

Environmental Risks & Unknowns

*Water Associated with Oil & Gas
Development and Long Term Water
Sustainability Strategies*

***21st Annual GWPC UIC Conference: Aquifer
Management & Underground Injection
February 24, 2016***

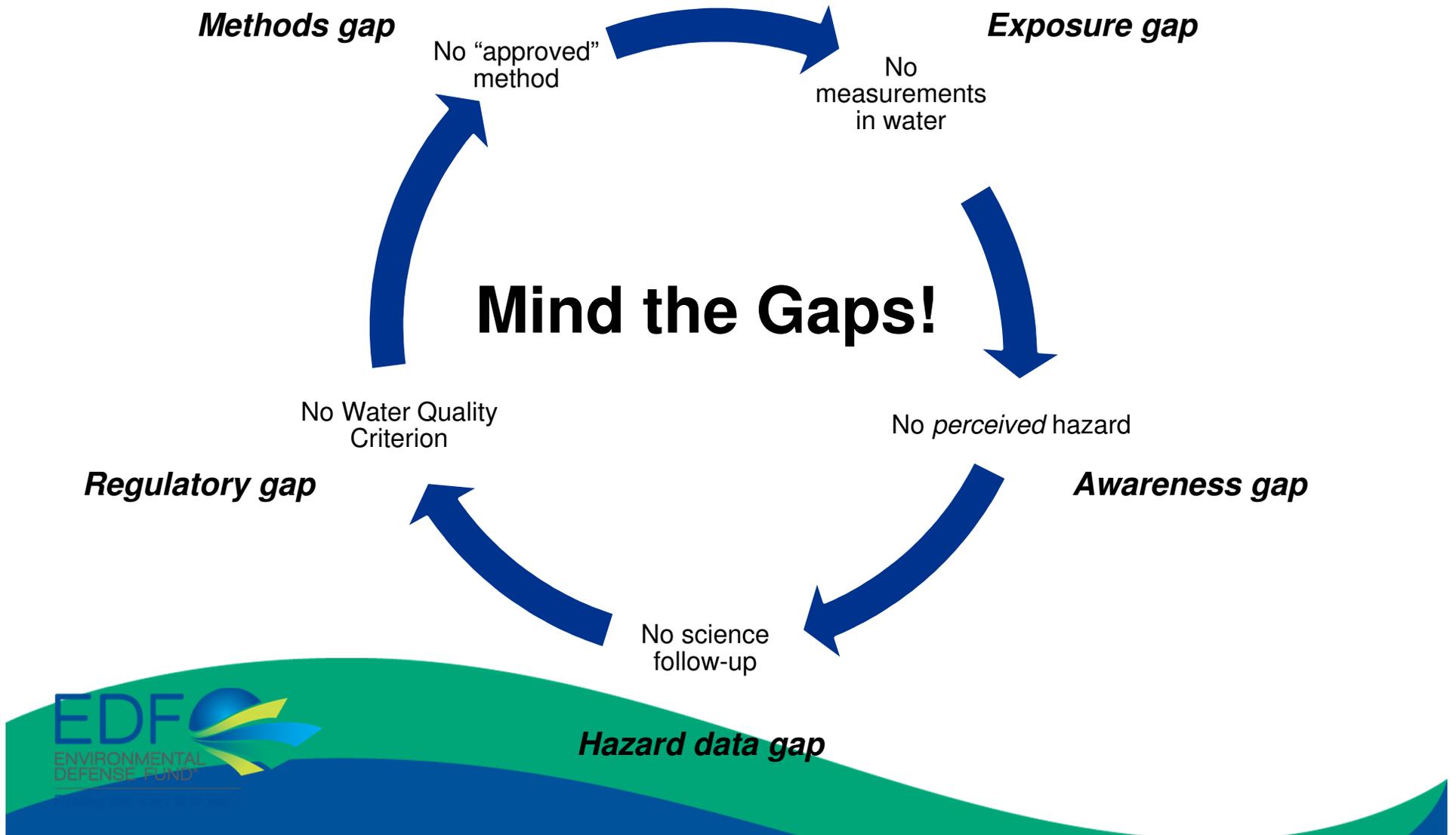


“Reports that say that something hasn't happened are always interesting to me, because as we know, there are **known knowns**; there are things we know we know. We also know there are **known unknowns**; that is to say we know there are some things we do not know. **But there are also unknown unknowns – the ones we don't know we don't know.** And if one looks throughout the history of our country and other free countries, **it is the latter category that tend to be the difficult ones.**”

-Sec. Donald Rumsfeld



Produced Water Knowledge Gaps



Methods Gap

481 Chemical
constituents
relevant to
the Marcellus
region
produced
water

>

215
Unique
constituents
with EPA -
approved
test methods



Exposure Gap

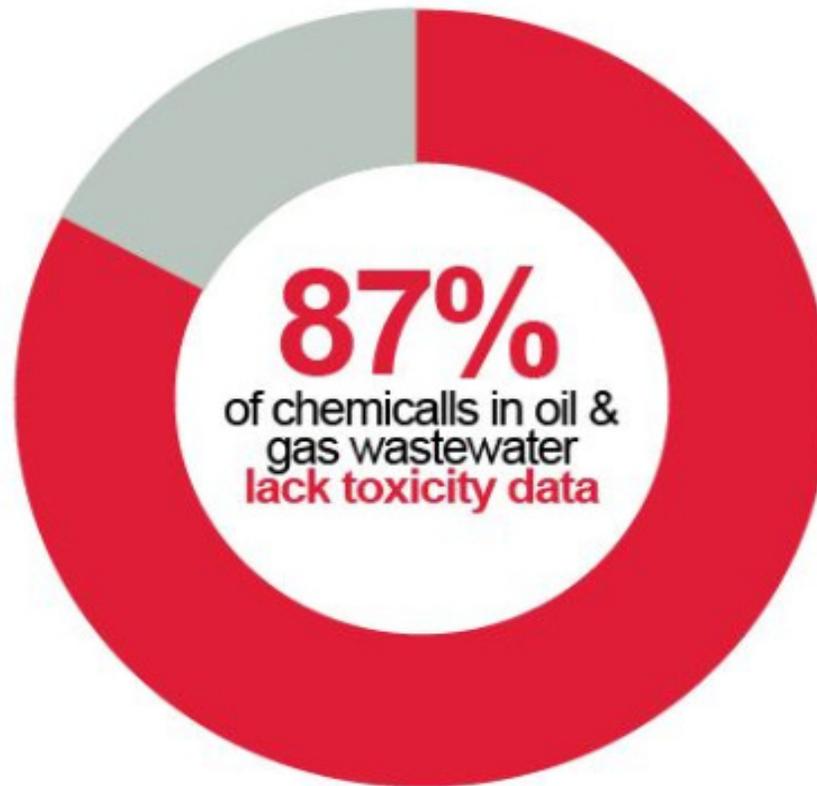
- *Disconnect between monitoring, fate and transport data, and potential constituents.*

Awareness Gap

- *Difference between perceived threat and actual risks*
- *Unknown unknowns*

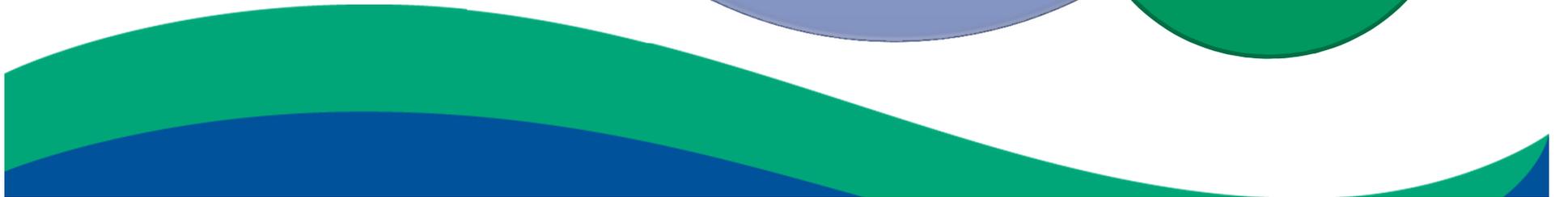
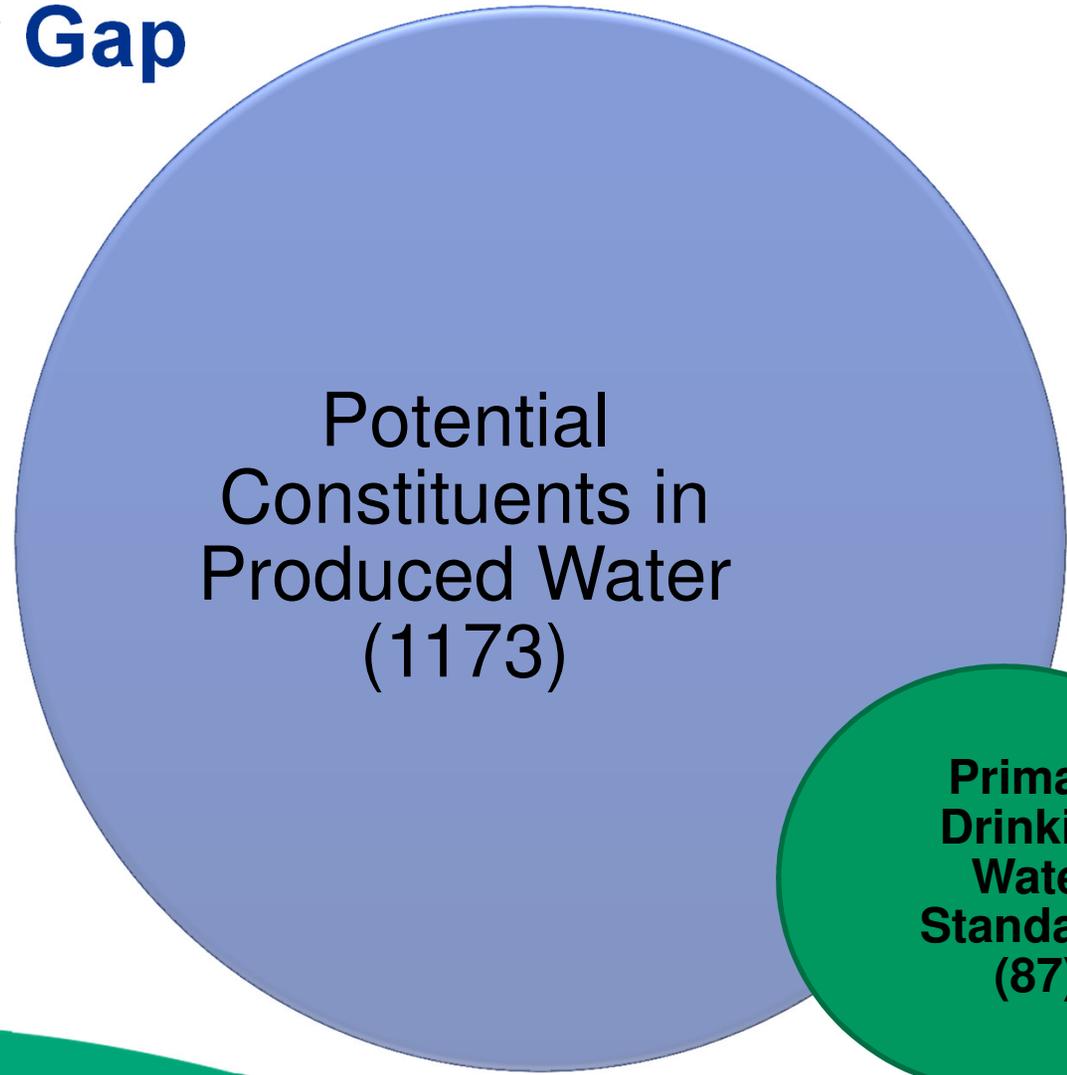


HAZARD DATA GAP

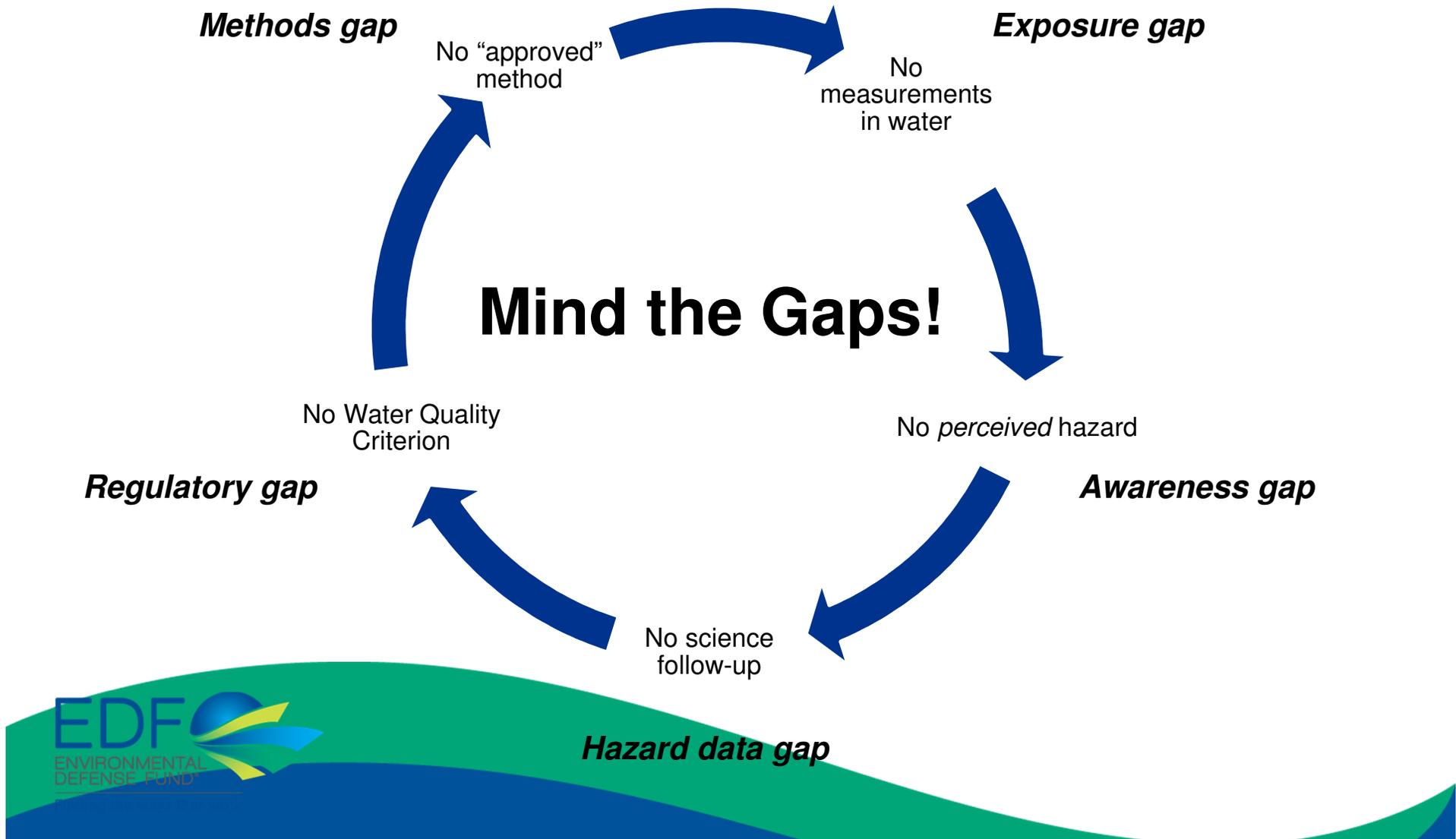


EPA Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources (2015)

Regulatory Gap



Produced Water Knowledge Gaps – The Cycle Repeats





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