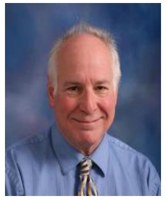
Policy/Economics: Offsetting diverse pollutants – trade schemes, scenarios, governance

- Can offset schemes that include trading between diverse pollutants/flows be developed to better manage water quality?
- What stakeholder roles are needed to make schemes successful/acceptable?



David Feldman, UCI

Ashmita Sengupta, SCCWRP

Vincent Pettigrove, CAPIM

Cameron Patel, UCI

Eric Stein, SCCWRP

Meenakshi Arora, Melb Uni

Lindsey Stuvick, UCI

Claudette Kellar, CAPIM

Nathan Delbridge, Melb Uni

Kate Berg, Western Water

Objectives

1. **Assess environmental values and pollution issues in Jacksons Creek**
    - Identify key stressors impacting health of aquatic fauna.
    - Determine relative contribution of recycled water.

2. **Develop flow and water quality scenarios**
    - Model stream flow and water quality to determine impacts.
    - Undertake scenario analysis based on various flow and water quality discharges.

3. **Develop environmental offsets / document methodology**
    - Examine strategies to minimize impact of contaminants at watershed level by discharging surplus recycled water.
    - Quantitatively evaluate stakeholder surveys that “feed” adaptive governance plans.
    - Assess application elsewhere in Australia, and similar areas in the U.S.

Approach

Phase I (completed)

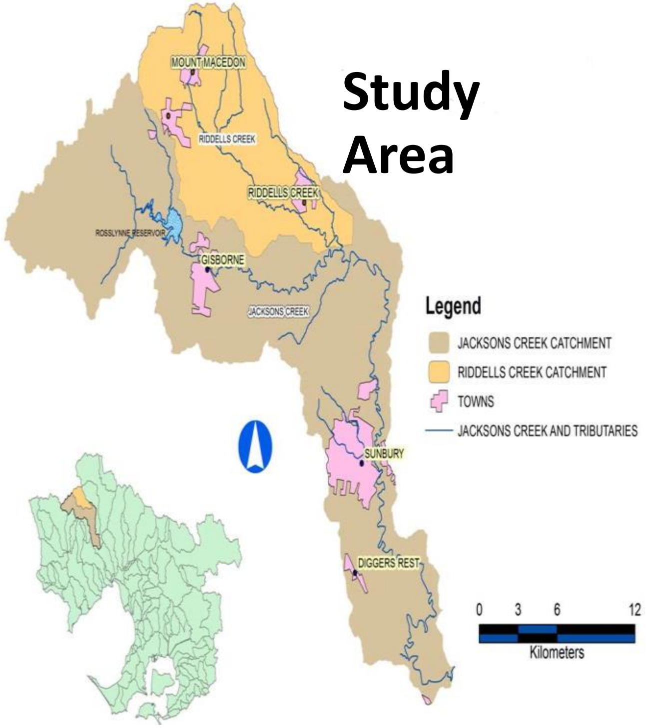
- Data collection for water toxicology, sediment toxicology, faunal alteration, bio-indicators of endocrine disruption and water toxicity.
- Preliminary model set-up using MUSIC and SOURCE (ewaters) to characterize watershed.
- Investigate governance issues associated with development of offset program in Jacksons Creek.

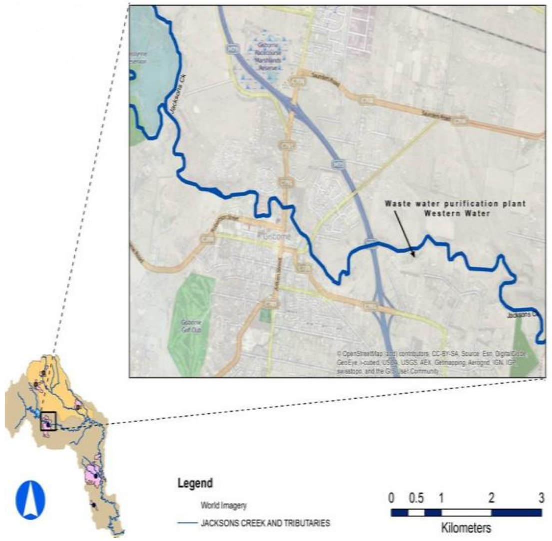
Phase II (in progress)

Determine best means to model stream health in order to facilitate design of offset program to reduce watershed impairment.

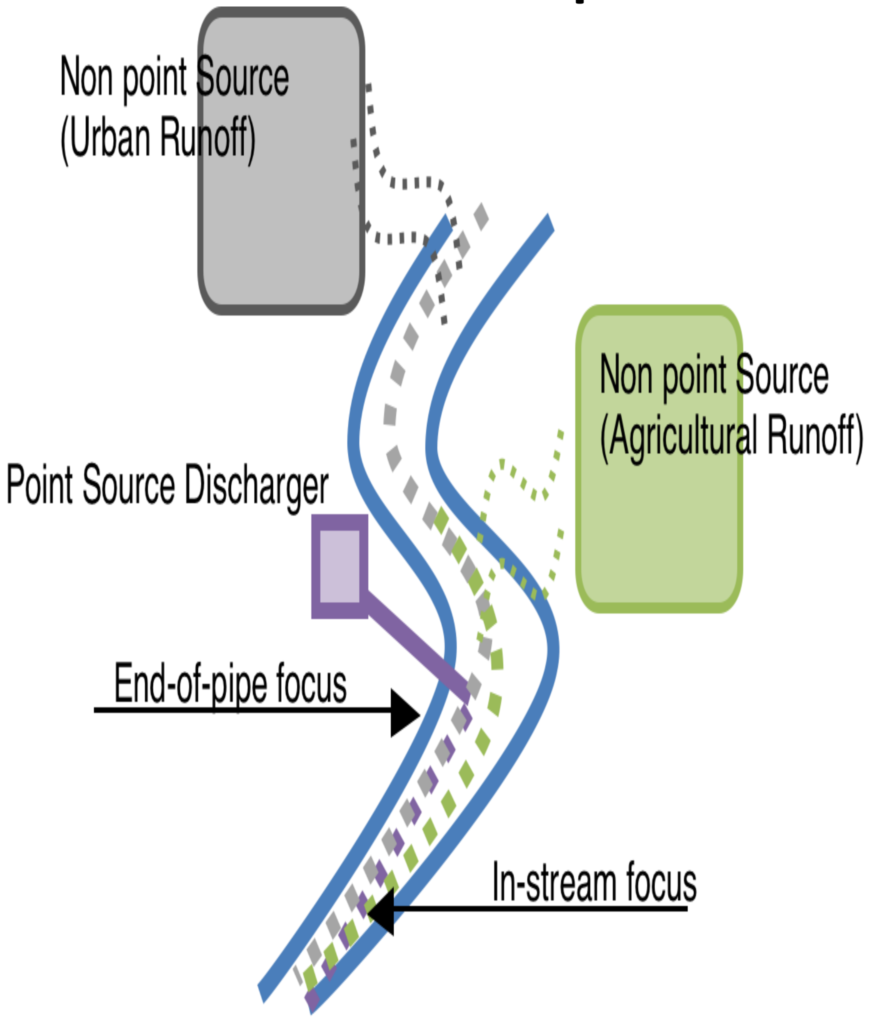
- Develop watershed/water quality model for different scenarios.
- Develop non-traditional modeling approach based on connectivity of watershed.
- Quantitatively analyze stakeholder surveys currently being undertaken by Western Water.

Study Area





Set up



Threats to Jackson Creek

Point source discharges

Nutrients, sediment, toxicants, pharmaceuticals.

Non-point source discharges

Altered flow regimes, sediment, pesticides

End point values – Jackson Creek

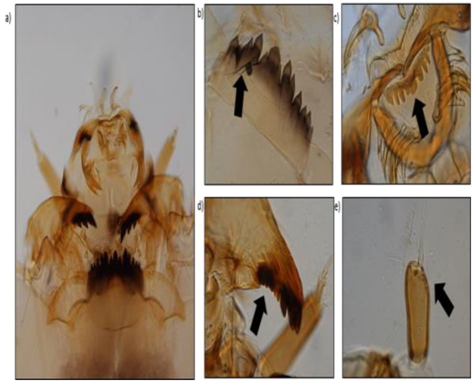
Platypus

Amenities

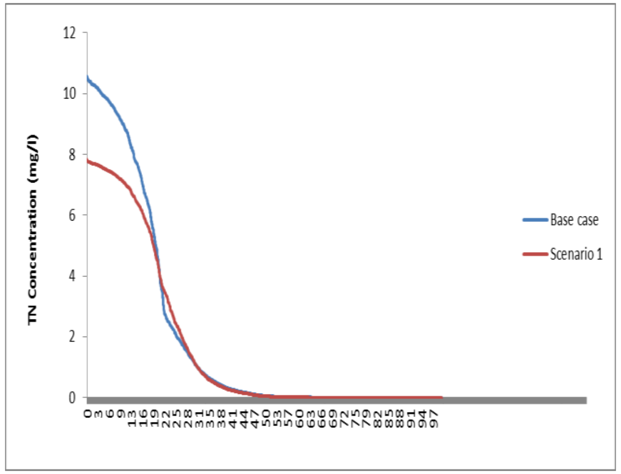
Results

Phase I

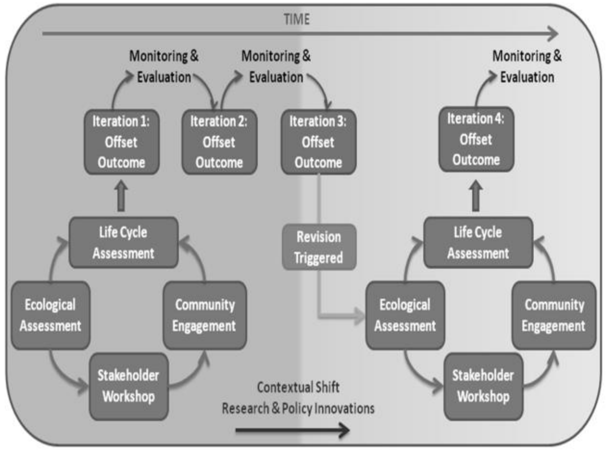
- Most sites show ecological impairment and exceedance for most pollutants.
- Preliminary modeling shows that while treatment plant exacerbates nutrient enrichment, it serves as an important source for one of the amenities (platypus) in the offset scheme.
- Adaptive learning strategy (partly via application) will improve outcomes for offset process if allowance is made for revisiting offset design (e.g., community-generated measures of benefit and their value).



A normal chironomid head capsule and examples of some deformities (Pettigrove et al, 2014)



Simulated TN % exceedance curve for Scenario-1 (Arora and Sengupta, 2014)

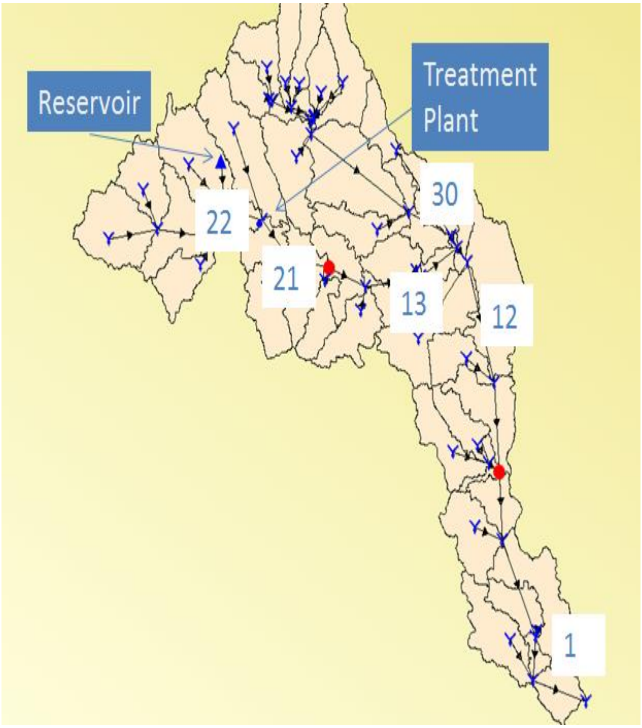


Strategies for adaptive governance (Feldman et al, 2014)

- **Phase II (Preliminary results)**

Determine best means to model stream health in order to facilitate actual design of offset program to reduce watershed impairment

  - Develop watershed/water quality model for various scenarios (e.g., normal precip vs. drought; land use change, recycling).
  - Two scenarios below - Steady Flow, Normal Precipitation (A) v. No flow, drought conditions (B).
  - Nickel, TP, and TN concentrations exceed regulatory requirements at all points in creek.



Scenario A						
(% of limit)	**22**	**20**	**13**	**30**	**12**	**1**
TP	208.00	500.00	404.00	416.00	400.00	548.00
TN	86.57	466.00	265.71	265.14	263.14	352.00
Nickel	223.53	188.24	258.82	229.41	247.06	229.41
Scenario B						
TP	268.00	720.00	268.00	300.00	268.00	360.00
TN	157.43	699.43	158.57	175.14	158.29	221.14
Nickel	241.18	188.24	247.06	241.18	247.06	241.18

Conclusions

- Flow conditions appear to have greatest effect on water quality and condition of faunal assemblages; worst impairment occurs during low-flow.
- Non-point runoff primary source of pollutants in system.
- Pre-treatment of stormwater (other runoff) necessary prior to it entering creek (future research will address the issue of impervious connectivity as one of the components of offset design).
- Adaptive governance critical for the successful implementation of offsets.

Products

- Accepted article: "Governance issues in developing and implementing offsets for water management benefits: Can preliminary evaluation guide implementation effectiveness?" for *WIRES Water 11/2014.*
- Presented "The Onset of a Novel Environmental Offset: A case study for diverse pollutant schemes in Australia," for : Sustainable Water Quantity and Quality in the Built Environment I – *AGU fall meeting*, San Francisco, December 2014.
- Completed "Rainfall Runoff Model of Jacksons Creek Catchment," November 2014, for Western Water (VIC) as support for Jacksons Creek watershed modelling.
- A. Sengupta awarded MERIT visiting scholar award from the University of Melbourne's engineering school. She was nominated for this award by the collaborators at Uni. Melbourne, and CAPIM.

Policy/Economics: Effective wastewater discharge regulations in a semi-rural environment subject to severe droughts - Application to Goulburn Valley, Victoria

Can regulations improve the value of recycled wastewater for humans, agriculture, and the environment?

Kimberly Duong, UCI

Jean-Daniel Saphores, UCI

Andrew Hamilton, U Melbourne

POSTERA CRESCAM LAUDE

THE UNIVERSITY OF MELBOURNE

Tentative Approach

1. Understand the local situation (possible uses of water / reclaimed wastewater)
2. Review the relevant literature on optimal regulation (economics)
3. Propose a simple economic model that accounts for the main uses of water/recycled water in the Goulburn Valley and their externalities
4. Combine this simple economic model with a hydrologic/water quality model of the catchment
5. Collect data on the value of services/costs created by reclaimed wastewater uses and the value of water for different uses
6. Explore the costs and benefits of different regulatory approaches
7. Analyze applicability to the Western U.S.

Policy/Economics: Identifying and Overcoming Barriers to Integrated Water Cycle innovation – comparing California and Australia

- Can cross-national innovation diffusion overcome institutional & other barriers to Integrated Water Cycle Management (ICWM)?

Kathleen Low

Dave Feldman

Stan Grant

Lisa Kohne

Constructed stormwater wetland

US-AUS Delegation Focus Group/External Advisory Board

- To understand barriers impeding institutional cooperation in adopting ICWM innovations, we'll bring Australia & SoCal experts together in dialogue.

- Sectors include: water supply, demand-management, stormwater, wastewater, academia.

- To generate insights collaborators will discuss issues through virtual platform and, later, as a focus group to discuss and assess:
  - What obstacles did Melbourne face during millennium drought and how were they overcome?
  - How are these obstacles similar to what California now faces, and can Melbourne's experiences be applied to California?
  - And, are there challenges Melbourne faces, or will soon face, that California experiences can help resolve?
  - Issues of regulatory flexibility, innovative capacity, fragmented responsibility (Roy et al 2008).

Approach – focus groups & wiki-space

- Step 1: Use Wikispace as a platform for discussion:

  - Allows for editing & track changes
  - User-tracking
  - Greater frequency of use
  - Password protected and secure

- Step 2: Form focus groups from Wikispace participants, use open-ended queries to generate discussion.

  - Focus groups are *discursive* (permit interaction between stakeholders); *dialectical* (discourse eventually produces social learning); and *distributed* – connect people from different places.

Project benefits

- To compare – and advance understanding of – innovation take-off/acceptability in regions undergoing water stress (e.g., conservation, biofilters, third-pipe systems).

- To evaluate – merits of using Wiki for inter-organizational collaboration and knowledge exchange. Purported benefits include:

    - Exchanging ideas on technical problems (Chau and Maurer 2005)
    - Helping organizations improve decisional processes (Majchrzak et al 2006)
    - Providing greater transparency on knowledge of employees (Danis and Singer 2008)
    - Knowledge sharing tool (Grace 2009)

- To establish – an advisory body for PIRE comprised of industry and academic experts who can guide the project’s efforts at *translational science*, and encourage greater boundary-spanning among fields involved in ICWM.

Initial products

- White paper on use of Wiki for inter-organization collaboration – draw on experiences of participants.
- Article comparing innovation success and failure in Southeast Australia and Southern California.
- Conduct in-depth interviews about Wiki experience.
- Form an innovative bi-national advisory body.