Discovery:
- 1916 by Bair Oil Company
- 269’ well in 1st Frontier formation
- Lost Soldier No. 1 IP’d = 200 bopd
- Earliest production from shallow horizons
  - Frontier, Muddy, Lakota, Morrison and Sundance

Development
- 1930’s: Lost Soldier Tensleep discovered
  (Well IP’d = at 2,435 bopd)
- 1936: Wertz Field discovered
- 1947: Madison discovered
- 1975: Acquired by Amoco
- 1999: Acquired by Merit Energy Company

Unitization
- Wertz: 1937
- Lost Soldier: 1962

Secondary & Tertiary Floods
- Waterfloods were initiated in the mid to late 70’s
- CO2 Floods were initiated in the late 80’s
Location:
- Great Divide Basin
- Northwestern edge of the Rawlins Uplift

Structure:
- Faulted anticlines
- Eight producing horizons (youngest to oldest)
  - Frontier
  - Muddy
  - Lakota
  - Sundance
  - Tensleep (CO₂)
  - Darwin (CO₂)
  - Madison (CO₂)
  - Flathead (CO₂)

Fields:
- Lost Soldier:
  - 250 wellbores
  - 400 mmbbl OOIP
- Wertz:
  - 164 wellbores
  - 200 mmbbl OOIP
Current Production Rates
- 8,000 bopd
- 1,400 bpd of Y-grade NGL’s
- 210,000 bwpd (WCTavg = 96.3%)
- 150,000 mcfd of CO2 (GOR = 18,000 scf/bbl)

General Statistics
- 165 active producers
- 153 active injectors
- Currently purchasing 30-40 mmcmd from Exxon’s Shute Creek Plant

Facilities
- Six production satellites
- 17 injection satellites
- Lost Soldier Main Battery (In 1995 Amoco Production Company combined production facilities)
- Injection plant No.1 (6 positive displacement pumps each with a 40,000 bwpd capacity)
- Bairoil CO2 Recycle Plant
Rates

Monthly Averages

- Oil Production, bopd
- Water Production, bwpd
- Gas Production, mcfpd
- Water Injection, bwpd
- CO2 Injection, mcfpd
- Original Waterflood Performance Prediction

The Bairoil Complex
The 2nd Annual Wyoming CO₂ Conference
<table>
<thead>
<tr>
<th>Field</th>
<th>Formation</th>
<th>Lithology</th>
<th>Average Depth</th>
<th>Formation Thickness</th>
<th>Average Porosity</th>
<th>Air Perm</th>
<th>Current Spacing</th>
<th>Res Press psi</th>
<th>Oil Grav API</th>
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<td>SS</td>
<td>5,000</td>
<td>535</td>
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<td>31.0</td>
<td>10 - 20</td>
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<td>SS</td>
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<td>340</td>
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<td>2.5</td>
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<td></td>
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<td>Darwin</td>
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<td>2.5</td>
<td>20 -30</td>
<td>3,300</td>
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</tbody>
</table>

**Primary Production:**
- Fluid expansion
- Water influx
- Gravity drainage

**Bairoil CO₂ Floods**
- Five active CO₂ floods
- Reservoir parameters listed above
- MMP = 2,300 to 2,500 psig
Merit Activity

Reactivations
- Wertz flood
- Shallow production
- ESP installations

Drilling
- Replacement wells & deepening
- Shallow fuel gas wells
- Horizontal drilling

Mechanical Integrity Work
- Increased CO₂ takes from Exxon
- Increased recycle capacity
- Increased water injection rate.
- Flowline & injection line replacement
- Upgrade of field automation system
- Lost Soldier main battery upgrades

Conformance
- Monthly bottom hole pressure surveys
- Active production/injection logging program
- Active workover program

Historic Oil Production
Forecast Oil Production Under Amoco
Actual Oil Production Under Merit

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Challenges

**Conformance**
- Poor sweep efficiencies due to fracturing and multiple zones
- Poor vertical conformance
- Pattern balancing
  ★ Solution: Contracted third party to update reservoir model

**Scaling**
- Down-hole scaling of injectors
- Scaling tendencies in injection lines, injection header & throughout production facilities
  ★ Solution: Active acidizing program

**Asphaltene Deposition**
- In ESP wells due to shearing action of pump and CO2 breakthrough
- In horizontal drill wells
  ★ Solution: Installation of capillary string & continuous injection of asphaltene inhibitor

**Maintaining WAG Cycles**
- Constantly swapping wells to bring on additional production
- Balancing water and CO2 injection & production volumes
  ★ Solution: Daily monitoring of cycles to ensure switches
Future Plans

Continue to optimize current EOR projects with recycled CO₂ volumes

Infill and horizontal drilling
- Down-space Lost Soldier Cambrian
- Horizontal side-tracks to target injection into specific horizons

Conformance improvements and pattern re-alignment
- Optimizing WAG ratios
- Increasing CO₂ retention factor

Expanding current floods
The Bairoil Complex

John Stroud  Merit Energy Company

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May 29th & 30th  •  Casper, Wyoming