

Wettability alteration for improved oil recovery

Geoffrey Thyne
ESal, LLC

Current Oil Market

Drilling Paradigm

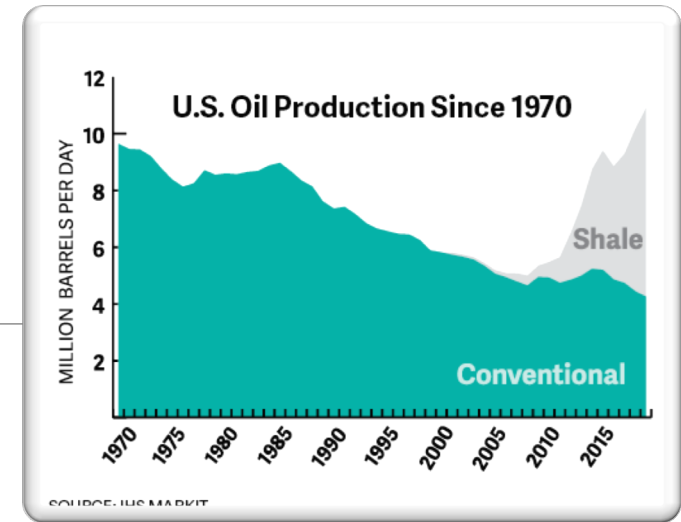
Conventional fields production is declining

Few new discoveries

Industry heavily focused on drilling in prolific shale plays

- Majority of drilling is in “sweet spots” that account for ~ 12% of acreage
- Most “sweet spots” will be fully utilized in mid 2020’s

“We know exactly where it is, we have wells drilled to it, and we know how to get the next 20 percent. Cost is the big issue.” —Russell Ostermann, Director of Petroleum, The University of Kansas.



CHALLENGES

- CONVENTIONAL:
 - DECLINING WITH AGE
 - FEW NEW DISCOVERIES
- SHALE:
 - LOWER YIELD: 5-8% OOIP
 - HIGHER DECLINE RATES: 10-15%
 - HIGH WATER PRODUCTION: UP TO 2:1
 - HIGH CAPITAL EXPENDITURE

A simple example

Which water would you use?



Would you rather

Water Source



Oil Production



Which water would you use?

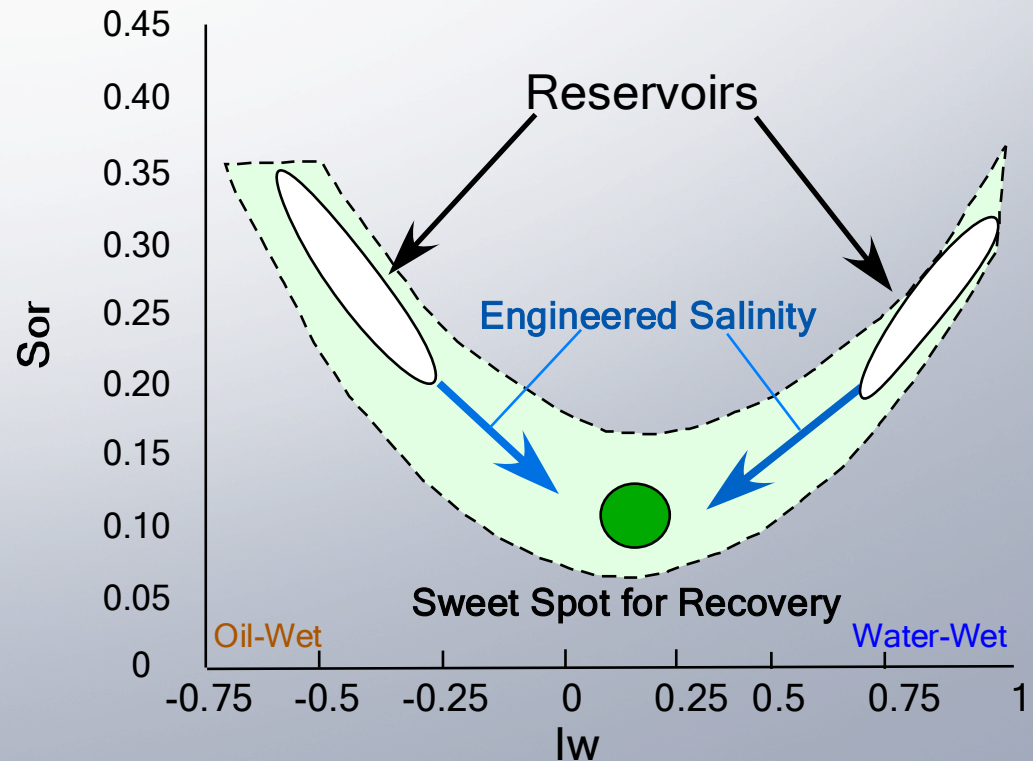
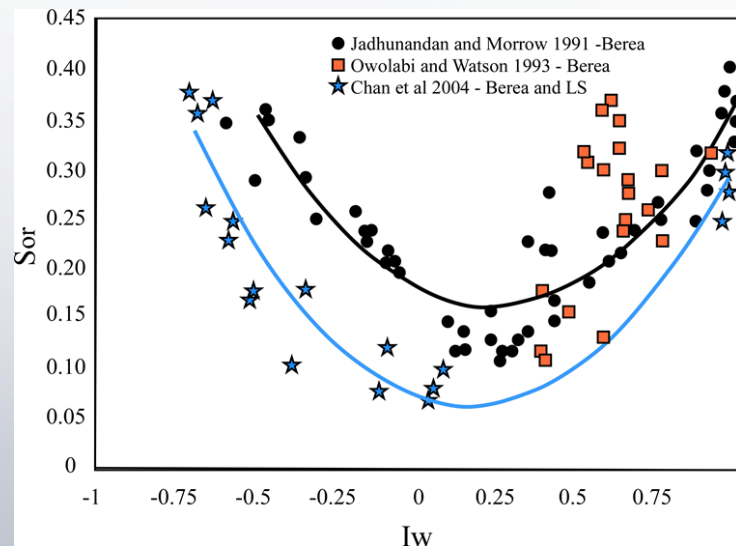


The solution is wettability through salinity

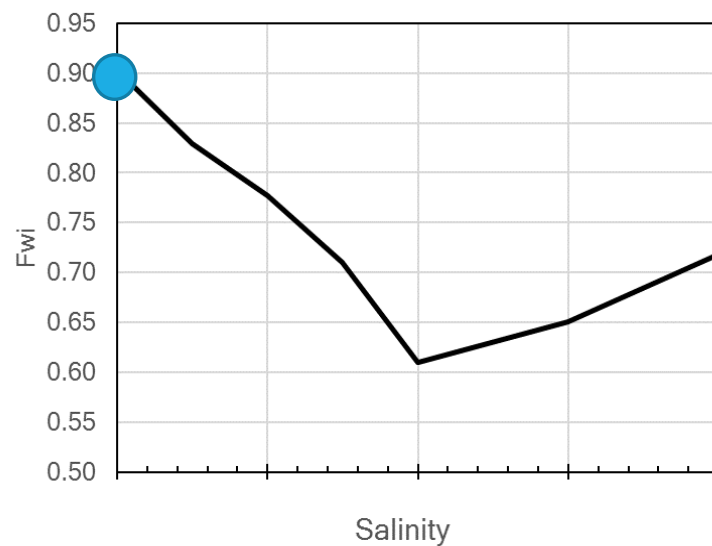
Reservoir wettability is the adhesion of oil to rock

The best oil recovery is at neutral wettability

Changing salinity will alter wettability in many reservoirs



Case 1

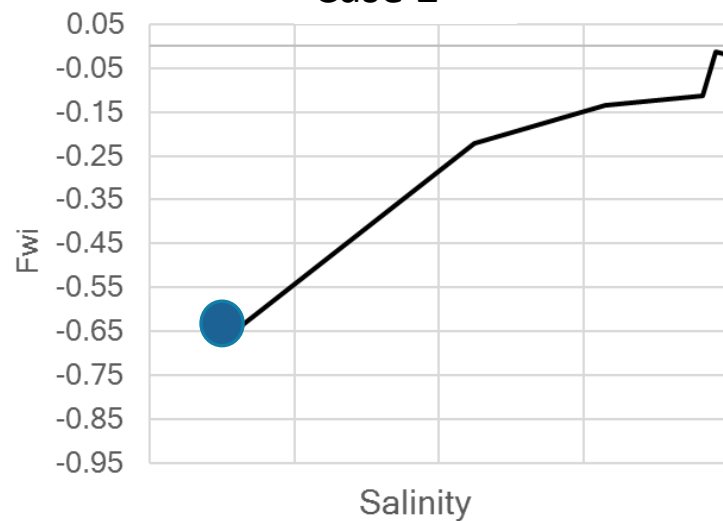


Water-Wet

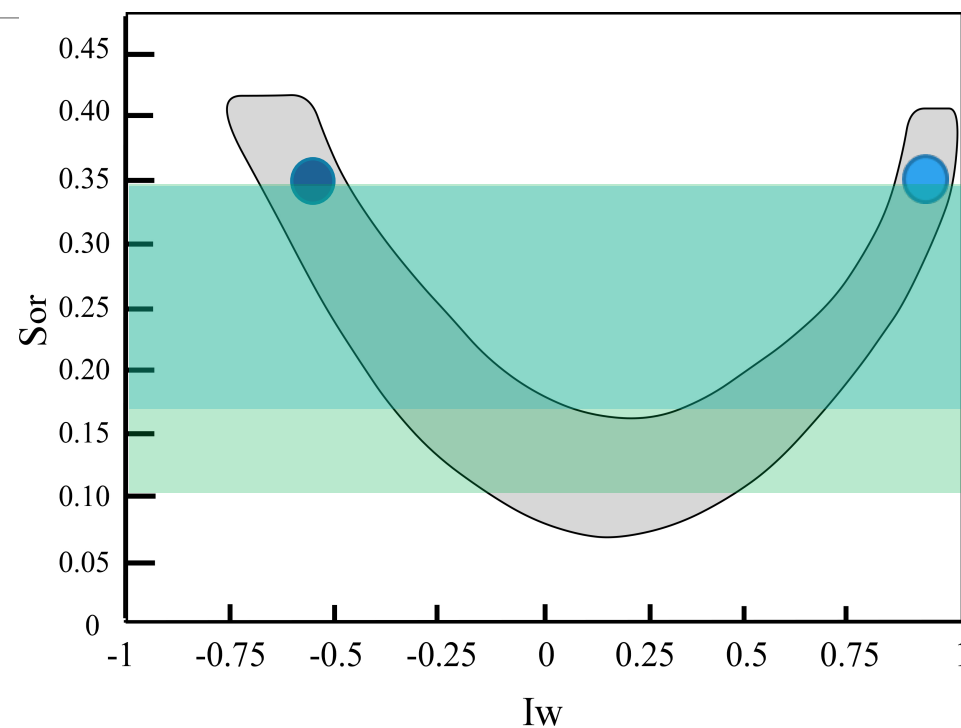
Change in S_{or} : .18 units

Estimated increased production: up to 8% OOIP

Case 2



Oil-Wet

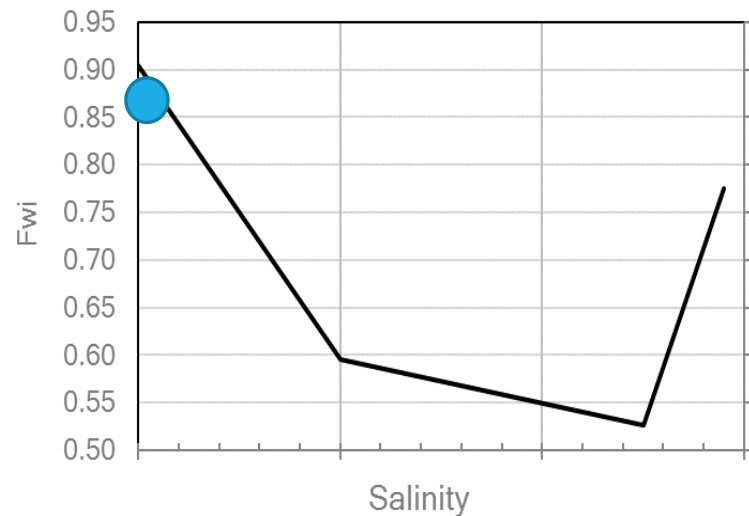


Change in S_{or} = .25

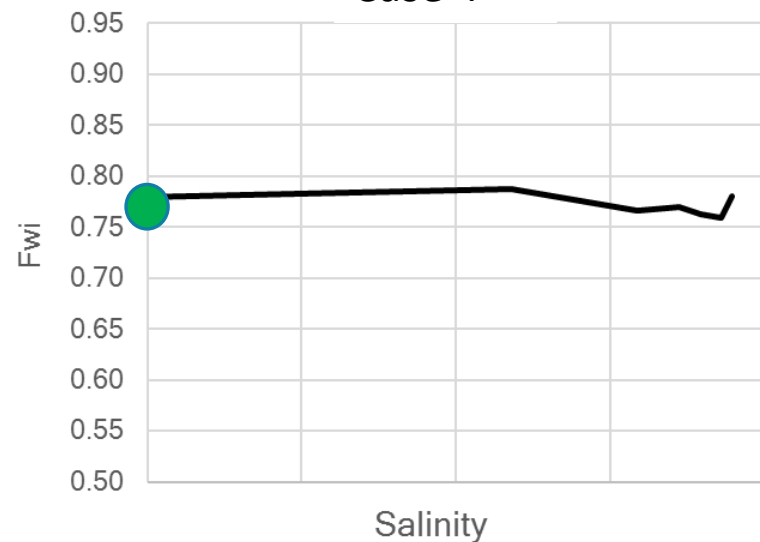
Estimated increased production: up to 12% OOIP

Increased production is dependent on heterogeneity, well spacing, porosity, original saturation, temp and pressure.

Case 3

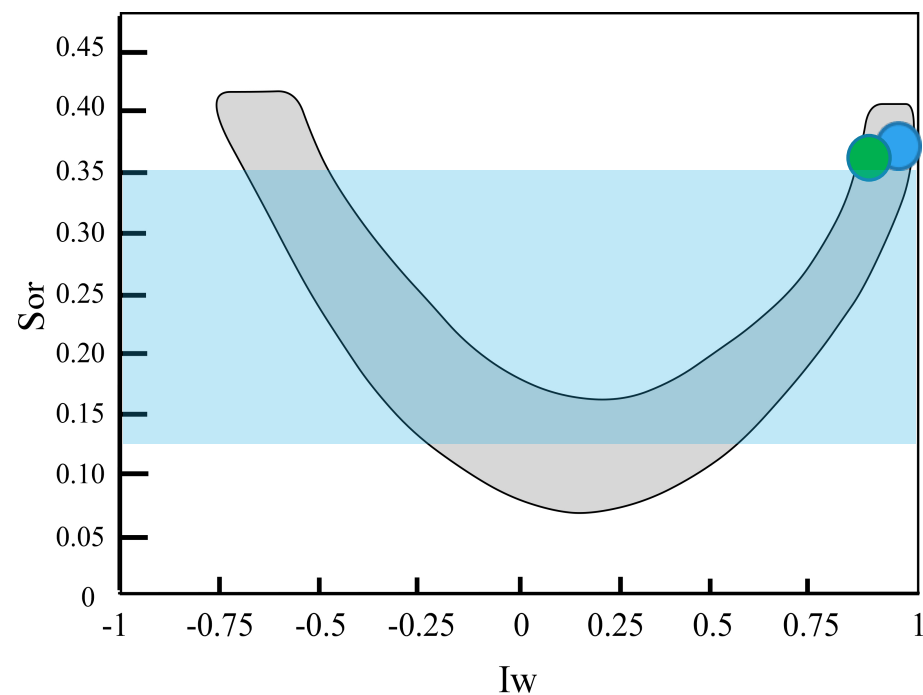


Case 4



Change in S_{or} = .22

Estimated increased production: up to 10% OOIP



Change in S_{or} = 0

Estimated increased production: 0% OOIP

Increased production is dependent on heterogeneity, well spacing, porosity, original saturation, temp and pressure.

What ESaI™ can do for you

Improve oil recovery:

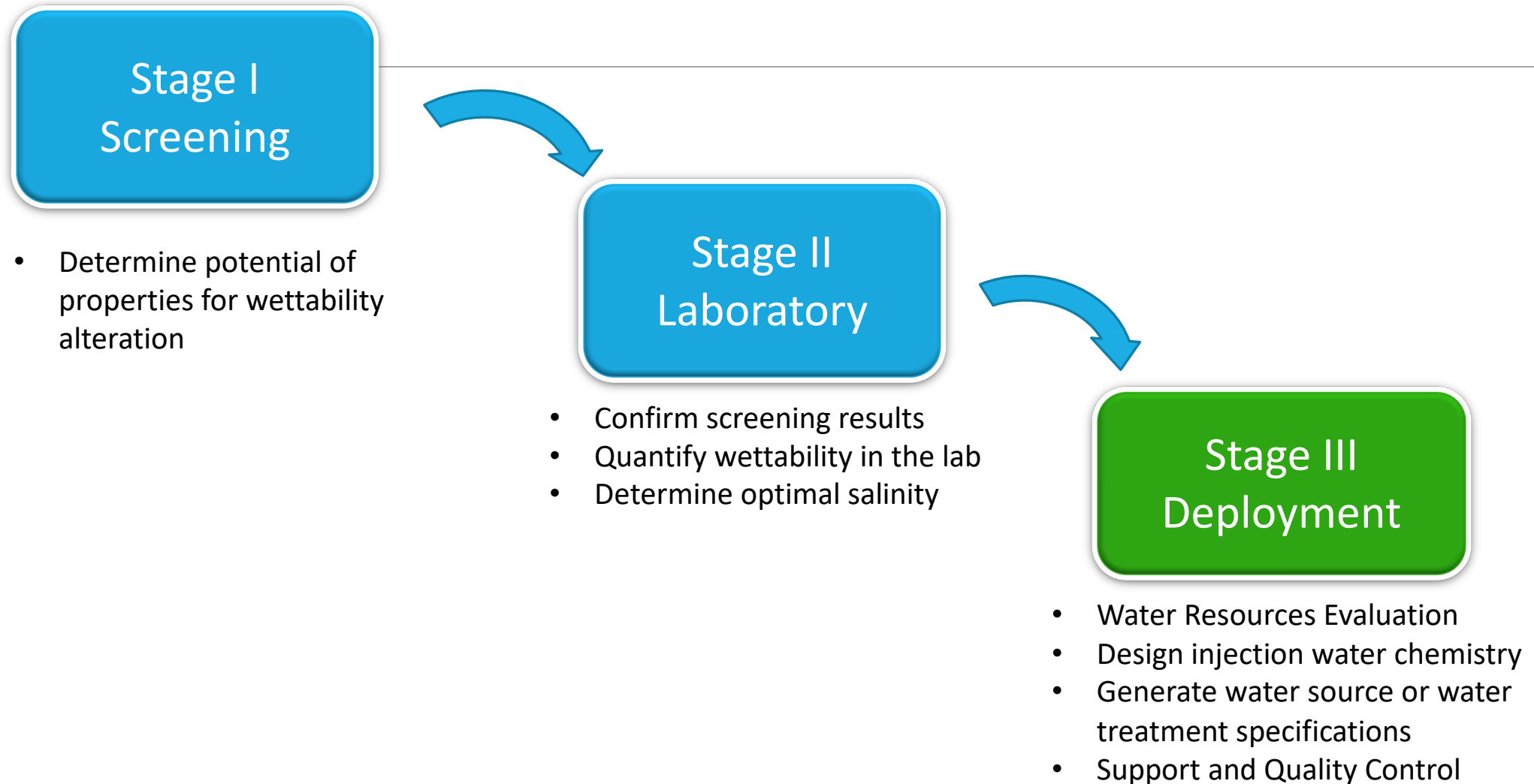
2-4% OOIP shale

5-15% OOIP
conventional

Lower water
production

Low CAPEX
Reduce Payback Period

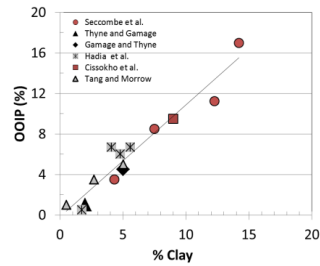
ESal™ Technical Work Flow



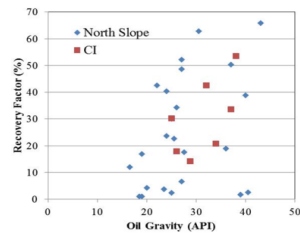
Analytical Screening Tool

Water, oil, rock and field parameters = score.

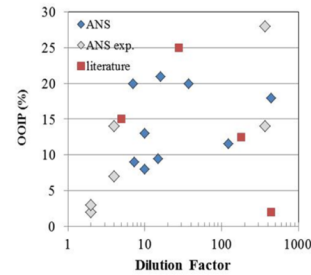
Excellent	92-100
Good	78-91
Average	60-77
Marginal	50-59
Not recommended	<50



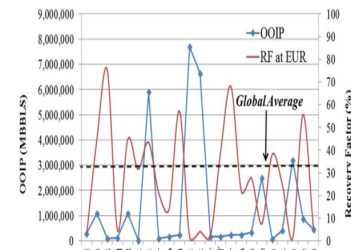
Rock



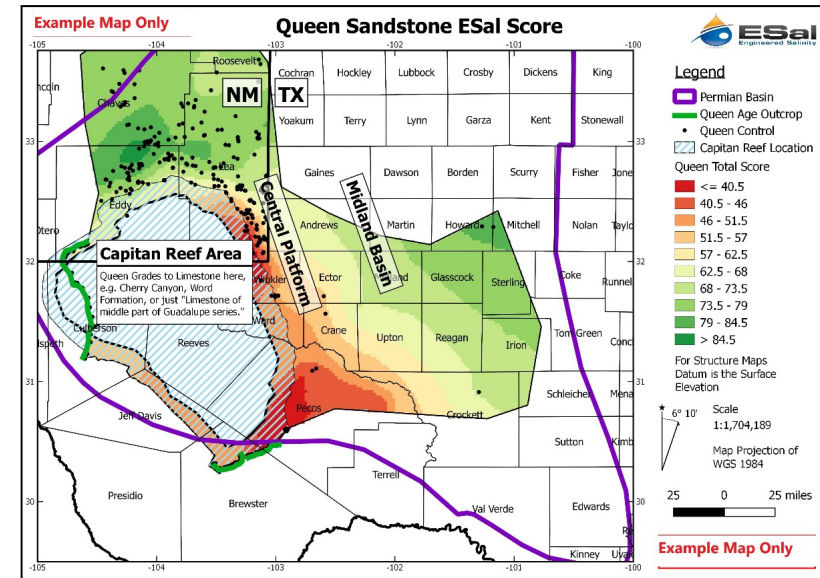
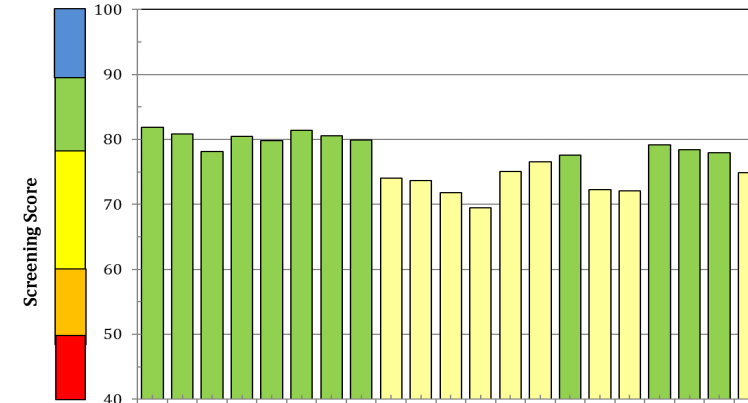
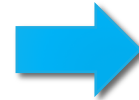
Oil



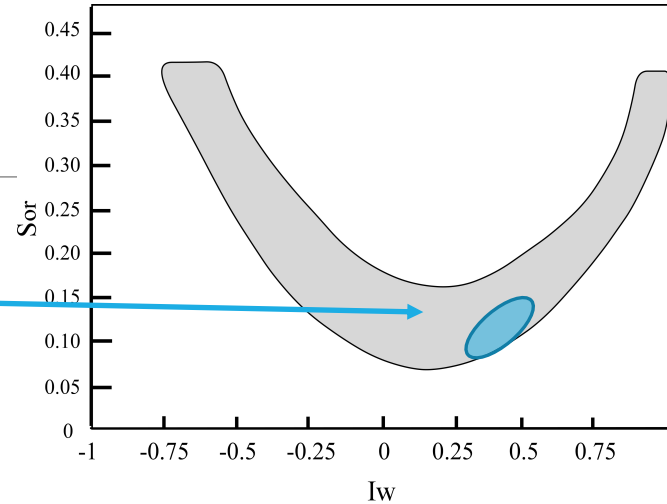
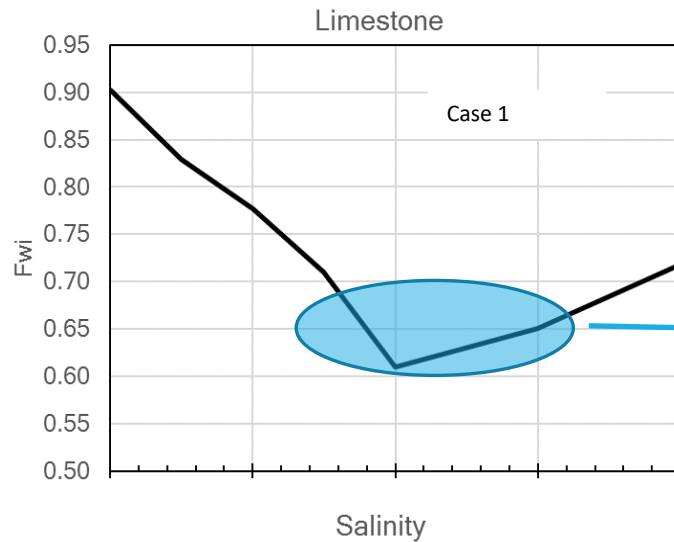
Water



Field

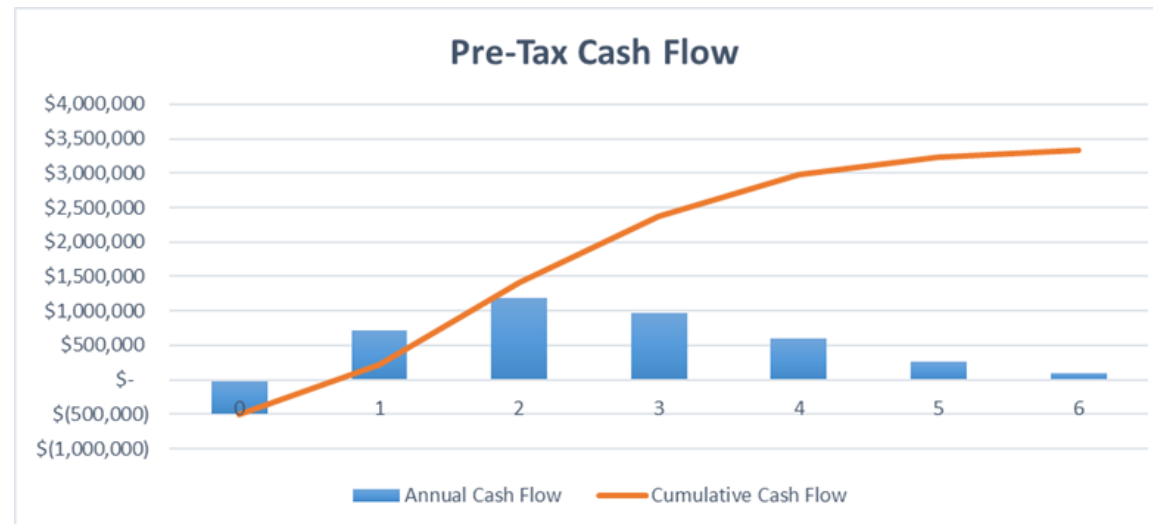


Financial evaluations



Our laboratory processes tell you exactly the right water solution for your individual reservoir

We give you various options to match your cost constraints and logistics for your maximum benefit

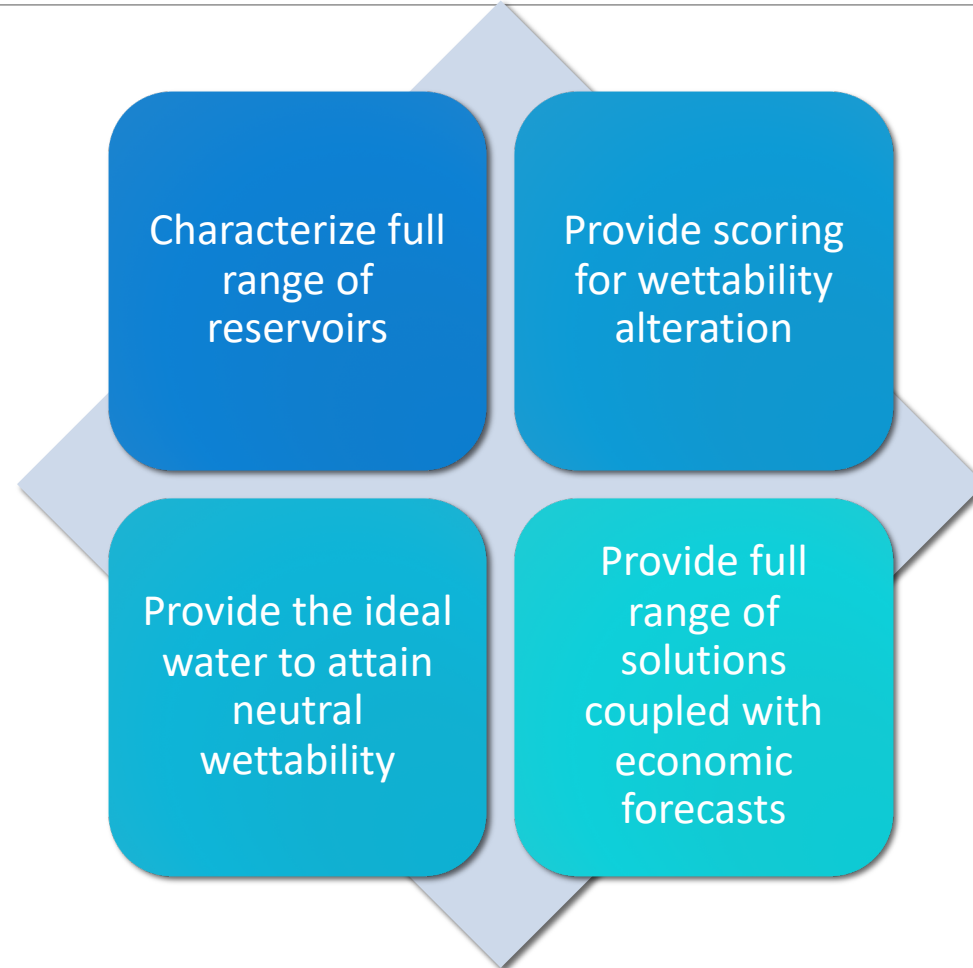


About our company

- **FAMILY OWNED AND OPERATED**
- **REVENUE > \$1 MILLION IN 2019**
 - **CONSISTENT 200%+ GROWTH OVER LAST 3 YEARS**
- **ZERO DEBT**
- **ALL WORK PROCESSES PATENTED OR PROTECTED**

Currently developing full-service software solution

The future of
engineered
salinity



What we
want to
continue
growth



Additional partners to
continue technology
validation



Capital partners to
increase market size and
adoption

A solid blue horizontal bar at the bottom of the slide.