Irrigation Protection in CBM Areas

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“All Wyoming surface waters which have the natural water quality potential for use as an agricultural water supply shall be maintained at a quality which allows continued use of such waters for agricultural purposes. Degradation of such waters shall not be of such an extent to cause a measurable decrease in crop or livestock production. Unless otherwise demonstrated, all Wyoming surface waters have the natural water quality potential for use as an agricultural water supply.”
What We’re NOT talking about....
What We ARE talking about....
Not Protected as Irrigation
What Gets Monitored

• CBM Outfalls (Produced Water)
• CBM Reservoirs
• Surface Water (Downstream)
• Groundwater
• Soils
• Crops / Forage
Typical CBM Layout

- CBM Outfall (end-of-pipe)
- On-Channel Reservoir
- Ephemeral stream channel (tributary to river)
- Groundwater
- Irrigated Fields
- River
Reservoirs

Threshold: Reservoir water EC concentrating salts at 150% or greater.

Action: Cease discharge of CBM water into affected reservoirs.
Groundwater

Threshold 1: Groundwater within 6 feet of surface.

Action 1: Increase sampling frequency. Add sampling for dissolved inorganic carbon.

Threshold 2: Groundwater within 3 feet of surface AND contains CBM water.

Action 2: Cease CBM flows from contributing areas.
Soils

• **Threshold:** 40% increase in EC or SAR in one year; or 15% increase over 2 years or more; or, regardless of trend, any finding of ESP > 10% or EC > 4,000 micromhos/cm at 0-12” depth.

• **Action:** Increase soil sampling to twice per year. Investigate source of problem. If CBM water a contributing factor, mitigate by reducing CBM discharges, improving drainage and/or amending soils.
2012 Dead Horse Creek:

Depth to groundwater:  3.5 – 12.5 ft
Groundwater EC:  3,000 – 12,000 µmhos/cm
Groundwater Carbon C\textsuperscript{13}/C\textsuperscript{12}: -4.5 to -12.5
Soil EC:  4,000 – 17,000 µmhos/cm
Soil ESP:  1 - 20
Soil Smectite:  18 – 32 %
Reservoir EC:  550 – 5,300 µmhos/cm
2012 Beaver Creek:

Depth to groundwater: 6 – 12.5 ft

Groundwater EC: 7,200 – 8,300 µmhos/cm

Groundwater Carbon C$^{13}$/C$^{12}$: -4.5 to -14.5

Soil EC: 1,300 – 32,000 µmhos/cm

Soil ESP: 1 - 20

Soil Smectite: 18 – 41 %

Reservoir EC: 800 – 3,600 µmhos/cm