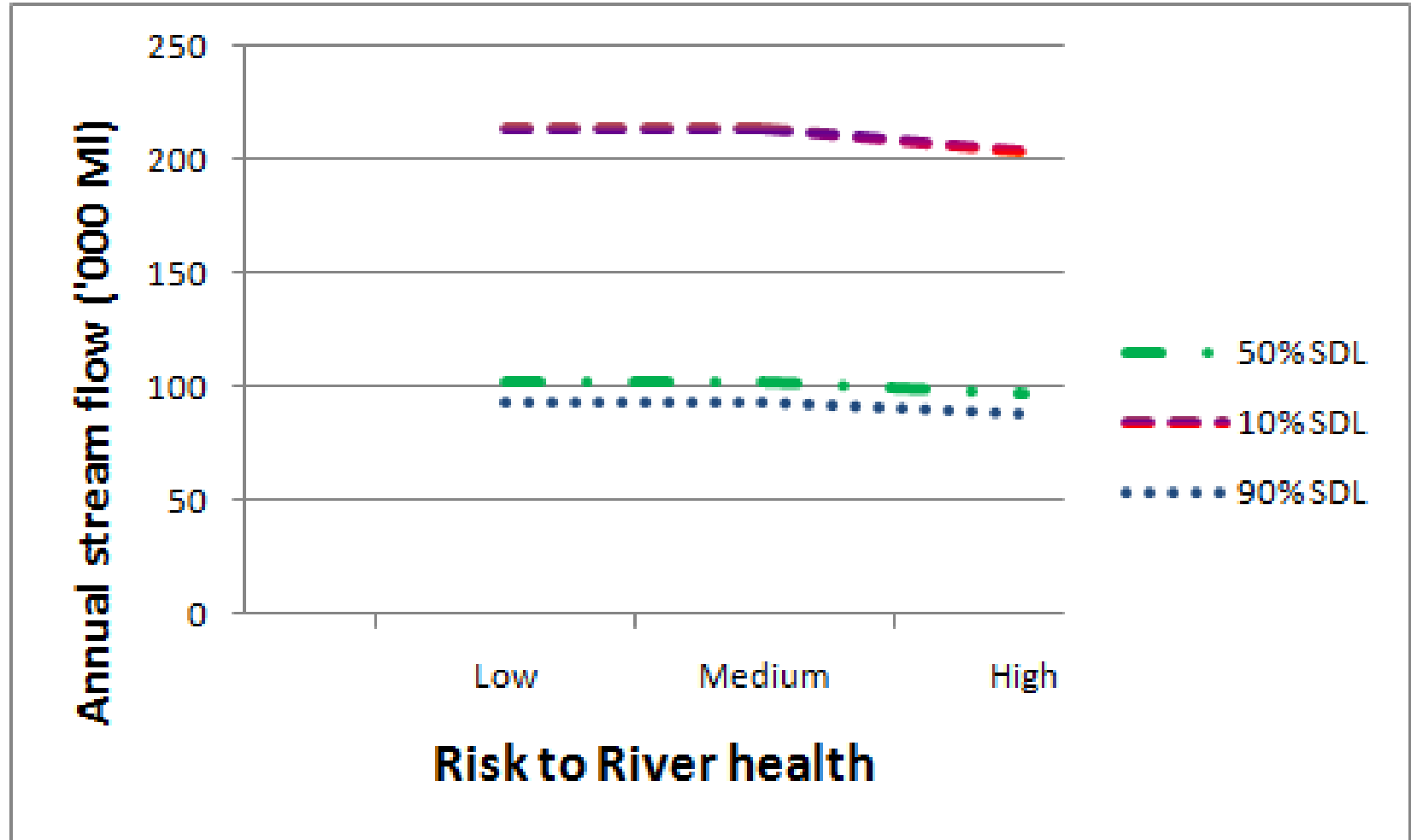
- A network allocation model
 - River system simulation
 - Temporal movement of water through system
 - Track ownership and route flows
 - Node-link network, daily time step
- Demands from agriculture and environment used to generate stream flows given different water supplies

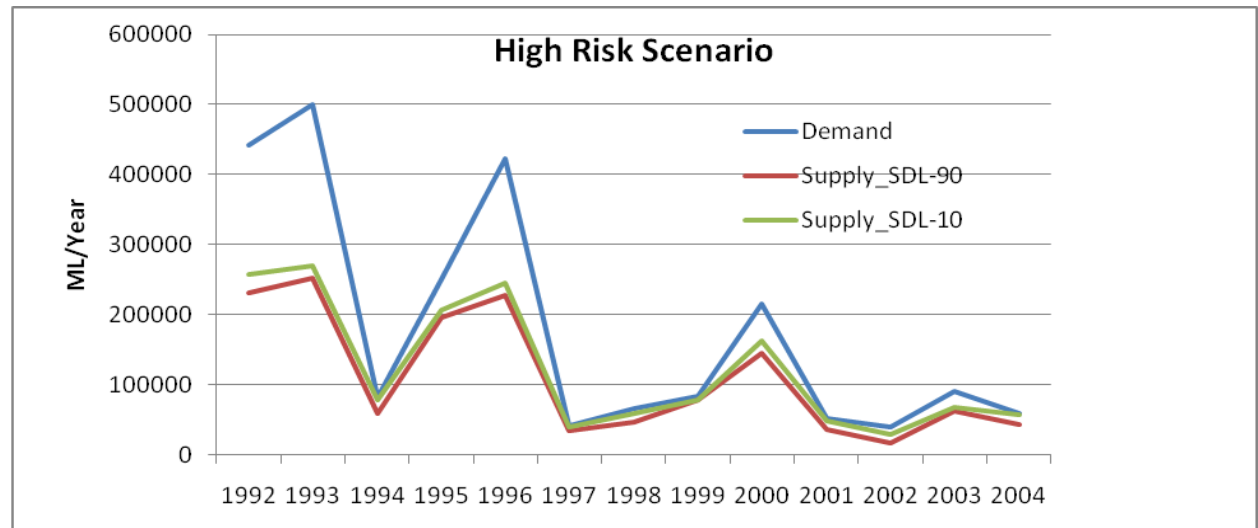
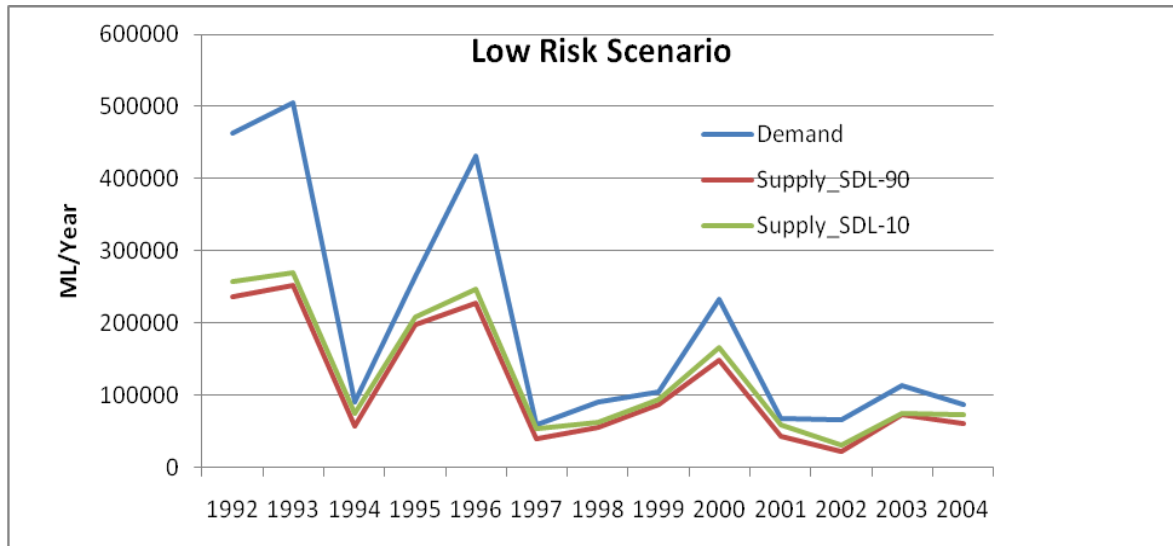


- Environmental flows from Source Rivers checked for compliance with environmental flow targets
 - Reliability to meet environmental demands



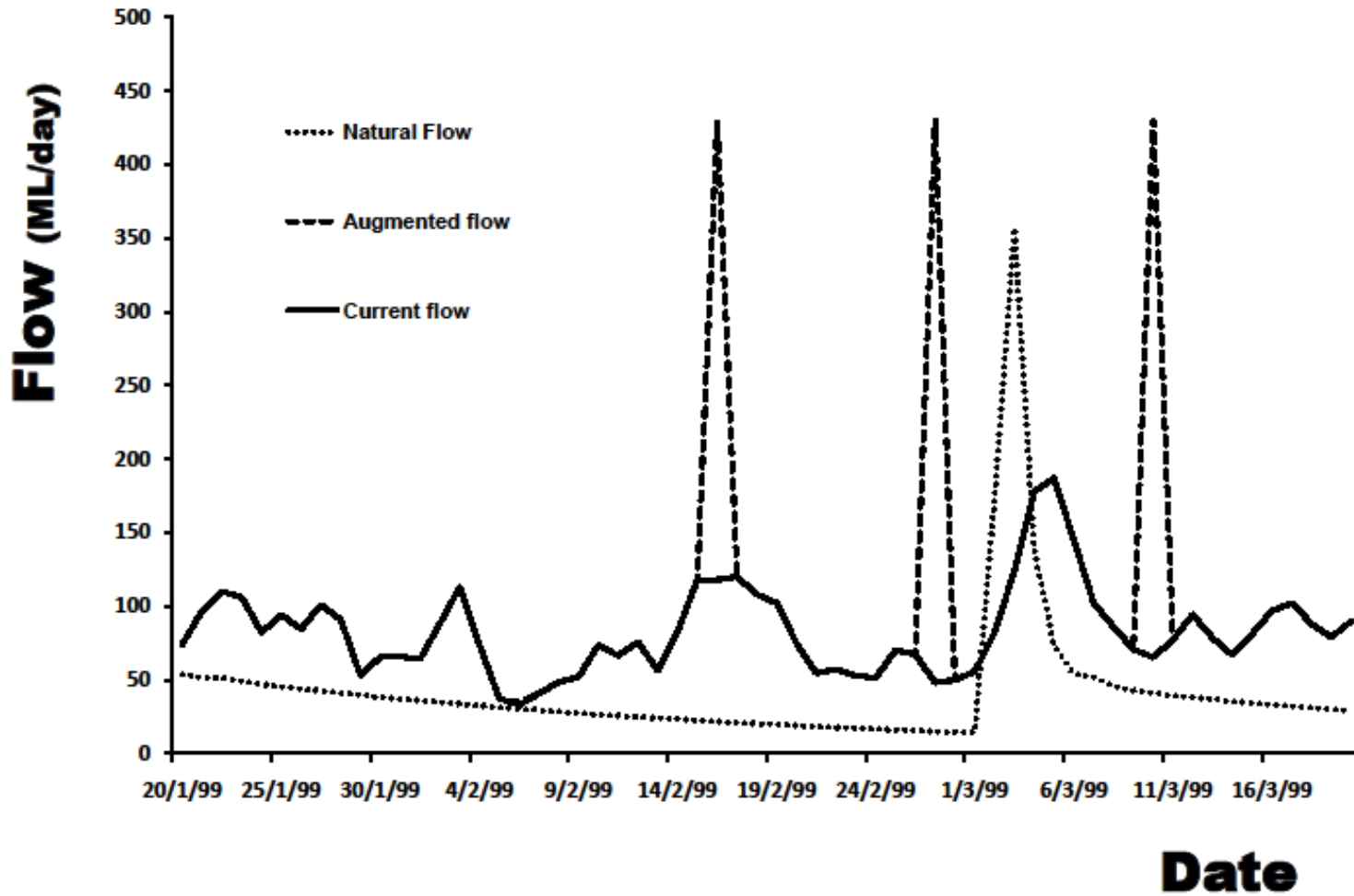
Environmental stream flows







Hydrograph





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