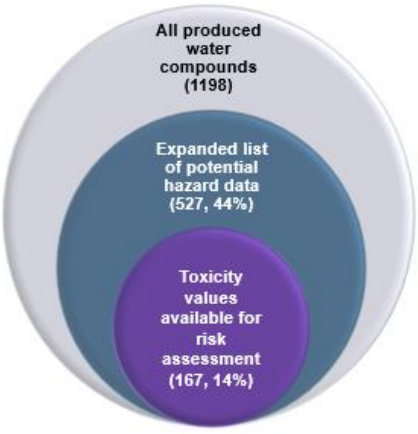
Assessing Regulatory Programs and their Fit for Produced Water Reuse Applications: Land

Environmental Defense Fund (EDF) is the Leader for a newly active "Action" in the National Water Reuse Action Plan (WRAP) – *Assessing Regulatory Programs and their Fit for Produced Water Reuse Applications* – Action 3.8.

This action presents a culmination of years of EDF work to elucidate scientific and analytical challenges tied to produced water and to understand implications of its reuse in the regulatory context. There is increased interest in treating and reusing some produced waters for use outside the oilfield. However, the complexity of this waste stream and analytical limitations regarding its chemical and toxicological nature will create challenges for regulators to identify and manage environmental and public health risks. EDF's project is designed to understand if regulators, who are considering new uses for produced waters, have the tools in place to adequately manage potential risks and provide insights on where additional research is needed to inform improvements to regulatory programs.

The project is two-fold: (1) utilize existing and previously published analyses of produced water constituents to assess scope of coverage in Clean Water Act state and federal programs applicable to surface water discharges, and (2) conduct initial research and analysis of exposure pathways associated with various end-uses involving land application and assess available laws, regulations, standards, and guidance potentially applicable to produced water reuse in those contexts.



Danforth et al. 2020.
10.1016/j.envint.2019.105280

Surface Discharges & Produced Water

Part 1 of Action 3.8 has been presented previously at WateReuse, WEFTEC, GWPC, ECOS, and other conferences and efforts are ongoing to translate that analysis into a comprehensive white paper. In brief, EDF assessed state and federal surface water regulatory programs for coverage of produced water constituents and found:

- A range of ~40-90 constituents found in produced waters are covered in some form in water quality standards.
- About 150-200 produced water chemicals (on average, across states) have a standard analytical method, do not have surface water quality standards, but do have toxicity values useful to assess risk, allowing an inference that these might be low-hanging fruit for further study based on data availability.
- More research is vital to move toward a system that prioritizes constituents of most concern in establishment of standards *based on actual analysis* of produced waters.

Over 1,000 Chemicals have no EPA-approved analytical method allowing their detection or quantification in the regulatory context

Quantifying Regulatory Challenges in the Land Apply Context – Harder!

Developing a comprehensive assessment of regulatory challenges facing produce water reuse scenarios involving land application is more difficult for numerous reasons, including:

- The variability of reuse scenarios means there's no single regulatory solution set to target
- Large number and variety of potential exposure pathways
- Limited existing regulatory coverage or guidance
  - ***No*** umbrella statutory backdrop (e.g., CWA)
  - ***Lacking*** science-based standards or guidance developed intentionally for PW
  - Agency jurisdictional questions

Project Framing and Approach

EDF and partners are approaching this project by building on the idea of a conceptual site model but taking the analysis further to overlay potential permitting resources – such as regulatory guidelines or standards – in addition to identifying exposure pathways. This will allow us to merge a discussion of exposure and risk with analysis and identification of regulatory and permitting needs in a more cohesive format. We are working to:

- Identify most likely reuse alternatives involving land application & compile potential receptors and exposure routes for each scenario
- Conduct initial research to identify for each scenario, based on receptor and exposure route, whether there are existing and potentially applicable resources to guide permitting there, including:
    - Regulations specific to produced water
    - Federal laws or regulations
    - State laws or regulations
    - Other non-regulatory guidelines, recommendations, best practices

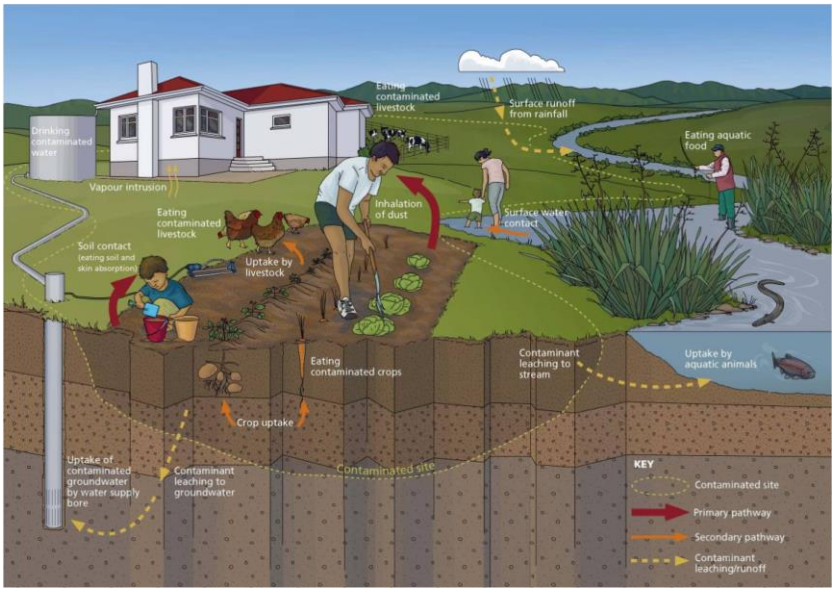
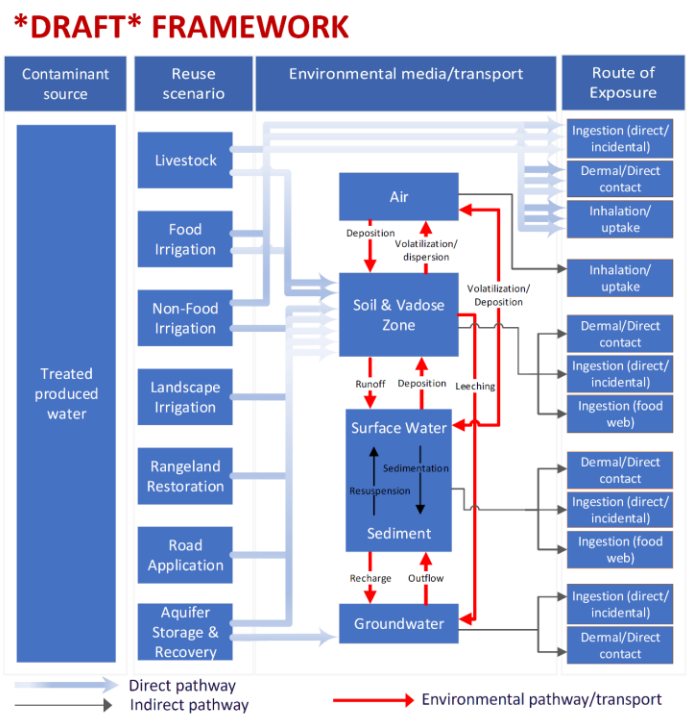
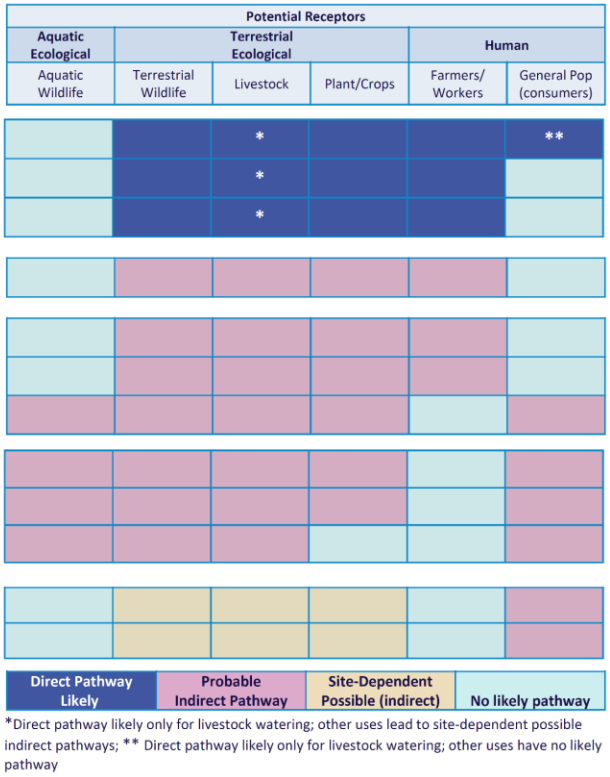


Image taken from the *Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*. 2012. Wellington: Ministry for the Environment.





*Direct pathway likely only for livestock watering; other uses lead to site-dependent possible indirect pathways; ** Direct pathway likely only for livestock watering; other uses have no likely pathway

Up Next: Building in Research on Laws, Standards, Regs & References

- For a range of exposures/risks might include: CWA, SDWA, ESA, OSHA, Food Safety, Ag Guidelines, Soil Guidelines, Irrigation Standards, etc. *but in many (most) cases guidelines are absent or very limited (e.g., only E. coli or salt).*
- Many of these will need modification to address unique considerations of PW! Need to ask the right questions on quality.
- Don't have as many analytical tools for toxicity and whole effluent assessment in terrestrial context – research opportunity!