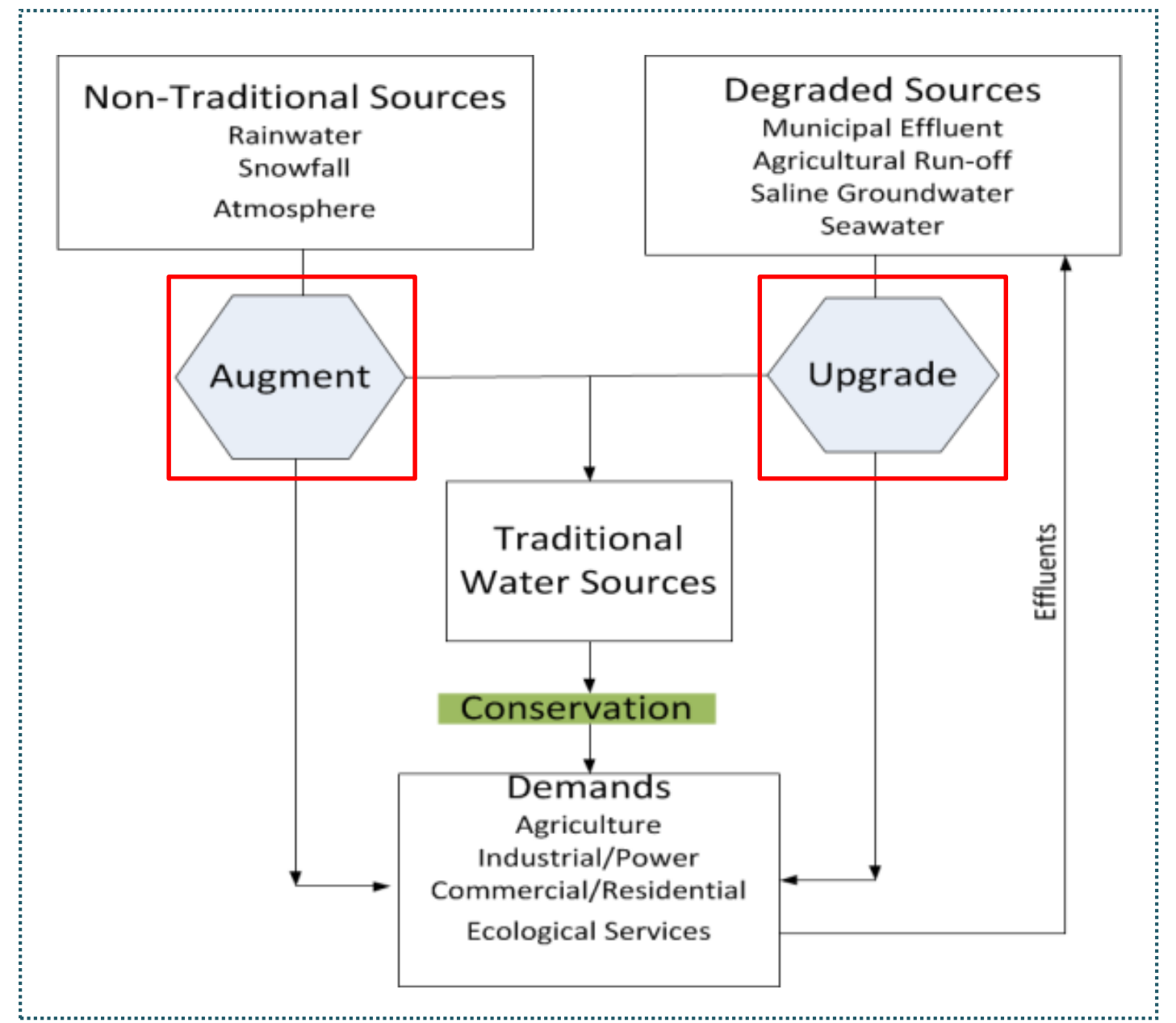


Water Upgrading & Augmentation

ILLINOIS SUSTAINABLE TECHNOLOGY CENTER
PRAIRIE RESEARCH INSTITUTE

Research Approaches

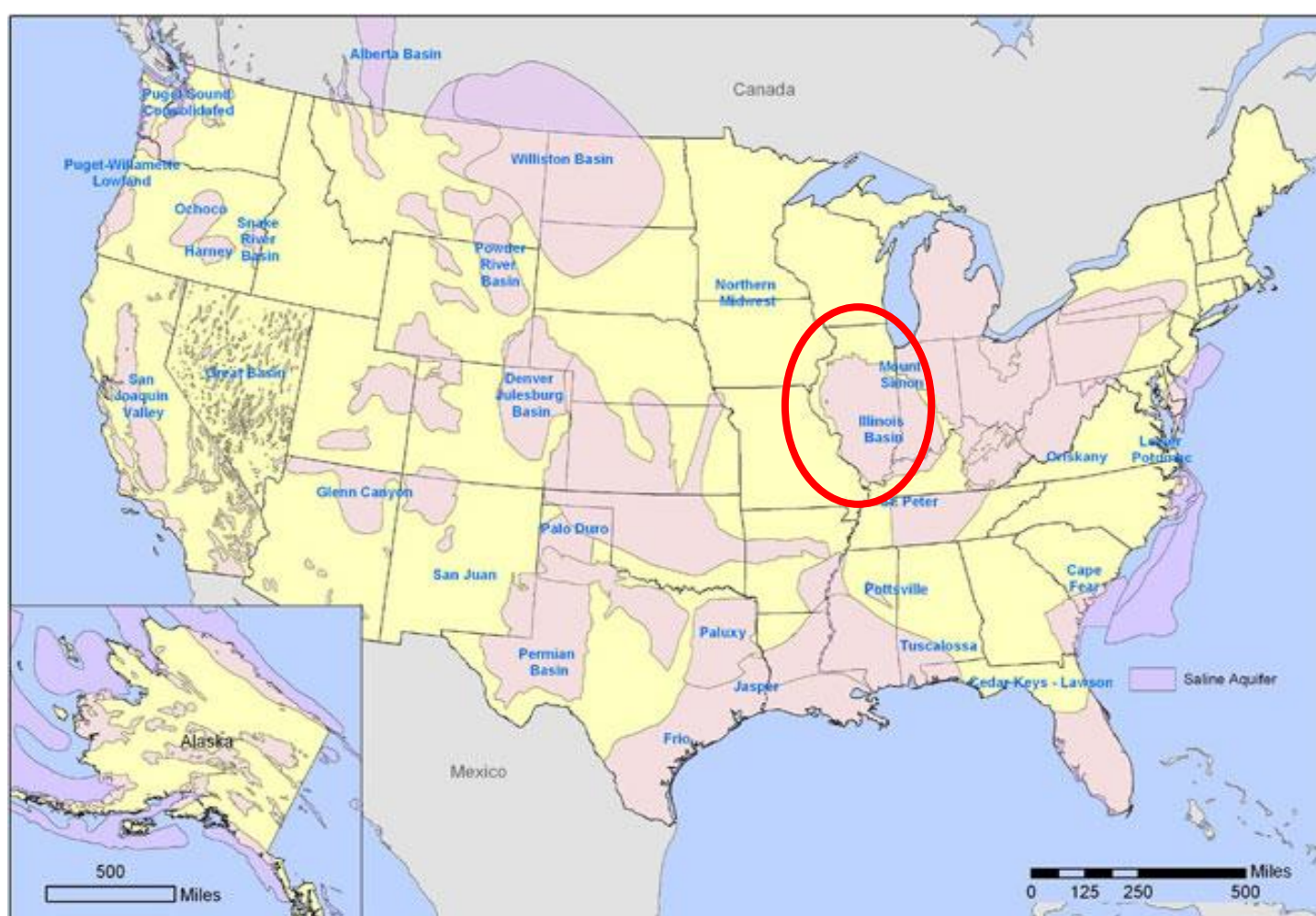
- Conservation
- **Upgrading**
- **Augmentation**



Saline and Brackish Water Research

Augmentation by Desalination

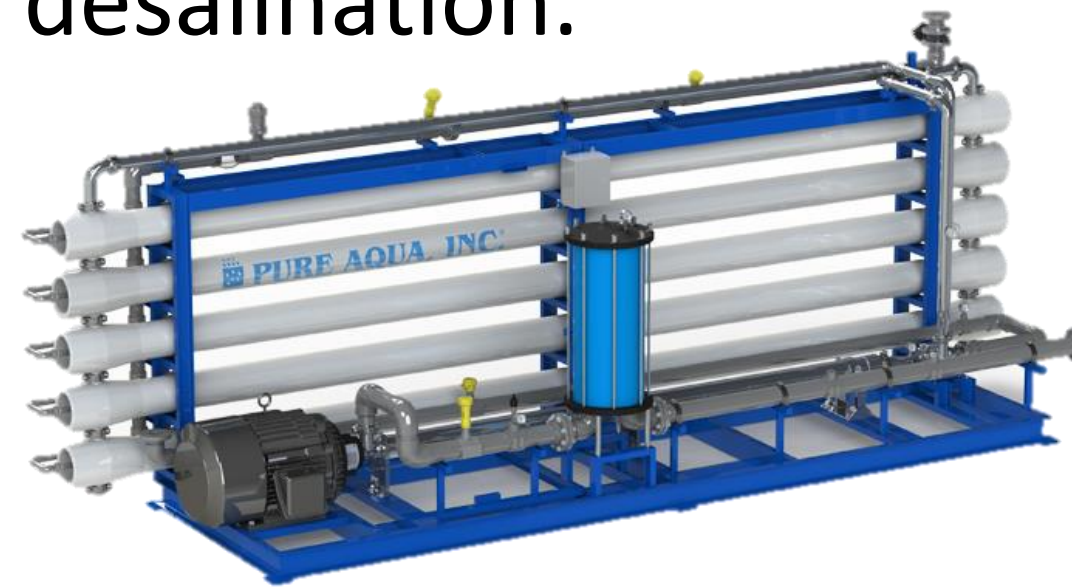
US Saline Water Aquifers



Saline and brackish aquifers are potential new water sources and are widespread in Illinois.

Reverse Osmosis (RO)

Reverse Osmosis is the most commonly used technology for desalination.

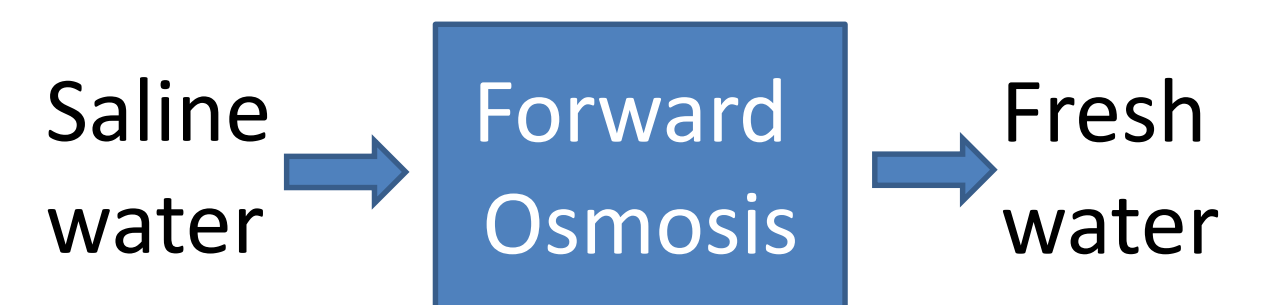


Concerns with reverse osmosis

- Green house gas (GHG) emissions
- High electricity consumption
- High pressure operation
- Prone to membrane fouling

Forward Osmosis (FO)

Forward Osmosis is an alternative desalination technology to RO.



Advantages of forward osmosis

- Uses low-grade energy
- Lower GHG emissions
- Low pressure process
- Ease of operation
- Inherently low membrane fouling

ISTC invented a draw solution regeneration process (US Pat. Application No: US2011/0272355) and is working on improved membranes for FO.

Upgrading

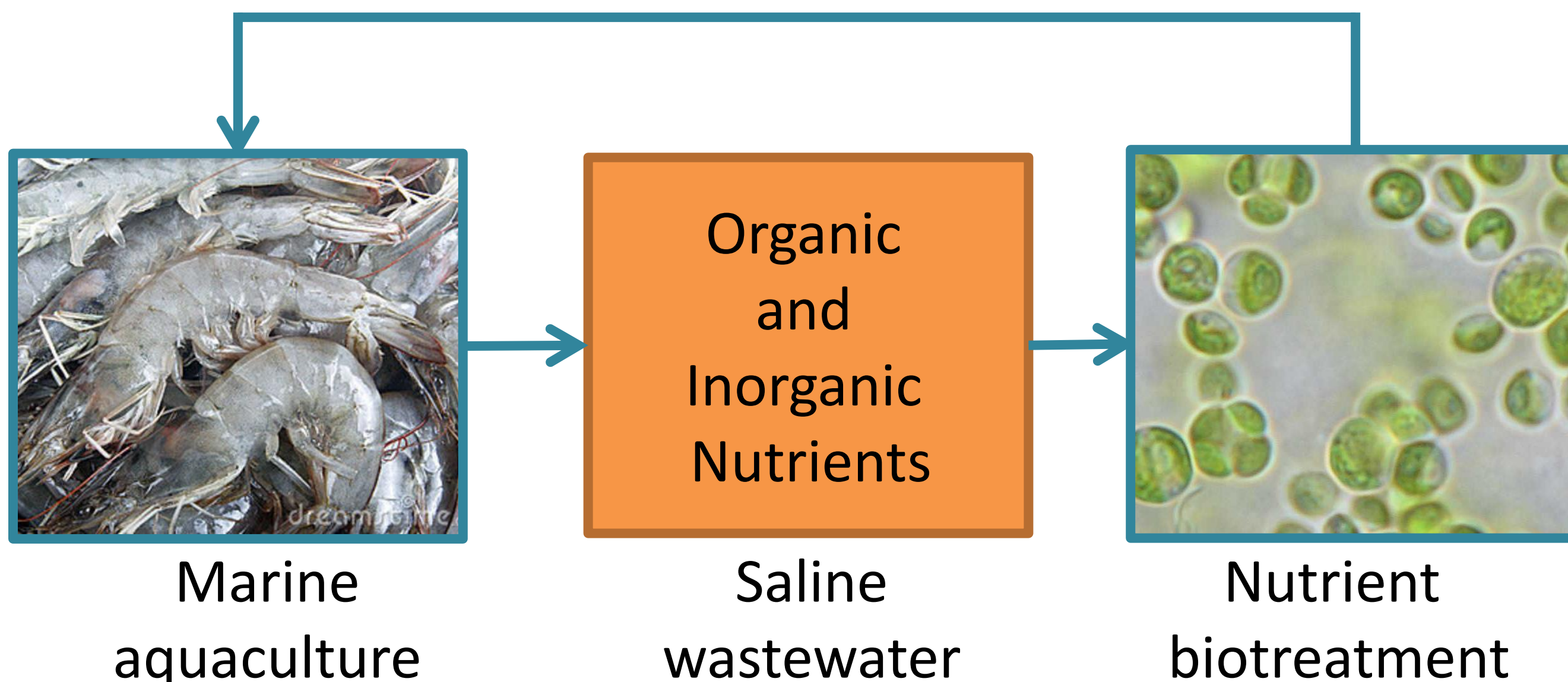
Beneficial reuse of wastewater generated in:

- Saline aquaculture
- Ion-exchange
- Pickling, canning, and tanning industries

Challenges with saline wastewater treatment

- Physicochemical treatments remove both contaminants and salts
- Biological treatments are limited by high osmotic pressure

Treated Saline Water



Example of beneficial reuse in saline aquaculture

ISTC research areas:

- Microalgae-based saline water treatment and reuse
- Microalgae biomass as potential biofuel