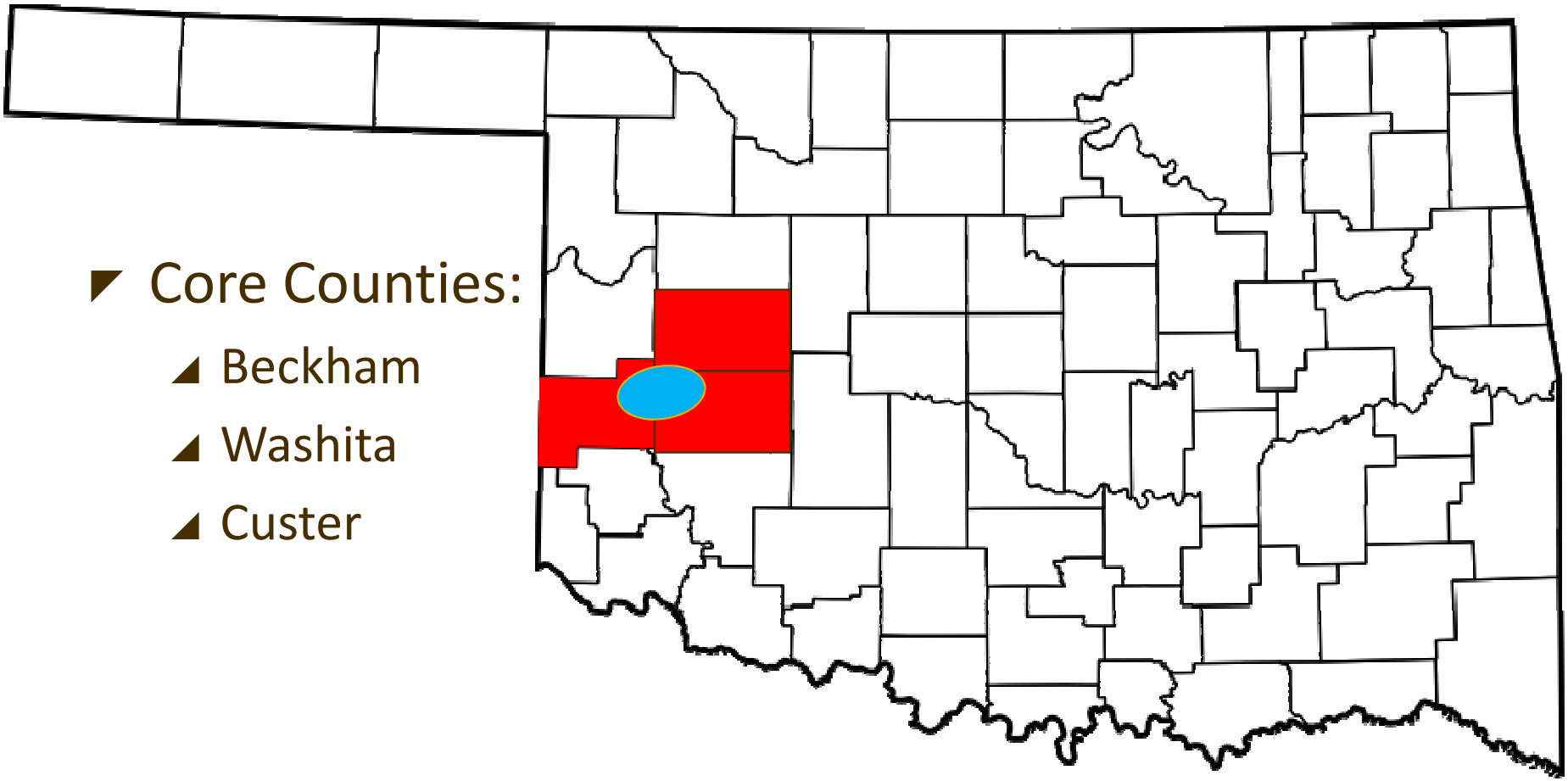
HOGSHOOTER WASH

2012 AADE MID-CONTINENT TECHNICAL SYMPOSIUM

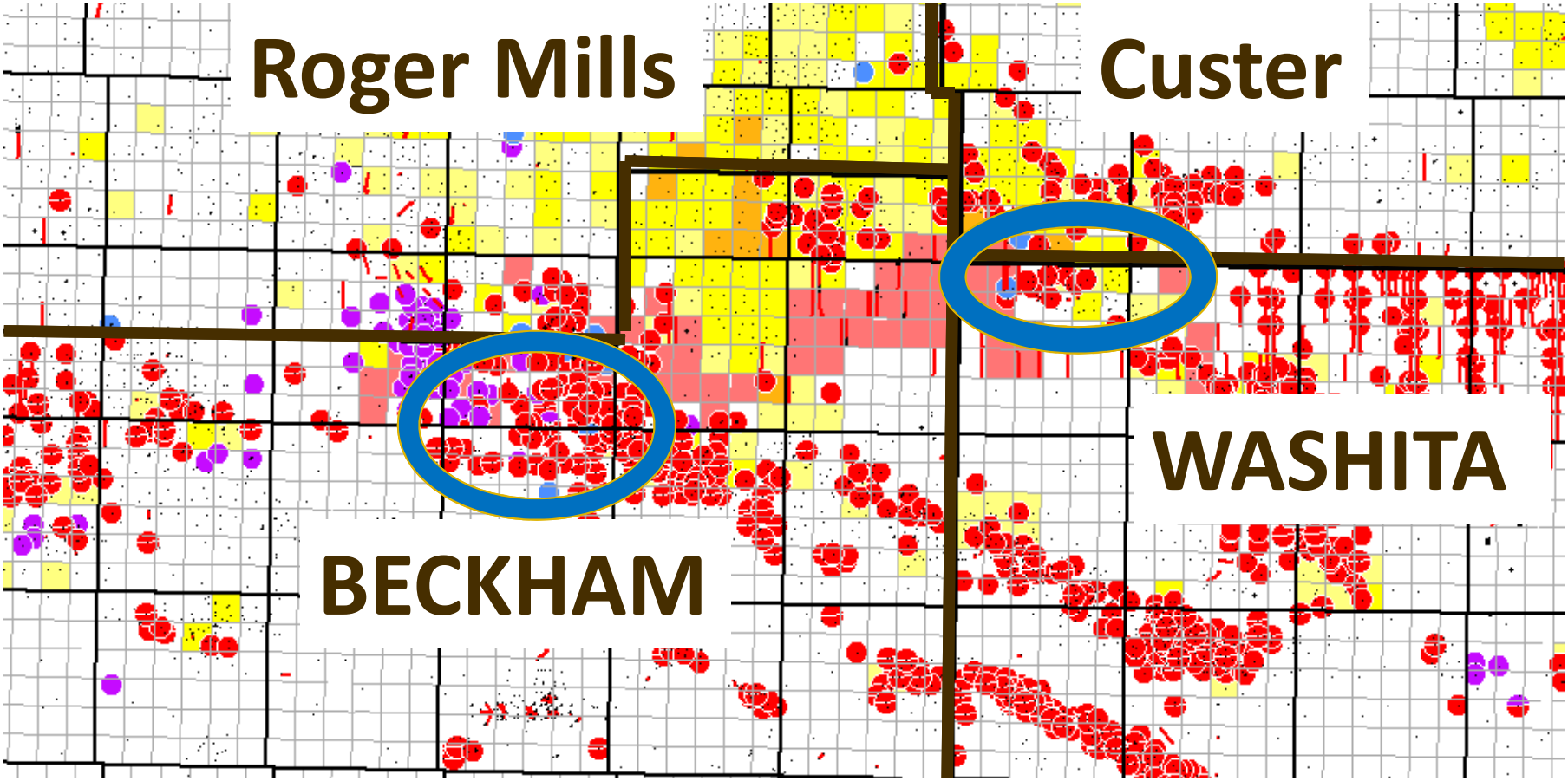
CHRIS JAMERSON

REGION

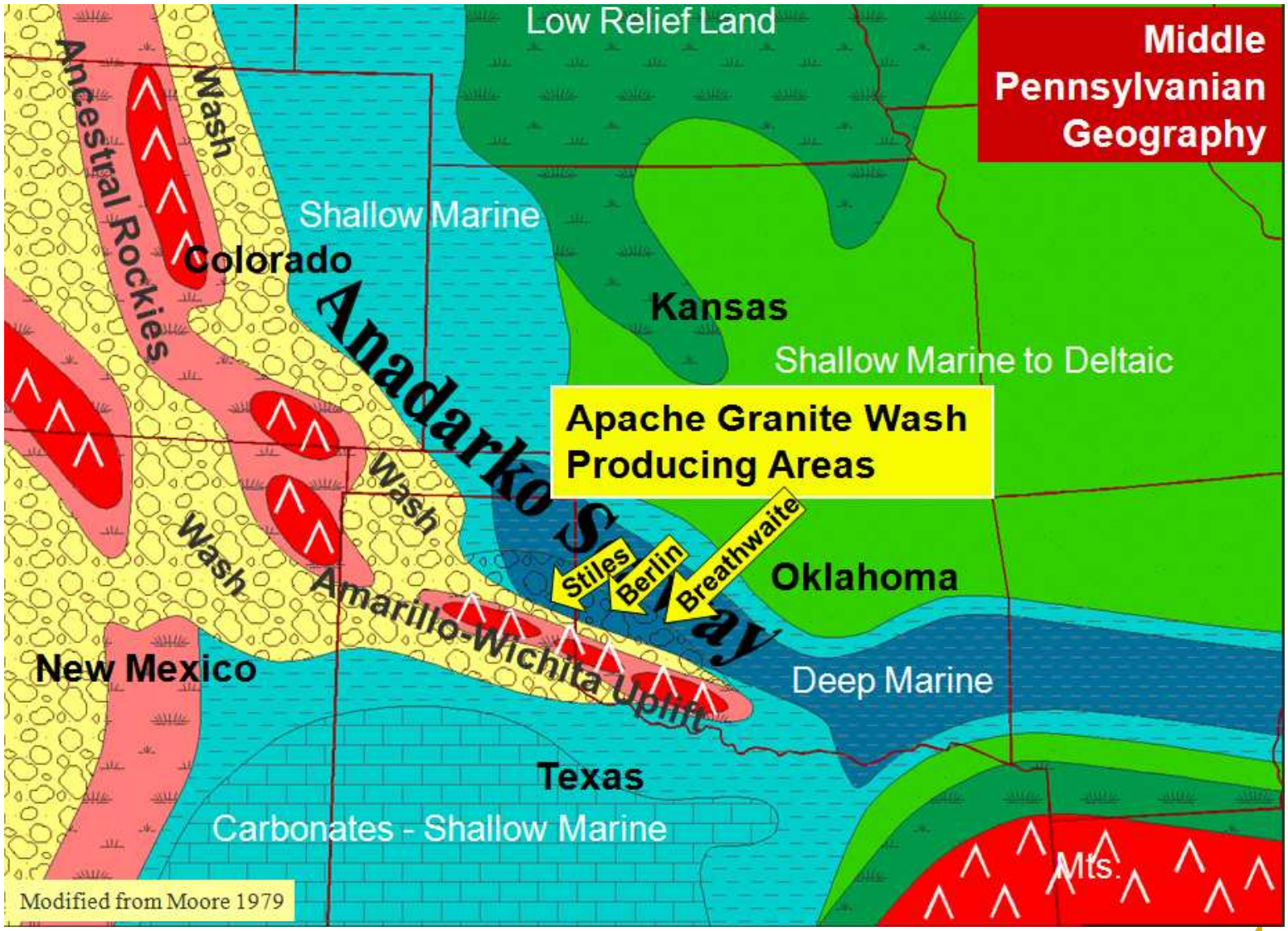
- Core Counties:
  - Beckham
  - Washita
  - Custer



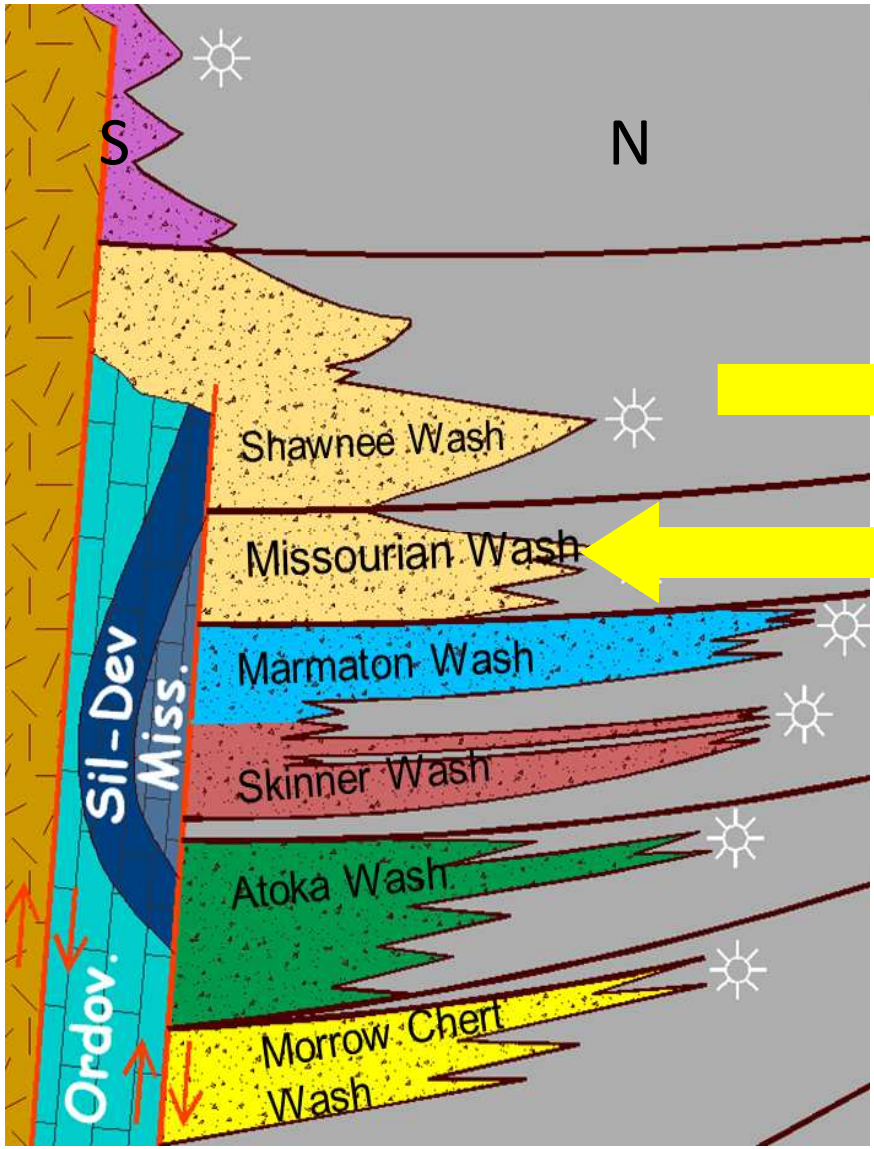
REGION CLOSE-UP

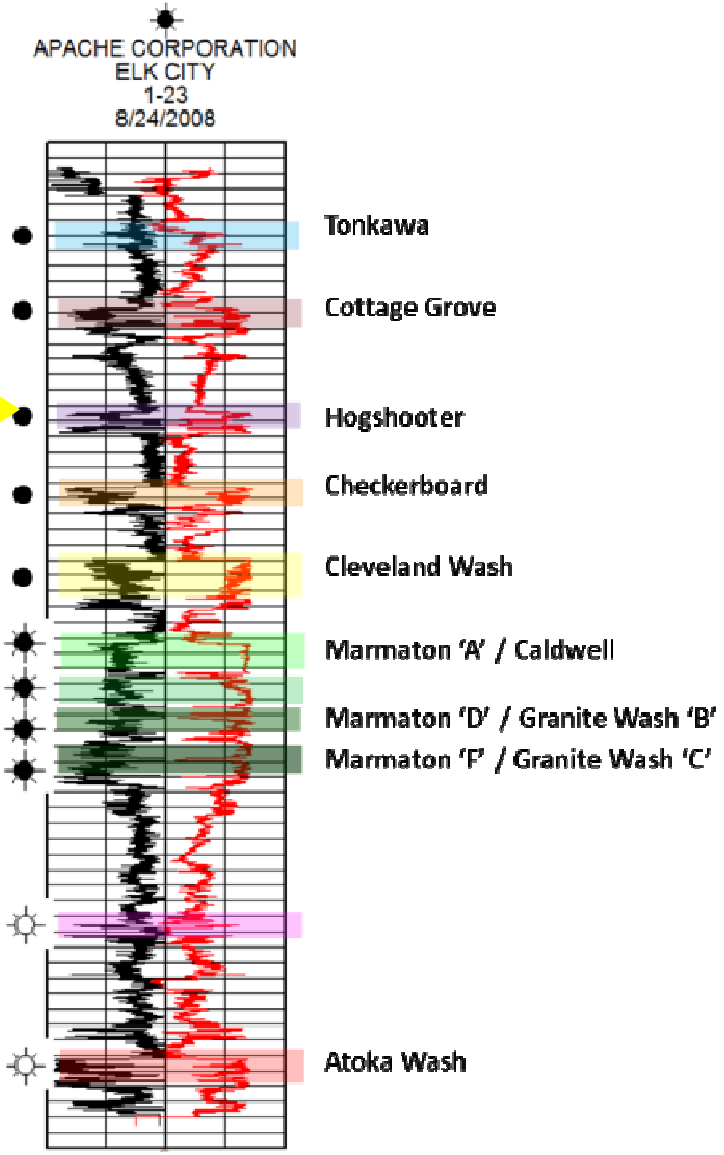


REGIONAL GEOLOGIC SETTING



REGIONAL GEOLOGIC SETTING





PLAY TIME LINE

- Hogshooter is Nuisance Zone for Deep Wells
- Q2 2010 Apache Spuds First Two Wells
  - Each have IP of 2,000 bbl & +3,000 MMCF/Day
- Frenzied Offsetting in Late 2010 & Early 2011
- 2011 Continued Mapping and Development Drilling
- 2012 ?

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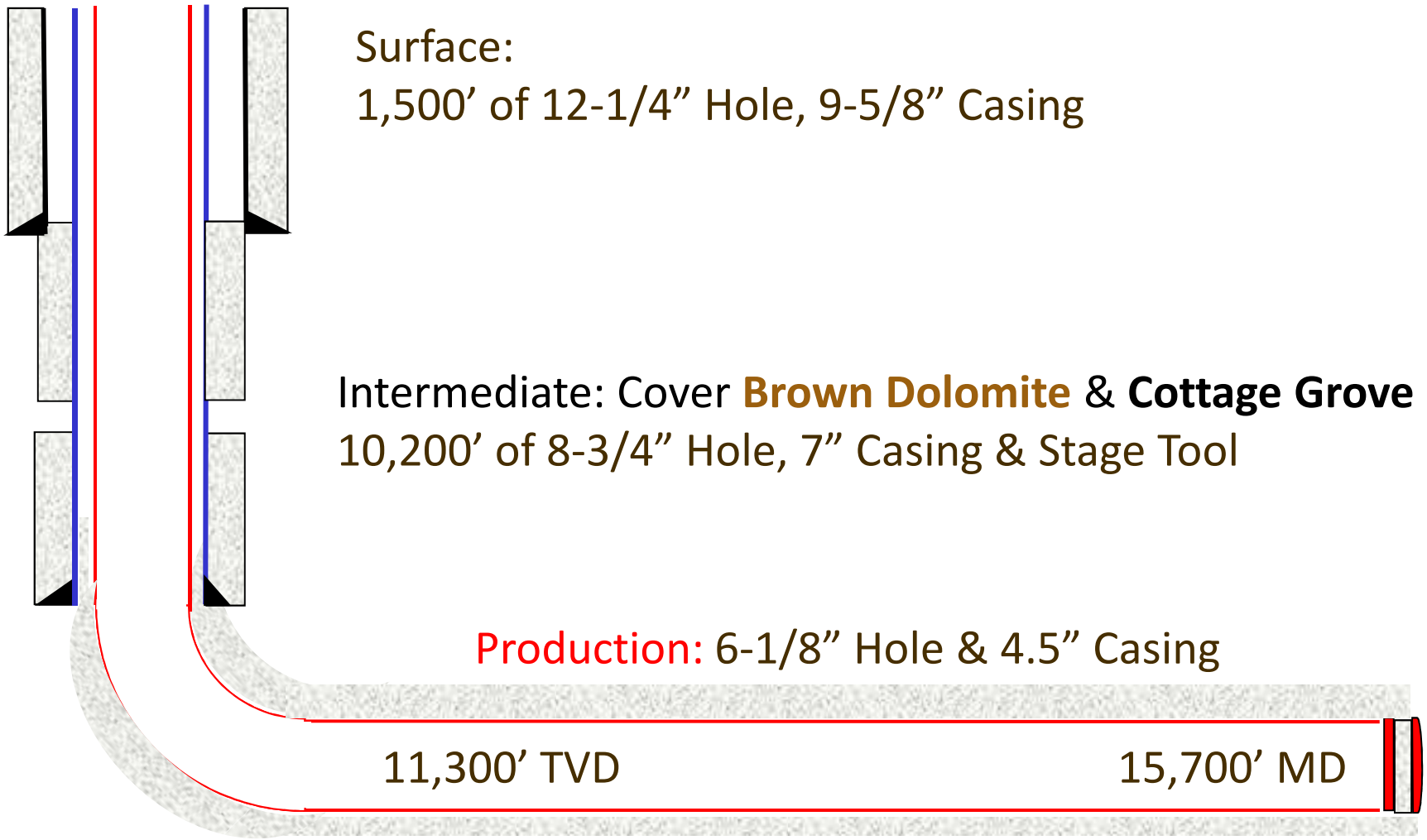
WELL PLAN

- 4 wells per section; N-S orientation.
- Ensure Legal Entry Point
  - 330’ from North or South Line
  - 500’ from East or West Line
- 10 DLS Curve
- Steer Lateral as needed by Geology
  - Targets every 500’ with a ±10’ window

ORIGINAL CASING DESIGN



Surface:
1,500’ of 12-1/4” Hole, 9-5/8” Casing

Intermediate: Cover **Brown Dolomite** & **Cottage Grove**
10,200’ of 8-3/4” Hole, 7” Casing & Stage Tool

Production: 6-1/8” Hole & 4.5” Casing

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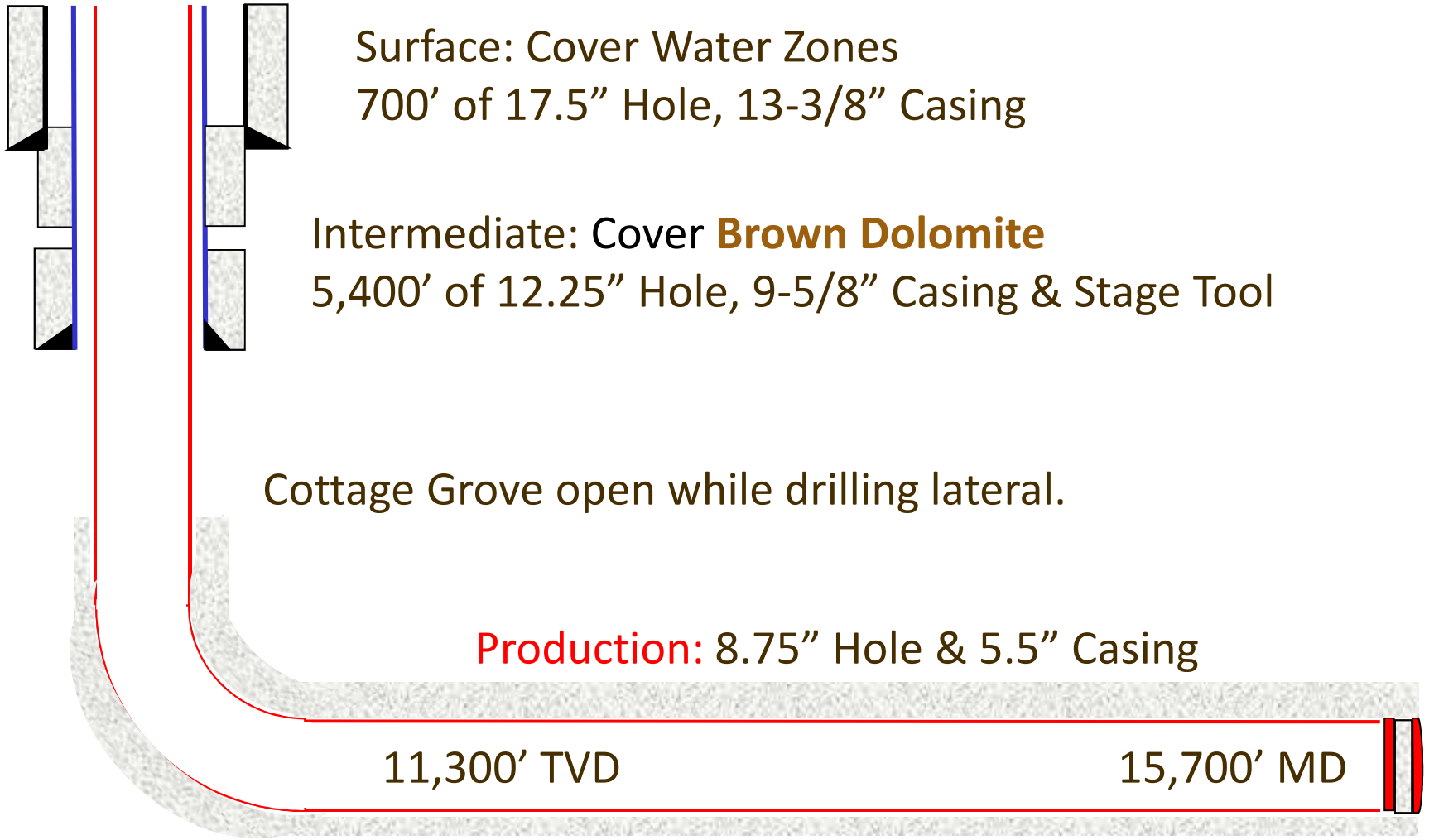
DRILL-THRU CASING DESIGN



Surface: Cover Water Zones
700’ of 17.5” Hole, 13-3/8” Casing

Intermediate: Cover **Brown Dolomite**
5,400’ of 12.25” Hole, 9-5/8” Casing & Stage Tool

Cottage Grove open while drilling lateral.

Production: 8.75” Hole & 5.5” Casing

11,300’ TVD

15,700’ MD

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SURFACE HOLE

- Cover Fresh-water zones
- Takes 1 day to drill with Mill Tooth
- Spud Mud

VERTICAL HOLE

- Zones of concern:
  - Brown Dolomite at 5,000’ – Losses and corrosive.
  - Heebner at 8,900’ – Deviation issue.
  - Tonkawa at 9,500’ – May kick.
  - Cottage Grove at 10,100’ – Lost circulation.

Case here

or here?

- Entering lateral, pressure profile is consistent. Vertical hole issues are primary driver to casing decisions.

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VERTICAL HOLE

- Drill with rotary pendulum assembly.
  - Drifts 150’ North to Northwest by KOP.
- 9.0 ppg water-based mud pre-treated with LCM
- Typically 1 bit to reach KOP.
  - Use 5-blade PDC bit with 16mm cutters.
  - Revert to 6-blade if a trip is made.

CURVE

- Drill with bent motor and 5-blade, 13mm PDC.
  - 1.83° bend to achieve 10 DLS
  - No significant dead-zones
- 8.9 ppg oil-based mud.
  - Fines as needed.
- Typically 1 bit and 2.5 days.

LATERAL

- Drill with motor and neutral BHA.
  - RSS once comfortable with bits in an area.
- 8.9 ppg oil-based mud.
  - Fines as needed.
- Variability in lateral ROP
  - 6 and 7-blade PDCs with 13mm preferred.
  - More aggressive gives higher instantaneous ROP. Worth it?
  - Diamond impreg bit and turbine?

LATERAL & GEO-STEERING

- Compromise between geology and casing run.
- Targets every 500’ and use a ±10’ window.
- Bit walks more than in the deeper washes.

CASING DESIGN BENEFITS & RISKS

- Drill-through can be done successfully.
- Should drill-through be standard practice?
  - Can you live with 4.5” production casing?
  - Would you rather spend $700K on casing or lost mud?
- What about the one train-wreck?

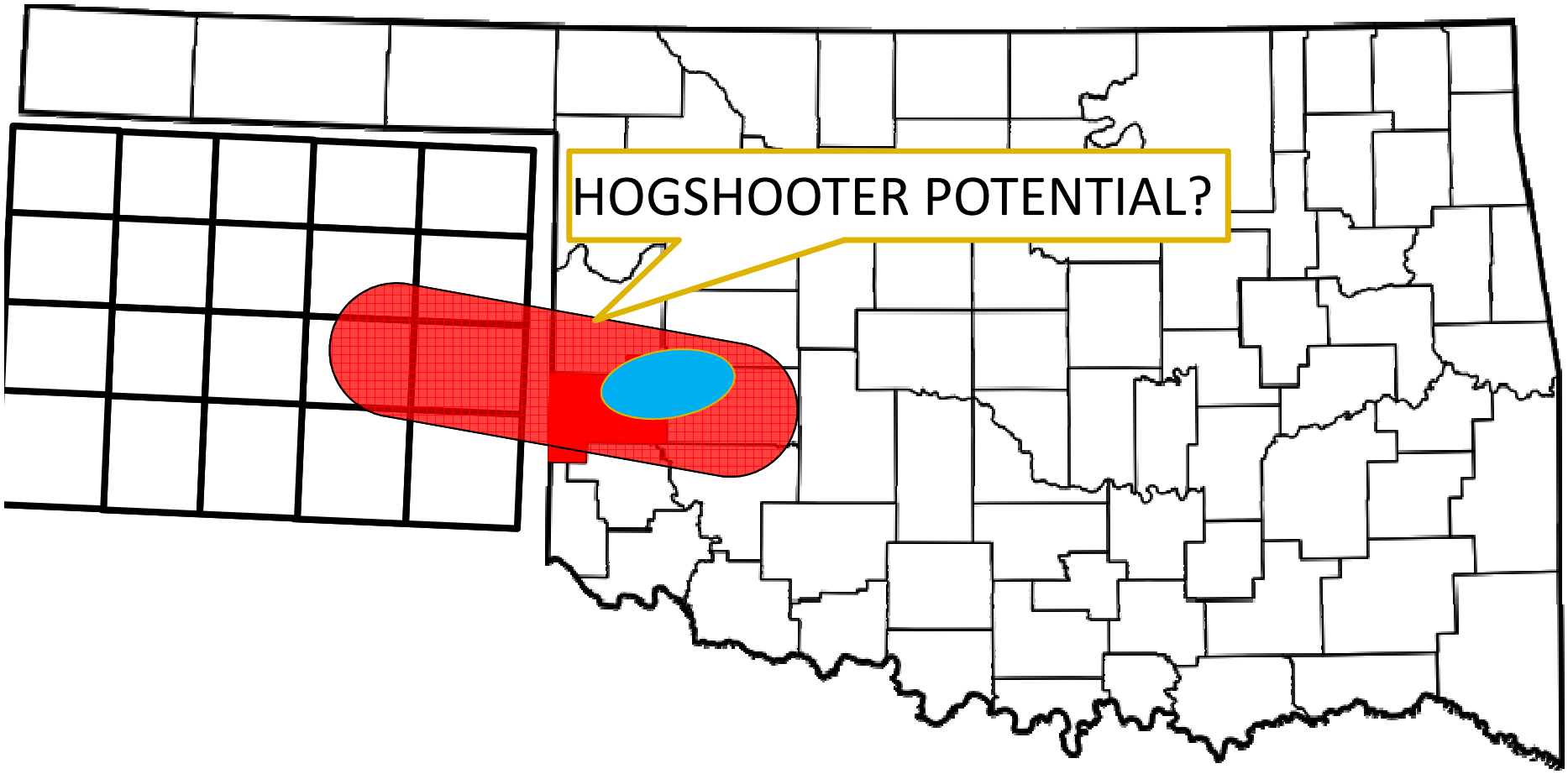
PROBLEMS SEEN

- Do all geologists want to be in the same rock?
  - Rigs across the street drill entirely different: Pyrite streaks, losses, stuck pipe, and geologic side-tracks.
  - Differences due to geology or geologist?
- Our pendulum assembly much slower than offset.
- Bit strategy.
- Fracture initiation pressures higher than expected.

APACHE GO-FORWARD PLAN

- Continue to map and assess acreage.
- No drill-though. Too much risk, too little gain.
  - Set 1,500’ of 9-5/8” surface and set 7” at KOP.
  - 6-1/8” lateral and 4.5” production casing.
- Performance motor in vertical pendulum.
- Lighten production cement, but NO FLARE!

EXTENT OF FIELD?

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QUESTIONS?