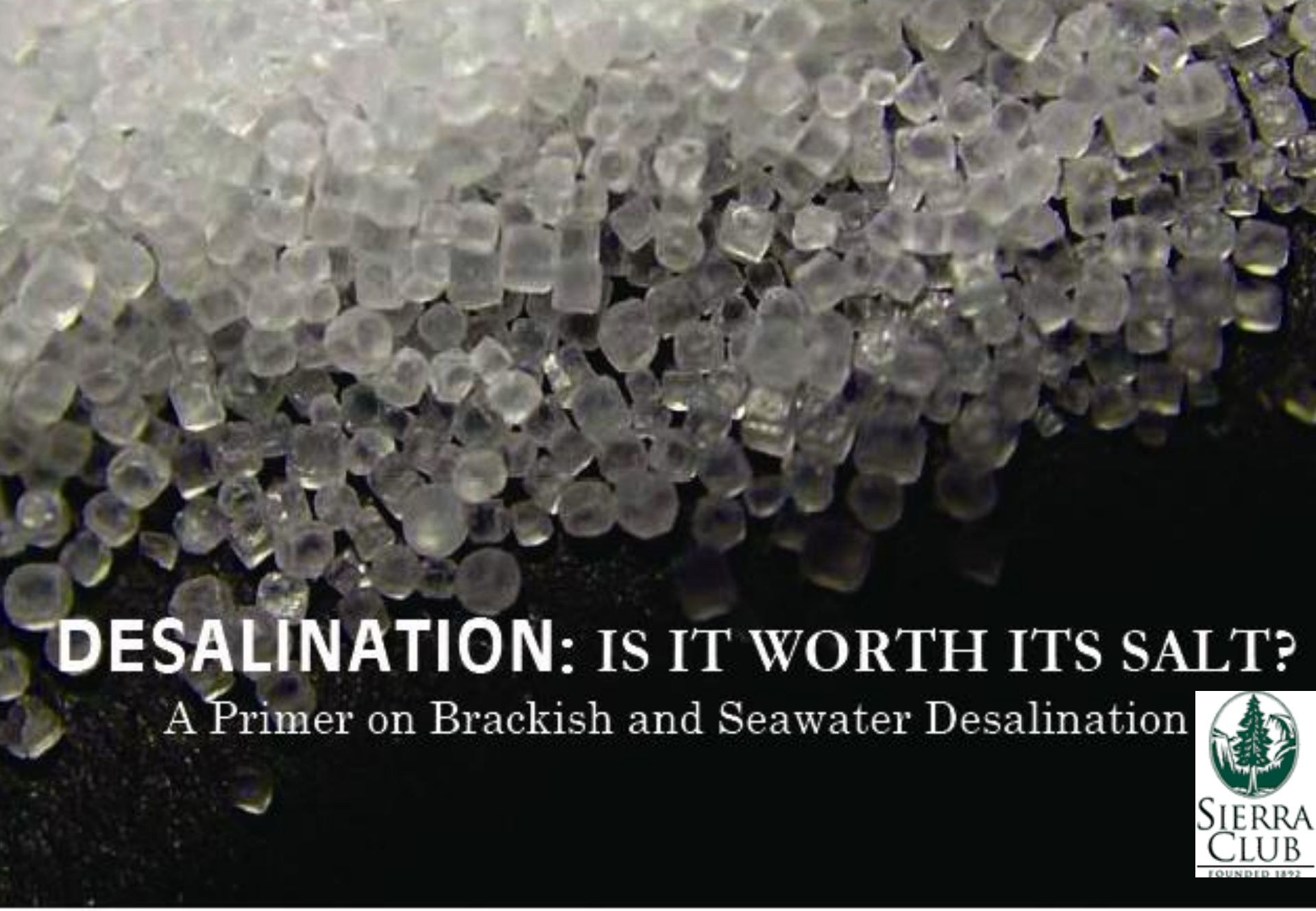
Desal:

The Environmental Perspective

Tyson Broad

Lone Star Chapter Sierra Club

Photo: Jennifer Ellis, National Wildlife Federation



DESALINATION: IS IT WORTH ITS SALT?

A Primer on Brackish and Seawater Desalination

SIERRA CLUB

FOUNDED 1892

Photo by Cynthi

Ecological effects of brine disposal
Entrainment of aquatic species
Increased energy needs
Facility siting

Environmental Considerations for Desalination

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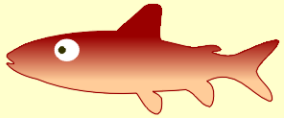
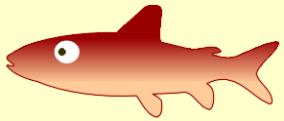
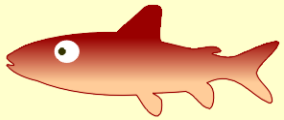
Brine Disposal Considerations



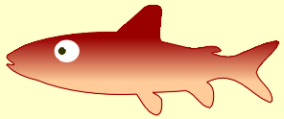
Changes in salinity regime caused by brine itself



Contamination from chemicals used for pretreatment, membrane cleaning and preservation

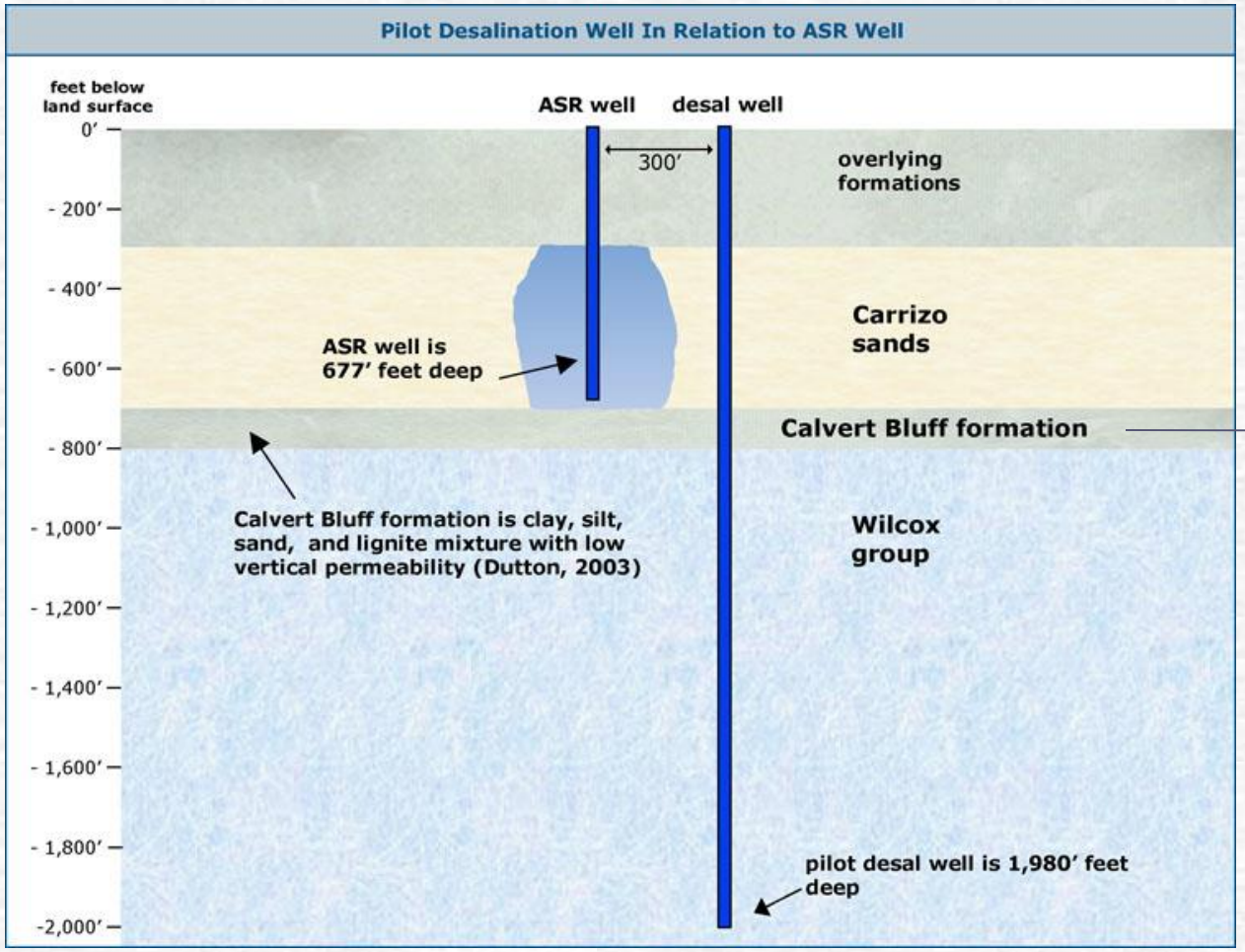


Contamination or impairment of fish resources and habitats



Contamination for concentrated source water constituents (arsenic & radionuclides)

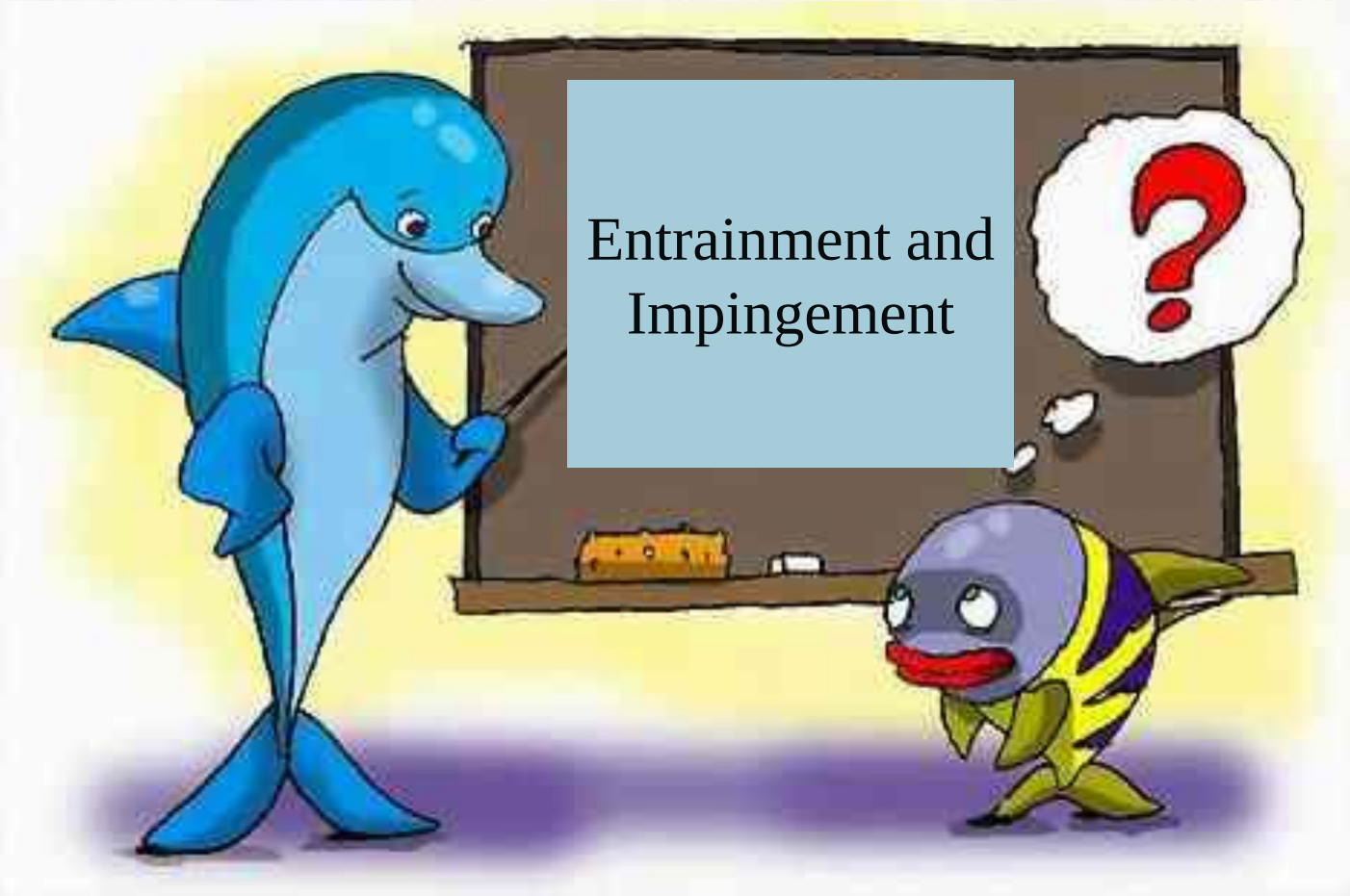
Slide Design stolen from Dr. George Ward



-variable thickness?

-little data/modeling

Environmental Considerations for Desalination


Entrainment and
Impingement

Impingement and Entrainment

Impingement : Organism pulled into an intake pipe and trapped against a fish screen

Entrainment : small organisms pass through the fish screen and actually taken into intake pipes

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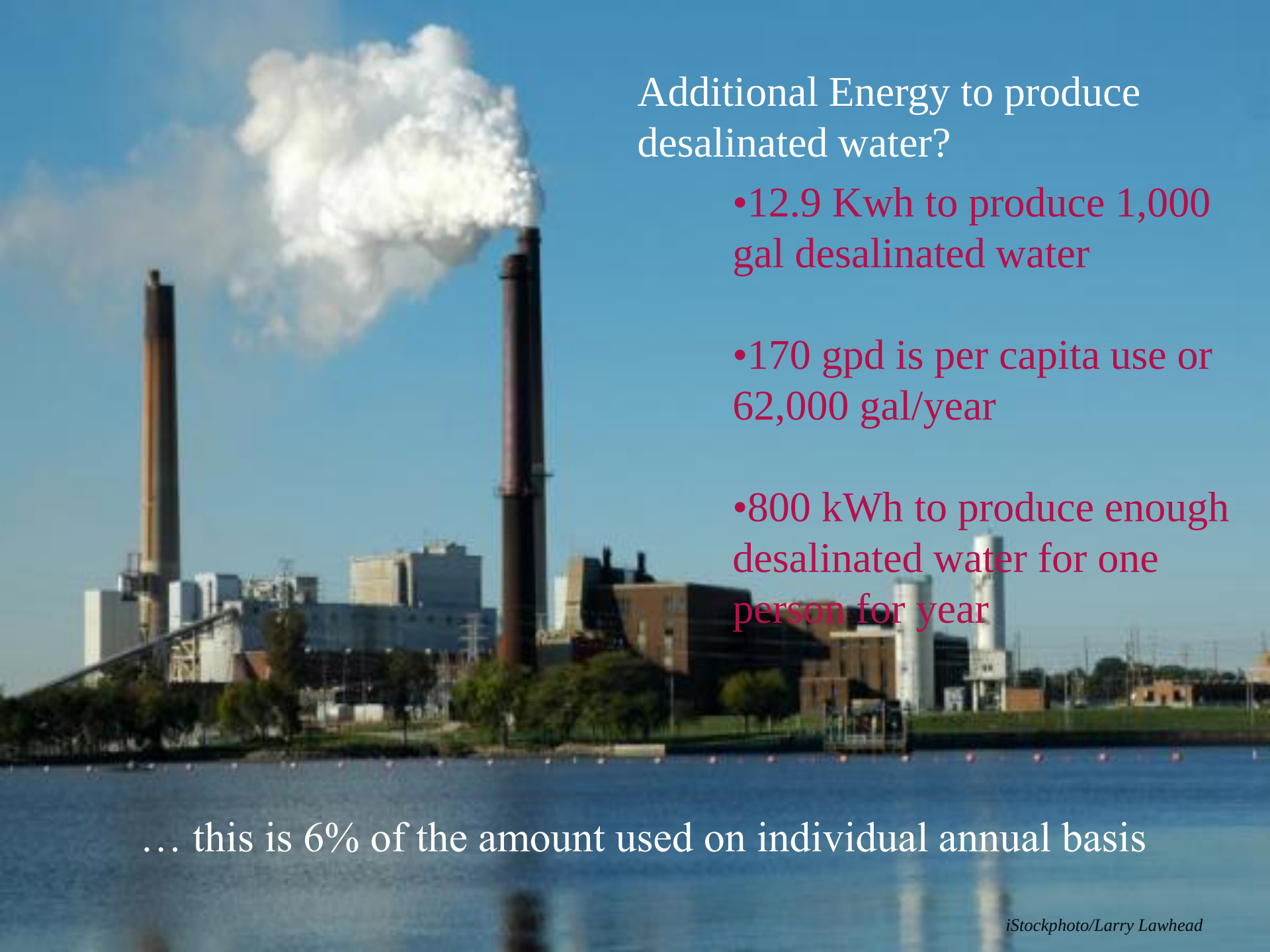
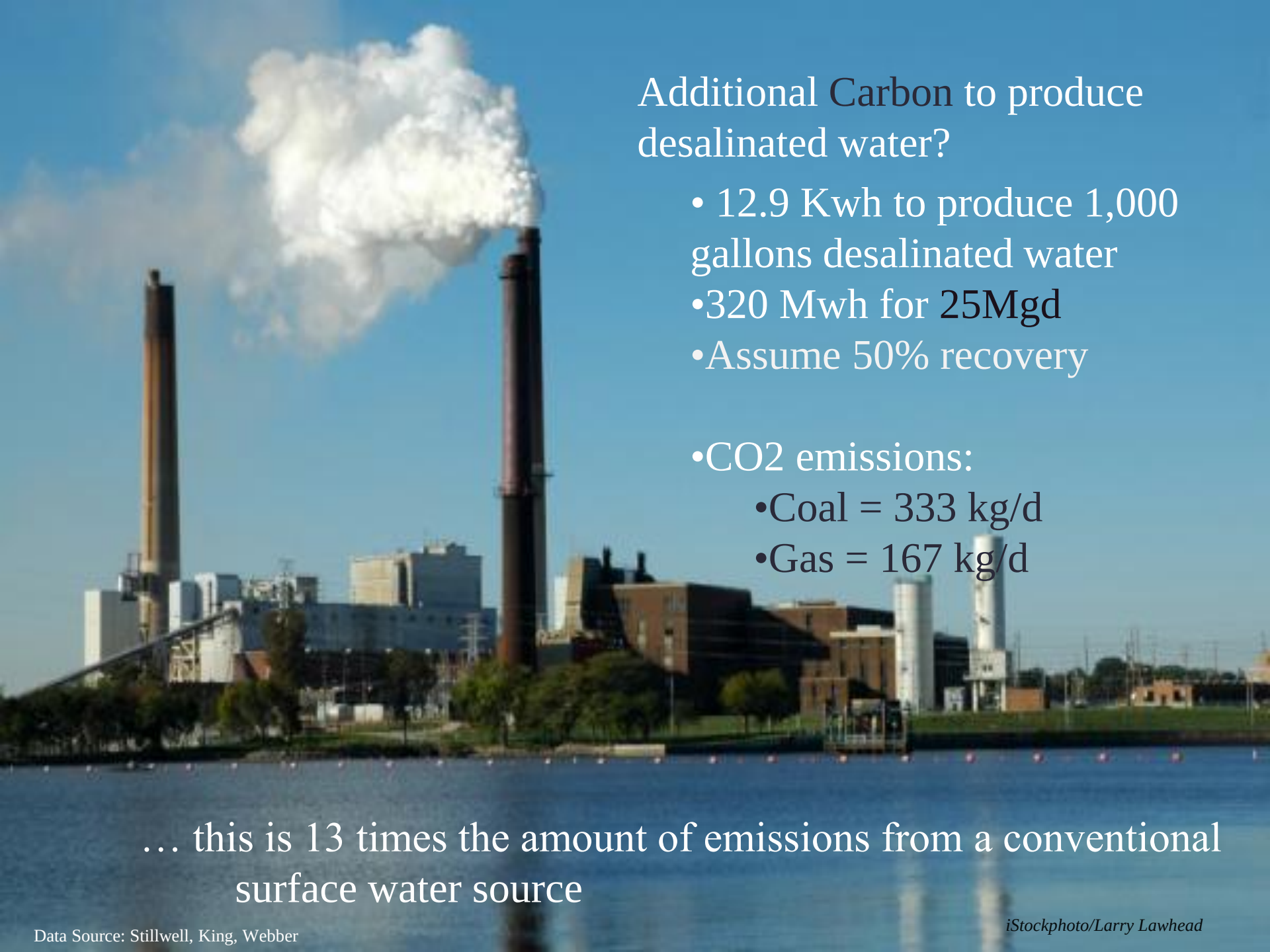


Additional Energy to produce desalinated water?

- 12.9 Kwh to produce 1,000 gal desalinated water
- 170 gpd is per capita use or 62,000 gal/year
- 800 kWh to produce enough desalinated water for one person for year

… this is 6% of the amount used on individual annual basis

iStockphoto/Larry Lawhead



Additional Carbon to produce desalinated water?

- 12.9 Kwh to produce 1,000 gallons desalinated water
- 320 Mwh for 25Mgd
- Assume 50% recovery

- CO_2 emissions:
  - Coal = 333 kg/d
  - Gas = 167 kg/d

… this is 13 times the amount of emissions from a conventional surface water source

Data Source: Stillwell, King, Webber

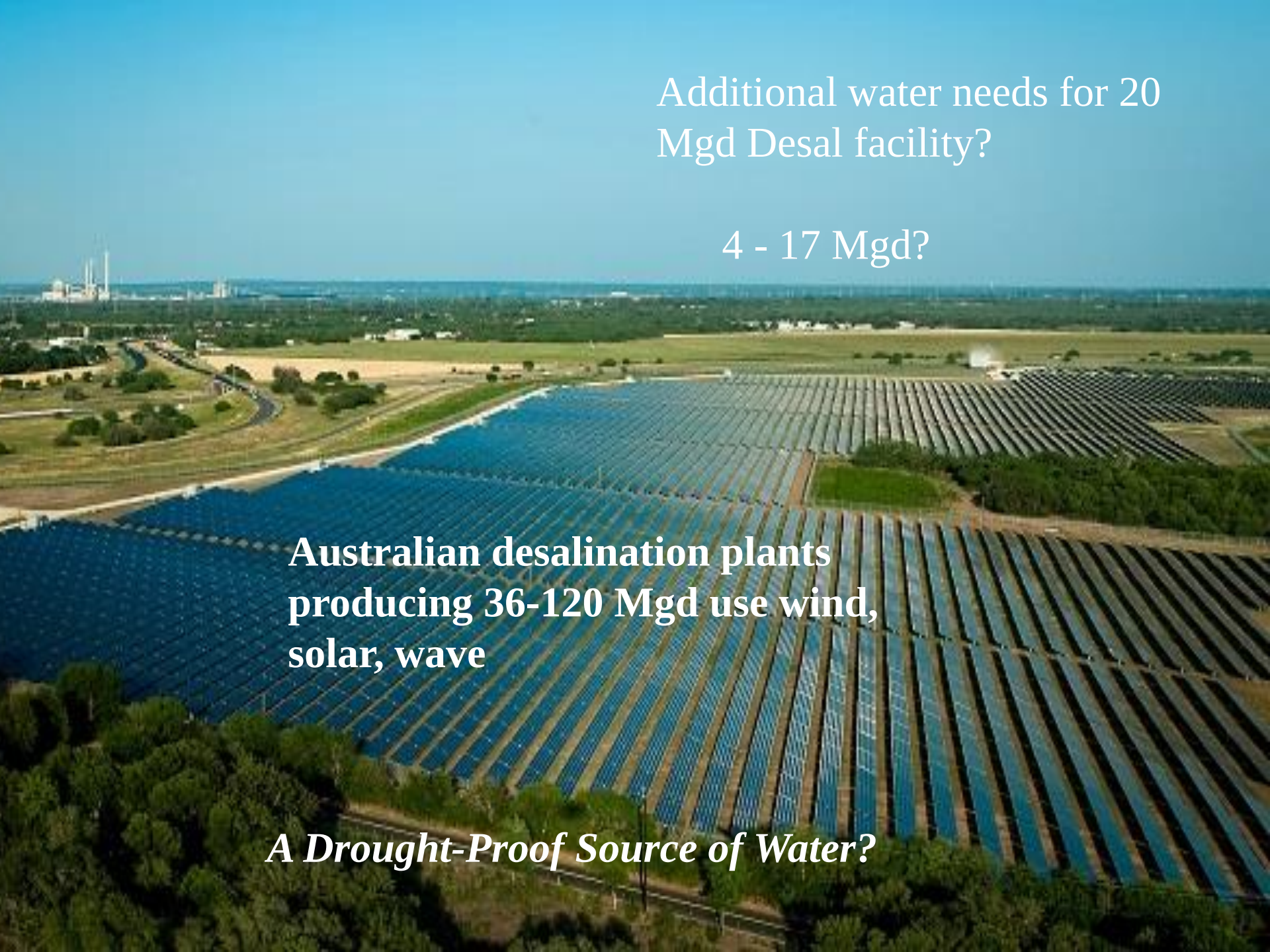
iStockphoto/Larry Lawhead

Additional water needs for 25 Mgd Desal facility?

- 13 mW to produce 1 million gal desalted water
- 15 – 40k gallons for 1 mW
- assume 50% recovery…

… 4 – 17 Mgd additional water withdrawn for power to process 50 Mgd

iStockphoto/Larry Lawhead



Additional water needs for 20 Mgd Desal facility?

4 - 17 Mgd?

Australian desalination plants producing 36-120 Mgd use wind, solar, wave

A Drought-Proof Source of Water?

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Facility and Pipeline Siting

- Sea grass beds
- Bird nesting habitat
- Turtle nesting habitat
- Endangered species and habitat

Costs make water conservation more attractive

Works well with water conservation programs

Works well with renewable energy

Positive impacts of Desalination?

Costs make water conservation more attractive

Works well with water conservation programs

Works well with renewable energy

Positive impacts of Desalination?

Unit Cost ($/ac-ft) Texas Water Supply Options

Source : TWDB
2012 State Water Plan

Costs make water conservation more attractive

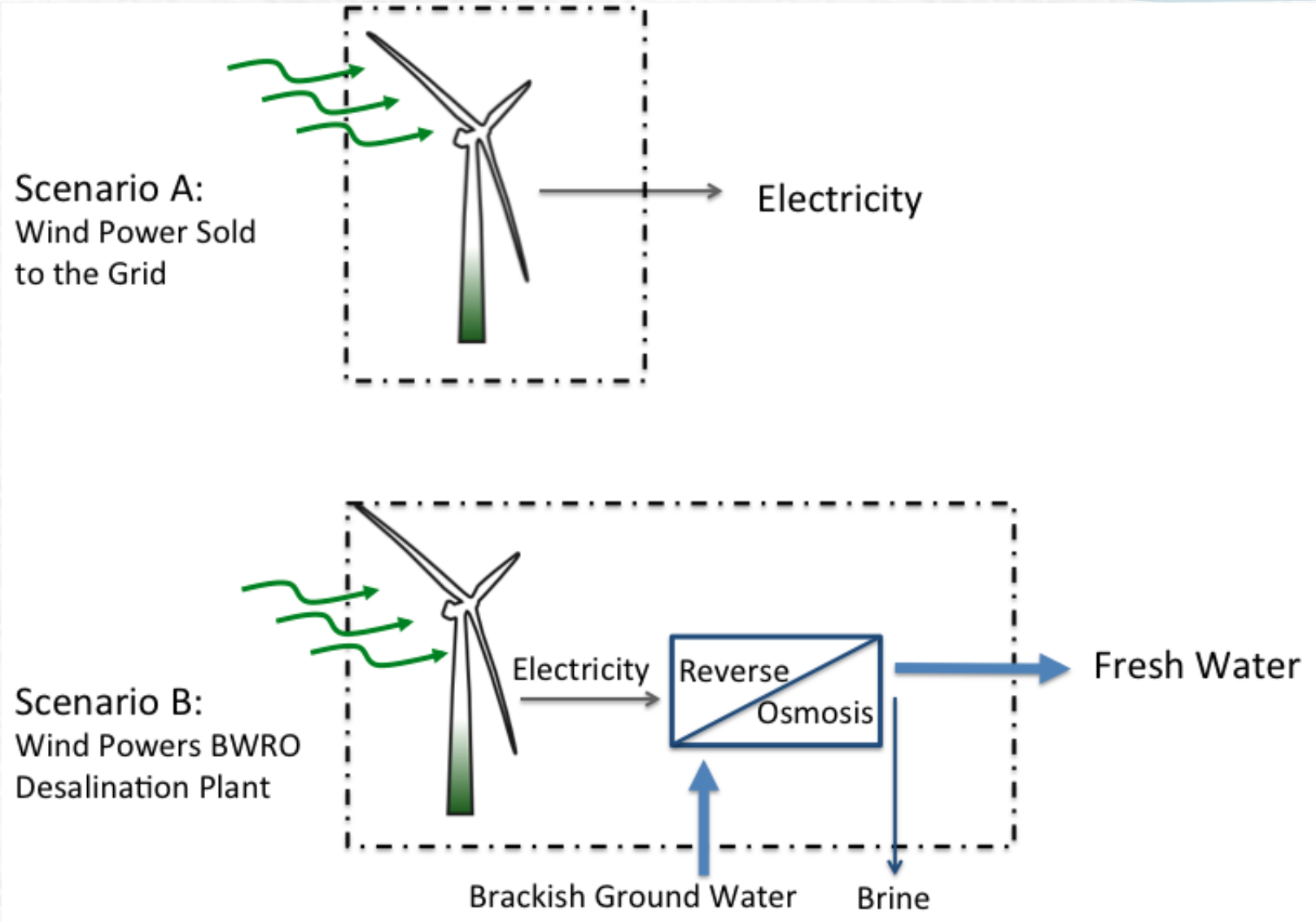
Works well with water conservation programs

Works well with renewable energy

Positive impacts of Desalination?

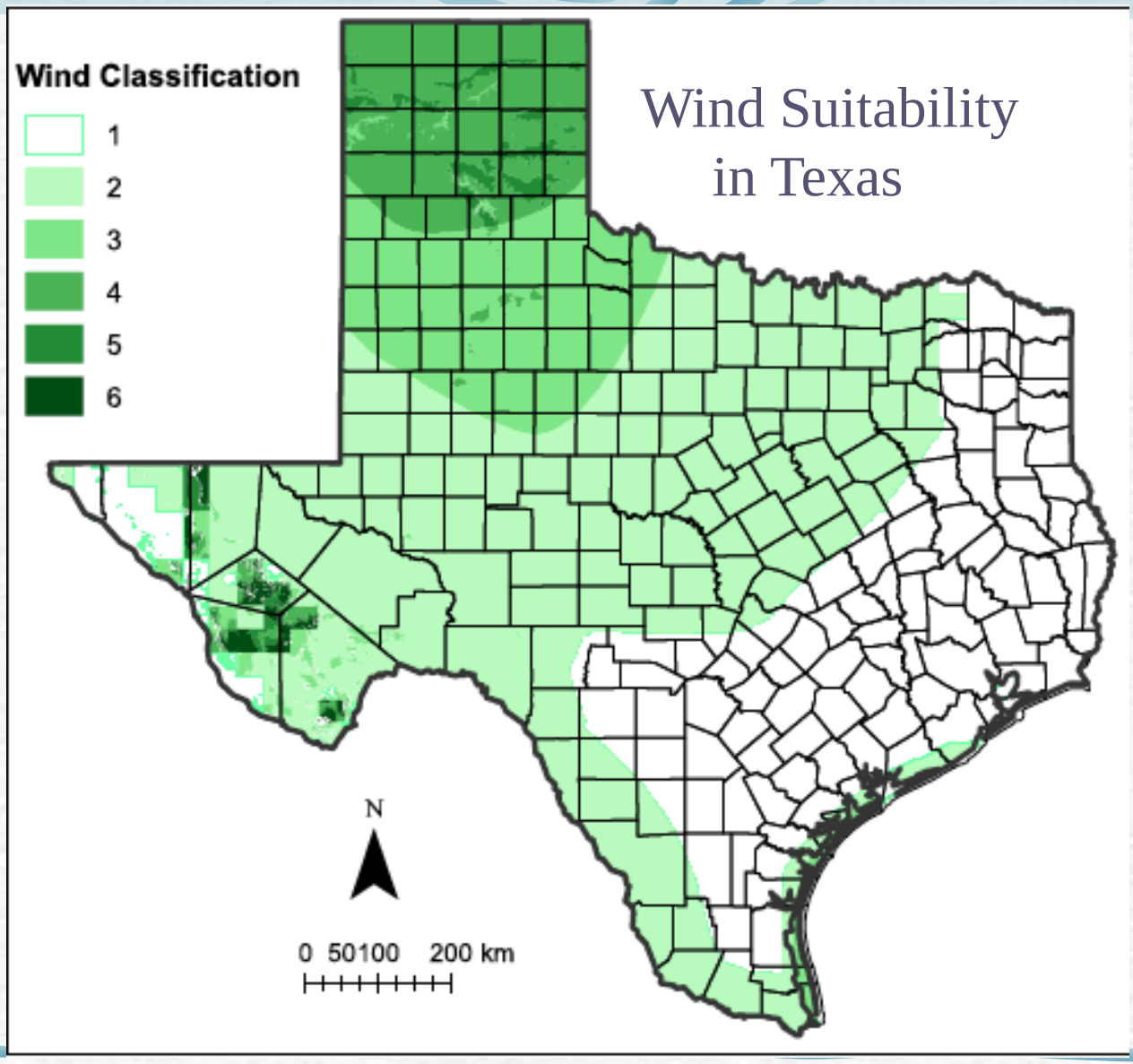

This yard is helping to
CONSERVE OUR
WATER SUPPLY


Costs make water conservation more attractive
Works well with water conservation programs
Works well with renewable energy
Positive impacts of Desalination?



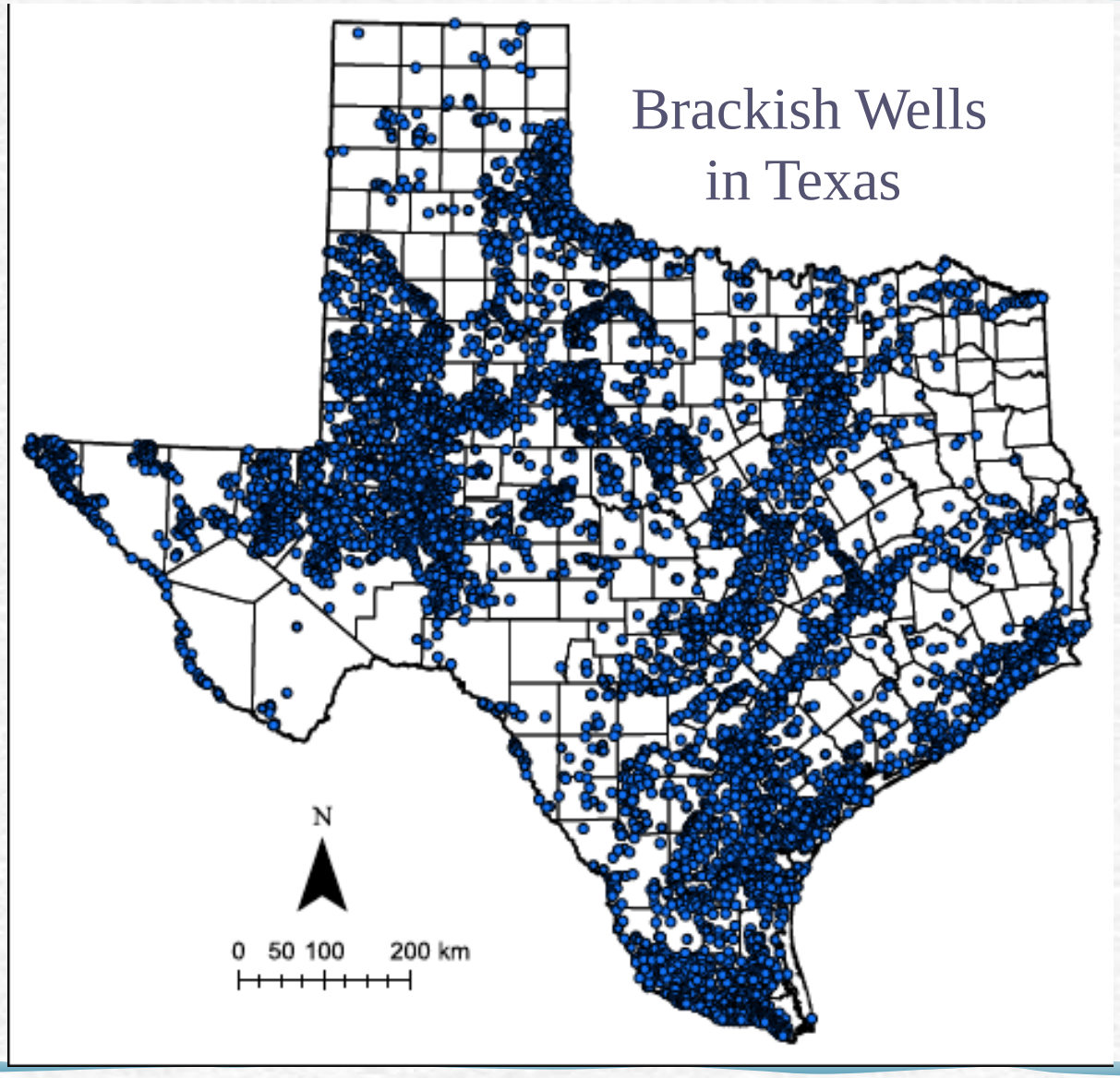
From Clayton, Stillwell, Webber

Wind Suitability in Texas



From Clayton, Stillwell, Webber

Lubbock
Midland
Abilene



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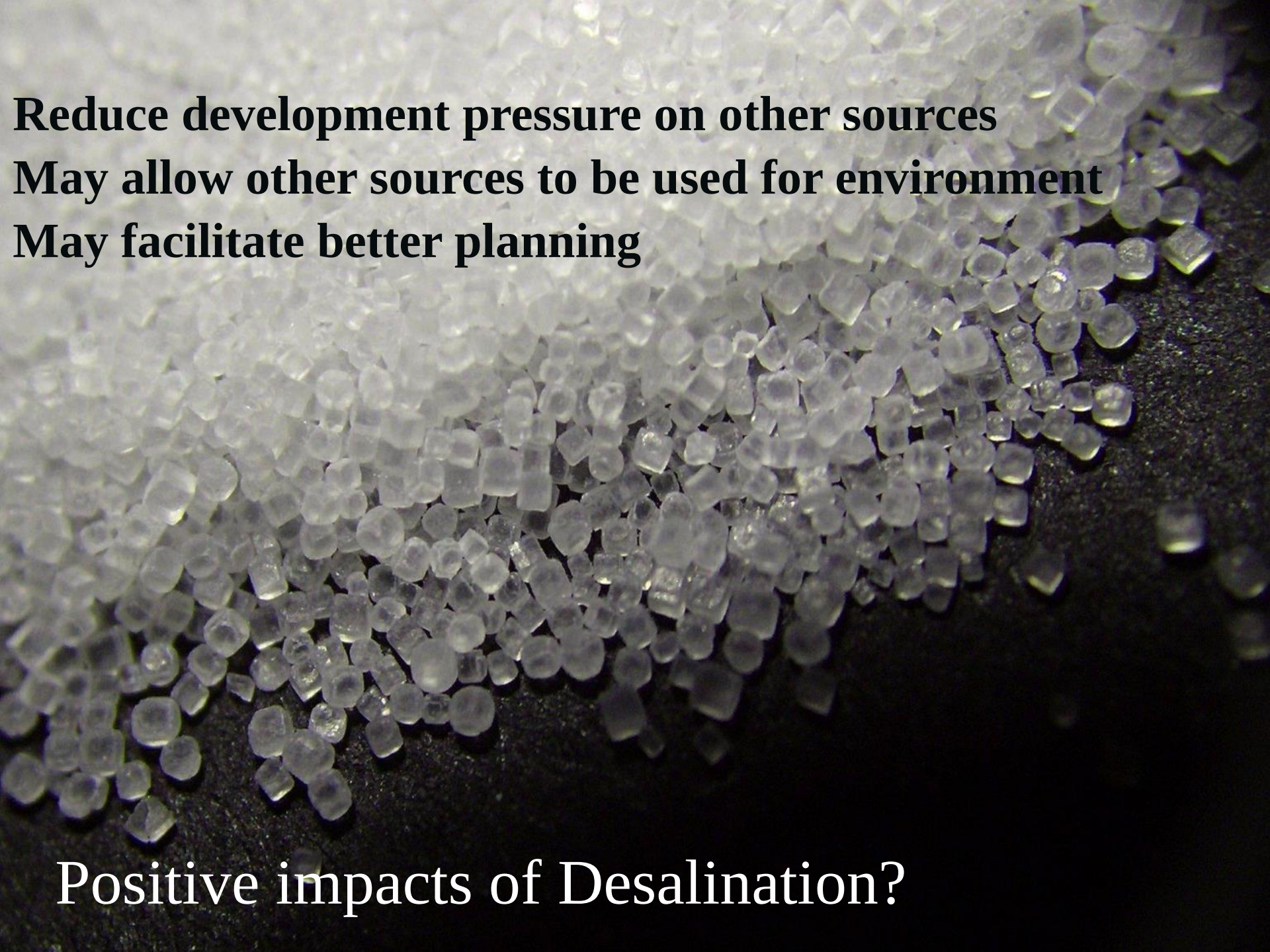


Reduce development pressure on other sources
May allow other sources to be used for environment
May facilitate better planning

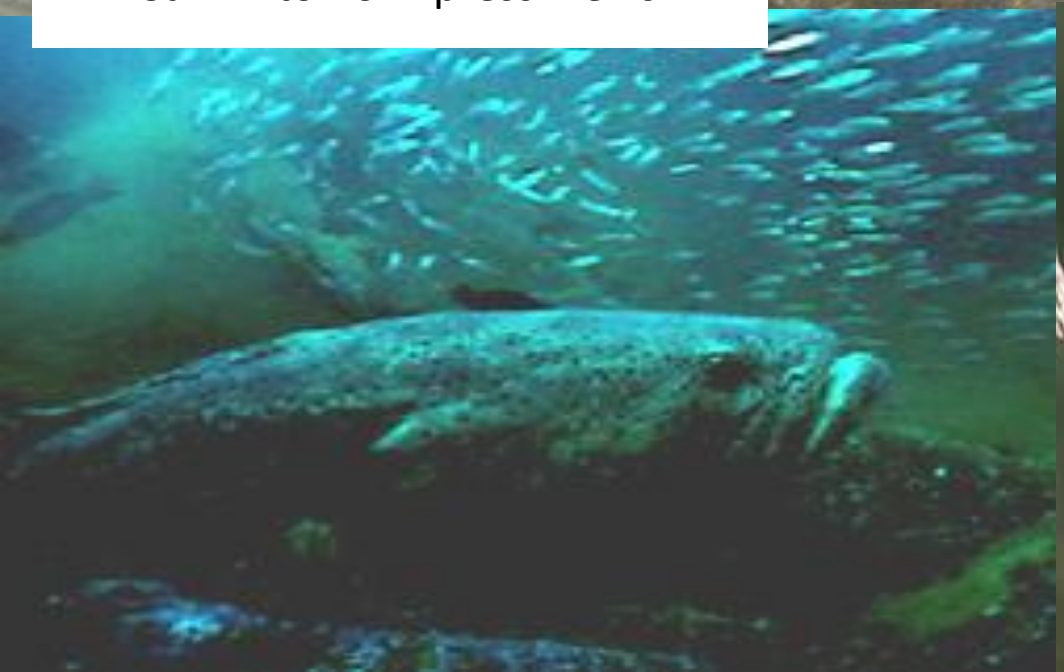
Positive impacts of Desalination?

Unit Cost ($/ac-ft) Texas Water Supply Options

Source : TWDB
2012 State Water Plan

Texas draining life from its bays

San Antonio Express-News



Unit Cost ($/ac-ft) Texas Water Supply Options

Source : TWDB
2012 State Water Plan

Edwards Aquifer plan will reconcile endangered species protection with stakeholder needs

January 4, 2012

SAN ANTONIO — The Edwards Aquifer Recovery Implementation Program has overcome the final hurdle in resolving a long-standing struggle to balance the protection of endangered species with water use in the Edwards Aquifer, according to the program's coordinator.

Source : TWDB
2012 State Water Plan

Unit Cost ($/c-ft) w/ and w/out MAG Limits

	Envisioned Project	MAG-Limited Project
Capital Costs	$271,008,000	$198,451,000
Project Costs	$415,405,000	$309,723,000
Annual Costs	$59,381,000	$42,050,000
Yield (acft/yr)	35,690	21,833
Unit Costs ($/acft)	$1,664	$1,926

DRAFT (8-7-14)

Source : TWDB
2012 State Water Plan

Meanwhile back in Australia…

The Sierra Club's Perspective…

With proper planning, siting, attention to all energy and environmental factors…Desal plants could be a significant part of a comprehensive water supply program ***that includes*** *advanced water conservation and drought management measures.*

Tyson Broad

Lone Star Chapter Sierra Club

Photo: Jennifer Ellis, National Wildlife Federation